SOLVED PAPER	NEET (UG) (Re-Examination) 4th September 2022	Code U6

Important Instructions :

1. *The test is of **3 hours 20 minutes** duration and Test Booklet contains **200** multiple choice questions (four options with a single correct answer) from **Physics, Chemistry and Biology (Botany and Zoology)**. **50** Questions in each subject are divided into two **Section (A and B)** as per details given below:*
   - ***(a) Section A** shall consist of **35 (Thirty-five)** Questions in each subject (Question Nos- 1 to 35, 51 to 85, 101 to 135 and 151 to 185). All questions are compulsory.*
   - ***(b) Section B** shall consist of **15 (Fifteen)** Questions in each subject (Question Nos- 36 to 50, 86 to 100, 136 to 150 and 80 to 200). In Section B, a candidate needs to **attempt any 10 (Ten)** questions out of **15 (Fifteen)** in each subject.*

   Candidates are advised to read all 15 questions in each subject of Section B** before they start attempting the question paper. In the event of a candidate attempting more than ten questions, **the first ten questions answered by the candidate shall be evaluated.
2. *Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, one mark will be deducted from the total scores. **The maximum marks are 720.***
3. *Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses on Answer Sheet.*
4. *Use of Electronic/Manual Calculator is prohibited.*
5. ***No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.***
6. *The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.*
7. *Compensatory time of one hour five minutes will be provided for the examination of three hours and 20 minutes duration, whether such candidate (having a physical limitation to write) uses the facility of scribe or not.*

PHYSICS

Section-A

1. Identify the function which represents a non-periodic motion.

(1) $e^{-\omega t}$ **(2)** $\sin \omega t$

(3) $\sin \omega t + \cos \omega t$ **(4)** $\sin(\omega t + \pi/4)$

2. The magnetic field of a plane electromagnetic wave is given by $\vec{B} = 3 \times 10^{-8} \cos(1.6 \times 10^3 x + 48 \times 10^{10} t)\,\hat{j}$, then the associated electric field will be:

(1) $3 \times 10^{-8} \cos(1.6 \times 10^3 x + 48 \times 10^{10} t)\,\hat{i}\,\mathrm{V/m}$

(2) $3 \times 10^{-8} \sin(1.6 \times 10^3 x + 48 \times 10^{10} t)\,\hat{i}\,\mathrm{V/m}$

(3) $9\sin(1.6 \times 10^3 x - 48 \times 10^{10} t)\,\hat{k}\,\mathrm{V/m}$

(4) $9\cos(1.6 \times 10^3 x + 48 \times 10^{10} t)\,\hat{k}\,\mathrm{V/m}$

3. The incorrect statement about the property of a Zener diode is:

(1) Zener voltage remains constant at breakdown

(2) It is designed to operate under reverse bias

(3) Depletion region formed is very wide

(4) p and n regions of zener diode are heavily doped

4. A cell of emf 4 V and internal resistance 0.5 Ω is connected to a 7.5 Ω external resistance. The terminal potential difference of the cell is:

(1) 3.75 V **(2)** 4.25 V

(3) 4 V **(4)** 0.375 V

5. Given below are two statements:

Statement-I:

In an a.c. circuit, the current through a capacitor leads the voltage across it.

Statement-II:

In a.c. circuits containing pure capacitance only, the phase difference between the current and the voltage is π:

In the light of the above statements, choose the most appropriate answer from the options given below:

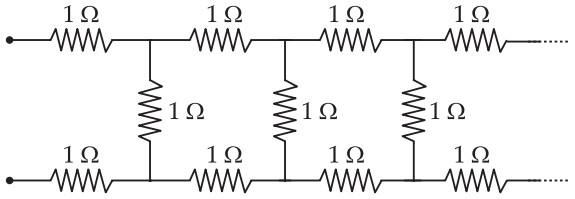
(1) Both **statement-I** and **statement-II** are correct

(2) Both **statement-I** and **statement-II** are incorrect

(3) **Statement-I** is correct but **statement-II** is incorrect

(4) **Statement-I** is incorrect but **statement-II** is correct

6. The equivalent resistance of the infinite network given below is:



(1) 2 Ω **(2)** $(1+\sqrt{2})\,\Omega$

(3) $(1+\sqrt{3})\,\Omega$ **(4)** $(1+\sqrt{5})\,\Omega$

7. A cricket ball is thrown by a player at a speed of 20 m/s in a direction 30° above the horizontal. The maximum height attained by the ball during its motion is (g = 10 m/s^2):

(1) 5 m **(2)** 10 m

(3) 20 m **(4)** 25 m

8. A closely packed coil having 1000 turns has an average radius of 62.8 cm. If current carried by the wire of the coil is 1 A, the value of magnetic field produced at the centre of the coil will be (permeability of free space = $4\pi \times 10^7$ H/m) nearly:

(1) 10^{-1} T **(2)** 10^{-2} T

(3) 10^{2} T **(4)** 10^{-3} T

9. An inductor of inductance 2 mH is connected to a 220 V, 50 Hz a.c. source. Let inductive reactance in the circuit is X_1. If a 220 V d.c. source replaces the a.c. source in the circuit, then the inductive reactance in the circuit is X_2. X_1 and X_2 respectively are:

(1) 6.28 Ω, zero **(2)** 6.28 Ω, infinity

(3) 0.628 Ω, zero **(4)** 0.628 Ω, infinity

10. During a cloudy day, a primary and a secondary rainbow may be created, then the:

(1) primary rainbow is due to double internal reflection and is formed above the secondary one.

(2) primary rainbow is due to double internal reflection and is formed below the secondary one.

(3) secondary rainbow is due to double internal reflection and is formed above the primary one.

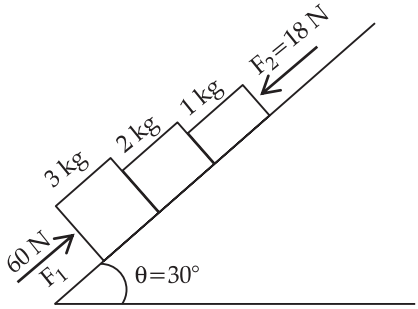
(4) secondary rainbow is due to single internal reflection and is formed above the primary one.

11. The light rays having photons of energy 4.2 eV are falling on a metal surface having a work function of 2.2 eV. The stopping potential of the surface is:

(1) 2 eV **(2)** 2 V

(3) 1.1 V **(4)** 6.4 V

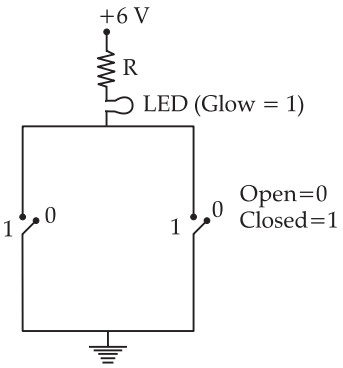
12. In the diagram shown, the normal reaction force between 2 kg and 1 kg is (Given g = 10 ms^{-2}) (Consider the surface, to be smooth):



(1) 25 N **(2)** 39 N

(3) 6 N **(4)** 10 N

13.



Identify the equivalent logic gate represented by the given circuit:

(1) OR **(2)** NOR

(3) AND **(4)** NAND

14. Two copper vessels A and B have the same base area but of different shapes. A takes twice the volume of water as that B requires to fill upto a particular common height. Then the correct statement among the following is:

(1) Pressure on the base area of vessels A and B is same.

(2) Pressure on the base area of vessels A and B is not same.

(3) Both vessels A and B weigh the same.

(4) Vessel B weighs twice that of A.

15. The distance between the two plates of a parallel plate capacitor is doubled and the area of each

plate is halved. If C is its initial capacitance, its final capacitance is equal to:

(1) 2C **(2)** C/2

(3) 4C **(4)** C/4

16. The terminal velocity of a copper ball of radius 5 mm falling through a tank of oil at room temperature is 10 cm s^{-1}. If the viscosity of oil at room temperature is 0.9 kg m^{-1} s^{-1}, the viscous drag force is:

(1) 8.48×10^{-3} N **(2)** 8.48×10^{-5} N

(3) 4.23×10^{-3} N **(4)** 4.23×10^{-6} N

17. If $\vec{F} = 2\hat{i} + \hat{j} - \hat{k}$ and $\vec{r} = 3\hat{i} + 2\hat{j} - 2\hat{k}$, then the scalar and vector products of $\vec{F}$ and $\vec{r}$ have the magnitudes respectively as:

(1) 5, $\sqrt{3}$ **(2)** 4, $\sqrt{5}$

(3) 10, $\sqrt{2}$ **(4)** 10, 2

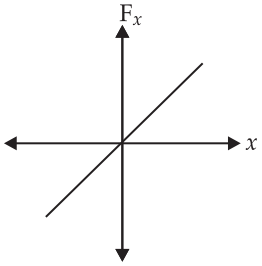
18. After passing through a polariser a linearly polarised light of intensity I is incident on an analyser making an angle of 30° with that of the polariser. The intensity of light emitted from the analyser will be :

(1) $\frac{I}{2}$ **(2)** $\frac{I}{3}$

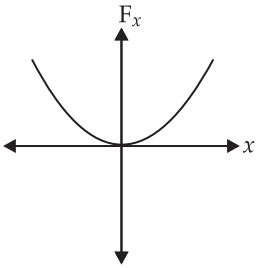
(3) $\frac{3I}{4}$ **(4)** $\frac{2I}{4}$

19. The restoring force of a spring with a block attached to the free end of the spring is represented by :

(1)



(2)



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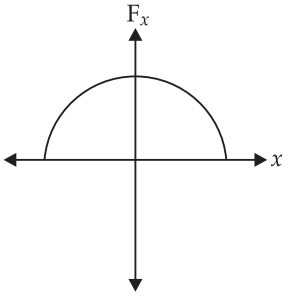
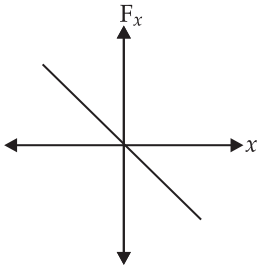


(4)



20. If the screen is moved away from the plane of the slits in a Young's double slit experiment, then the:

(1) angular separation of the fringes increases

(2) angular separation of the fringes decreases

(3) linear separation of the fringes increases

(4) linear separation of the fringes decreases

21. The effective capacitances of two capacitors are 3 μF and 16 μF, when they are connected in series and parallel respectively. The capacitance of two capacitors are:

(1) 10 μF, 6 μF **(2)** 8 μF, 8 μF

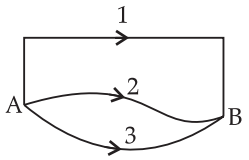
(3) 12 μF, 4 μF **(4)** 1.2 μF, 1.8 μF

22. The distance covered by a body of mass 5 g having linear momentum 0.3 kg m/s in 5 s is:

(1) 300 m **(2)** 30 m

(3) 3 m **(4)** 0.3 m

23. A gravitational field is present in a region and a mass is shifted from A to B through different paths as shown. If W_1, W_2 and W_3 represent the work done by the gravitational force along the respective paths, then



(1) $W_1 = W_2 = W_3$

(2) $W_1 > W_2 > W_3$

(3) $W_1 > W_3 > W_2$

(4) $W_1 < W_2 < W_3$

24. The reciprocal of resistance is:

(1) reactance **(2)** mobility

(3) conductivity **(4)** conductance

25. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R),

Assertion (A):

When a fire cracker (rocket) explodes in mid air, its fragments fly in such a way that they continue moving in the same path, which the fire cracker would have followed, had it not exploded

Reason (R):

Explosion of cracker (rocket) occurs due to internal forces only and no external force acts for this explosion.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(3) (A) is correct but (R) is not correct

(4) (A) is not correct but (R) is correct

26. The threshold frequency of a photoelectric metal is ν_0. If light of frequency $4\nu_0$ is incident on this metal, then the maximum kinetic energy of emitted electrons will be:

(1) $h\nu_0$ **(2)** $2h\nu_0$

(3) $3h\nu_0$ **(4)** $4h\nu_0$

27. The ratio of the magnitude of the magnetic field and electric field intensity of a plane electromagnetic wave in free space of permeability μ_0 and permittivity ε_0 is (Given that c - velocity of light in free space):

(1) c **(2)** $\frac{1}{c}$

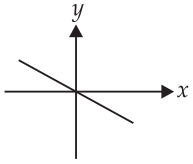
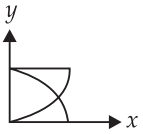
(3) $\frac{c}{\sqrt{\mu_0\varepsilon_0}}$ **(4)** $\frac{\sqrt{\mu_0\varepsilon_0}}{c}$

28. The shape of the magnetic field lines due to an infinite long, straight current carrying conductor is:

(1) a straight line **(2)** circular

(3) elliptical **(4)** a plane

29. Match List - I with List - II:

	List - I (x-y graphs)		List - II (Situations)
(a)		**(i)**	Total mechanical energy is conserved
(b)		**(ii)**	Bob of a pendulum is oscillating under negligible air friction
(c)		**(iii)**	Restoring force of a spring
(d)		**(iv)**	Bob of a pendulum is oscillating along with air friction

Choose the **correct** answer from the options given below:

(1) (a) - (iv), (b) - (i), (c) - (iii), (d) - (i)

(2) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

(3) (a) - (i), (b) - (iv), (c) - (iii), (d) - (i)

(4) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)

30. Given below are two statements: Out of Syllabus

Statement I:

The law of radioactive decay states that the number of nuclei undergoing the decay per unit time is inversely proportional to the total number of nuclei in the sample.

Statement II:

The half life of a radionuclide is the sum of the life time of all nuclei, divided by the initial concentration of the nuclei at time $t = 0$.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **Statement I** and **Statement II** are correct

(2) Both **Statement I** and **Statement II** are incorrect

(3) **Statement I** is correct but **Statement** II is incorrect

(4) **Statement I** is incorrect but **Statement II** is correct

31. An ideal gas follows a process described by the equation $PV^2 = C$ from the initial (P_1, V_1, T_1) to final (P_2, V_2, T_2) thermodynamic states, where C is a constant. Then:

(1) If $P_1 > {}_2$ then $T_1 < T_2$

(2) If $V_2 > V_1$ then $T_2 > T_1$

(3) If $V_2 > V_1$ then $T_2 < T_1$

(4) If $P_1 > P_2$ then $V_1 > V_2$

32. A standard filament lamp consumes 100 W when connected to 200 V a.c. mains supply. The peak current through the bulb will be :

(1) 0.707 A **(2)** 1 A

(3) 1.414 A **(4)** 2 A

33. Let R_1 be the radius of the second stationary orbit and R_2 be the radius of the fourth stationary orbit of an electron in Bohr's model. The ratio $\frac{R_1}{R_2}$ is:

(1) 0.25 **(2)** 0.5

(3) 2 **(4)** 4

34. The physical quantity that has the same dimensional formula as pressure is:

(1) Force

(2) Momentum

(3) Young's modulus of elasticity

(4) Coefficient of viscosity

35. An energy of 484 J is spent in increasing the speed of a flywheel from 60 rpm to 360 rpm. The moment of inertia of the flywheel is:

(1) 0.7 kg-m^2 **(2)** 3.22 kg-m^2

(3) 30.8 kg-m^2 **(4)** 0.07 kg-m^2

Section-B

36. The magnetic flux linked to a circular coil of radius R is:

$\phi = 2t^3 + 4t^2 + 2t + 5$ Wb

The magnitude of induced emf in the coil at $t = 5$ s is:

(1) 108 V **(2)** 197 V

(3) 150 V **(4)** 192 V

37. An astronomical refracting telescope is being used by an observer to observe planets in normal adjustment. The focal lengths of the objective and eye piece used in the construction of the telescope are 20 m and 2 cm respectively. Consider the following statements about the telescope:

(a) The distance between the objective and eye piece is 20.02 m

(b) The magnification of the telescope is (–) 1000

(c) The image of the planet is erect and diminished

(d) The aperture of eye piece is smaller than that of objectie

The correct statements are:

(1) (a), (b) and (c) **(2)** (b), (c) and (d)

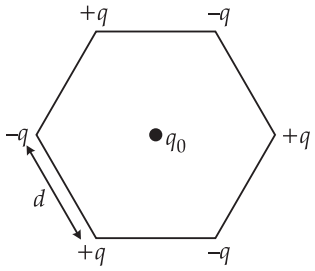
(3) (c), (d) and (a) **(4)** (a), (b) and (d)

38. At any instant, two elements X_1 and X_2 have same number of radioactive atoms. If the decay constant of X_1 and X_2 are 10λ and λ respectively. Then the time when the ratio of their atoms becomes $\frac{1}{e}$ respectively will be: Out of Syllabus

(1) $\frac{1}{11\lambda}$ **(2)** $\frac{1}{6\lambda}$

(3) $\frac{1}{6\lambda}$ **(4)** $\frac{1}{5\lambda}$

39. Six charges $+q$, $-q$, $+q$, $-q$, $+q$ and $-q$ are fixed at the corners of a hexagon of side d as shown in the figure. The work done in bringing a charge q_0 to the centre of the hexagon from infinity is (ε_0 - permittivity of free space):



(1) Zero **(2)** $\frac{-q^2}{4\pi\varepsilon_0 d}$

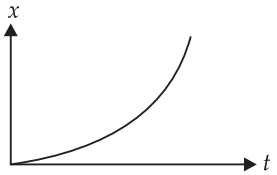
(3) $\frac{-q^2}{4\pi\varepsilon_0 d}\left(3-\frac{1}{\sqrt{2}}\right)$ **(4)** $\frac{-q^2}{4\pi\varepsilon_0 d}\left(6-\frac{1}{\sqrt{2}}\right)$

40. An organ pipe filled with a gas at 27°C resonates at 400 Hz in its fundamental mode. If it is filled with the same gas at 90°C, the resonance frequency at the same mode will be:

(1) 420 Hz **(2)** 440 Hz

(3) 484 Hz **(4)** 512 Hz

41. The position-time ($x - t$) graph for positive acceleration is:

(1)


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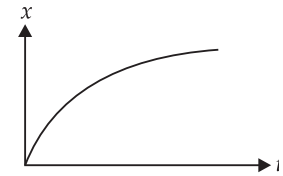

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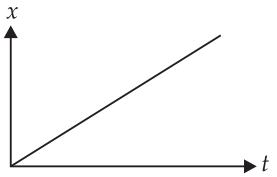

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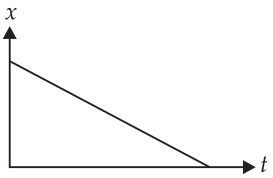


42. The collector current in a common base amplifier using n-p-n transistor is 24 mA. If 80% of the electrons released by the emitter is accepted by the collector, then the base current is numerically: Out of Syllabus

(1) 6 mA and leaving the base

(2) 3 mA and leaving the base

(3) 6 mA and entering the base

(4) 3 mA and entering the base

43. Three vessels of equal capacity have gases at the same temperature and pressure. The first vessel contains helium (monoatomic), the second contains fluorine (diatomic) and the third contains sulfur hexafluoride (polyatomic). The correct statement, among the following is:

(1) All vessels contain unequal number of respective molecules

(2) The root mean square speed of molecules is same in all three cases

(3) The root mean square speed of helium is the largest

(4) The root mean square speed of sulfur hexafluoride is the largest

44. In a gravitational field, the gravitational potential is given by, $V = \frac{K}{x}$ (J/kg). The gravitational field intensity at point (2, 0, 3) m is:

(1) $+\frac{K}{2}$ **(2)** $-\frac{K}{2}$

(3) $-\frac{K}{4}$ **(4)** $+\frac{K}{4}$

45. Two very long, straight, parallel conductors A and B carry current of 5 A and 10 A respectively and are at a distance of 10 cm from each other. The direction of current in two conductors is same. The force acting per unit length between two conductors is ($\mu_0 = 4\pi \times 10^{-7}$ SI unit):

(1) 2×10^{-4} Nm^{-1} and is attractive

(2) 2×10^{-4} Nm^{-1} and is repulsive

(3) 1×10^{-4} Nm^{-1} and is attractive

(4) 1×10^{-4} Nm^{-1} and is repulsive

46. The magnetic field on the axis of a circular loop of radius 100 cm carrying current $I = \sqrt{2}$ A, at point 1 m away from the centre of the loop is given by:

(1) 3.14×10^{-7} T **(2)** 6.28×10^{-7} T

(3) 3.14×10^{-4} T **(4)** 6.28×10^{-4} T

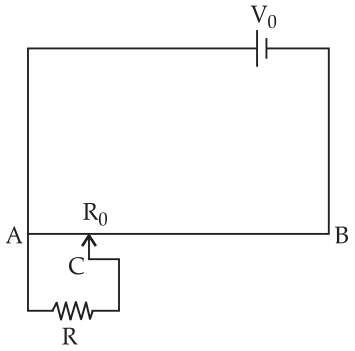
47. Two rods one made of copper and other made of steel of the same length and same cross sectional area are joined together. The thermal conductivity of copper and steel are 385 J s^{-1} K^{-1} m^{-1} and 50 J s^{-1} m^{-1} respectively. The free ends of copper and steel are held at 100°C and 0°C respectively. The temperature at the junction is, nearly:

(1) 12°C **(2)** 50°C

(3) 73°C **(4)** 88.5°C

48. The sliding contact C is at one fourth of the length of the potential wire (AB) from A as shown in the circuit diagram. If the resistance of the wire AB is R_0, then the potential drop (V) across the resistor R is:

Out of Syllabus



(1) $\frac{4V_0R}{3R_0+16R}$ **(2)** $\frac{4V_0R}{3R_0+R}$

(3) $\frac{2V_0R}{4R_0+R}$ **(4)** $\frac{2V_0R}{2R_0+3R}$

49. The ratio of coulomb's electrostatic force to the gravitational force between an electron and a proton separated by some distance is 2.4×10^{39}. The ratio of the proportionality constant, $K = \frac{1}{4\pi\varepsilon_0}$ to the Gravitational constant G is nearly

(Given that the charge of the proton and electron each = 1.6×10^{-19} C, the mass of the electron = 9.11×10^{-31} kg, the mass of the proton = 1.67×10^{-27} kg):

(1) 10^{20} **(2)** 10^{30}

(3) 10^{40} **(4)** 10

50. The percentage error in the measurement of g is (Given that $g = \frac{4\pi^2 L}{T^2}$, L = (10 ± 0.1) cm, T = (100 ± 1) s):

(1) 2% **(2)** 5%

(3) 3% **(4)** 7%

❐❐❐

CHEMISTRY

Section A

51. The correct order of bond angles in the following compounds/species is :

(1) $H_2O < NH_3 < \overset{+}{N}H_4 < CO_2$

(2) $H_2O < \overset{+}{N}H_4 < NH_3 < CO_2$

(3) $H_2O < \overset{+}{N}H_4 = NH_3 < CO_2$

(4) $CO_2 < NH_3 < H_2O < \overset{+}{N}H_4$

52. K_H value for some gases at the same temperature 'T' are given:

gas	K_H/k bar
Ar	40.3
CO_2	1.67
HCHO	1.83×10^{-5}
CH_4	0.413

where K_H is Henry's Law constant in water. The order of their solubility in water is :

(1) $Ar < CO_2 < CH_4 < HCHO$

(2) $Ar < CH_4 < CO_2 < HCHO$

(3) $HCHO < CO_2 < CH_4 < Ar$

(4) $HCHO < CH_4 < CO_2 < Ar$

53. Which of the following reactions is a part of the large scale industrial preparation of nitric acid ?

Out of Syllabus

(1) $NaNO_3 + H_2SO_4 \xrightarrow[500K,\ 9\ bar]{Pt} NaHSO_4 + HNO_3$

(2) $4NH_3 + 5O_2$ (from air) $\xrightarrow[500K,\ 9\ bar]{Pt} 4NO + 6H_2O$

(3) $4HPO_3 + 2N_2O_5 \xrightarrow[500K,\ 9\ bar]{Pt} 4HNO_3 + P_4O_{10}$

(4) $Cu(NO_3)_2 + 2NO_2 + 2H_2O \xrightarrow[500K,\ 9\ bar]{Pt} 4HNO_3 + Cu$

54. $CaCl_2$ and $Ca(OCl)_2$ are components of :

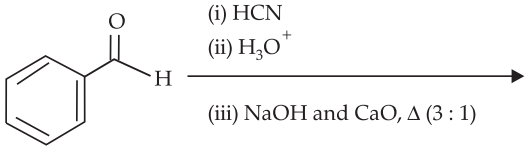
(1) gypsum

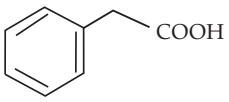
(2) Portland cement

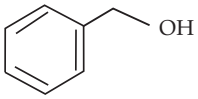
(3) bleaching powder

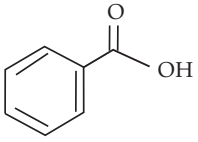
(4) lime water

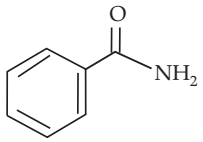
55. The product formed from the following reaction sequence is :



(1) 

(2) 

(3) 

(4) 

56. Match List-I with List-II :

List-I (Reaction)		List-II (Product formed)	
(a)	Gabriel synthesis	**(i)**	Benzaldehyde
(b)	Kolbe synthesis	**(ii)**	Ethers
(c)	Williamson synthesis	**(iii)**	Primary amines
(d)	Etard synthesis	**(iv)**	Salicyclic acid

Choose the correct answer from the options given below :

(1) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv)

(2) (a) - (ii), (b) - (iii), (c) - (i), (d) - (iv)

(3) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)

(4) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

57. Match List-I with List-II

Out of Syllabus

List-I		List-II	
(a)	Sodium laurylsulphate	**(i)**	Toilet soap
(b)	Cetyltrimethyl ammonium chloride	**(ii)**	Non-ionic detergent
(c)	Sodium stearate	**(iii)**	Anionic detergent
(d)	Polyethyleneglycyl stearate	**(iv)**	Cationic detergent

Choose the correct answer from the options given below :

(1) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)

(2) (a) - (i), (b) - (iv), (c) - (ii), (d) - (iii)

(3) (a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)

(4) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv)

58. Which of the following reactions is a decomposition redox reaction ?

(1) $2Pb(NO_3)_2(s) \rightarrow 2PbO(s) + 4NO_2(g) + O_2(g)$

(2) $N_2(g) + O_2(g) \rightarrow 2NO(g)$

(3) $Cl_2(g) + 2OH(aq) \rightarrow ClO^-(aq) + Cl^-(aq) + 4H_2O(l)$

(4) $P_4(s) + 3OH(aq) + 3H_2O(l) \rightarrow PH_3(g) + 3H_2PO^-_2(aq)$

59. If first ionization enthalpies of element X and Y are 419 kJ mol^{-1} and 590 kJ mol^{-1}, respectively and second ionization enthalpies of X and Y are 3069 kJ mol^{-1} and 1145 kJ mol^{-1}, respectively.

Then correct statement is :

(1) X is an alkali metal and Y is an alkaline earth metal.

(2) X is an alkaline earth metal and Y is an alkali metal.

(3) Both X and Y are alkali metals.
(4) Both X and Y are alkaline earth metals.

60. Predict the order of reactivity of the following four isomers towards S_N2 reaction.
(I) $CH_3CH_2CH_2CH_2Cl$
(II) $CH_3CH_2CH(Cl)CH_3$
(III) $(CH_3)_2CHCH_2Cl$
(IV) $(CH_3)_3CCl$
(1) (IV) > (III) > (II) > (I)
(2) (I) > (II) > (III) > (IV)
(3) (I) > (III) > (II) > (IV)
(4) (IV) > (II) > (III) > (I)

61. Match List-I with List-II :

List-I (Molecules)		List-II (Shape)	
(a)	NH_3	**(i)**	Square pyramidal
(b)	ClF_3	**(ii)**	Trigonal bipyramidal
(c)	PCl_5	**(iii)**	Trigonal pyramidal
(d)	BrF_5	**(iv)**	T-shape

Choose the correct answer from the options given below :
(1) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
(2) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)
(3) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)
(4) (a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)

62. Which among the following is a thermoplastic polymer ? Out of Syllabus
(1) Bakelite
(2) Polythene
(3) Urea-formaldehyde resin
(4) Melamine polymer

63. Match List-I with List-II : Out of Syllabus

List-I (Compounds)		List-II (Molecular formula)	
(a)	Borax	(i)	$NaBO_2$
(b)	Kernite	(ii)	$Na_2B_4O_7.4H_2O$
(c)	Orthoboric acid	(iii)	H_3BO_3
(d)	Borax bead	(iv)	$Na_2B_4O_7.10H_2O$

Choose the **correct answer** from the options given below :
(1) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)
(2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)
(3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
(4) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

64. Two half cell reactions are given below :
$Co^{3+} + e^- \rightarrow Co^{2+}$, $E^o_{Co^{2+}/Co^{3+}} = -1.81$ V
$2Al^{3+} + 6e^- \rightarrow 2Al(s)$, $E^o_{Al/Al^{3+}} = +1.66$ V
The standard EMF of a cell with feasible redox reaction will be :
(1) +7.09 V **(2)** +0.15 V
(3) +3.47 V **(4)** –3.47 V

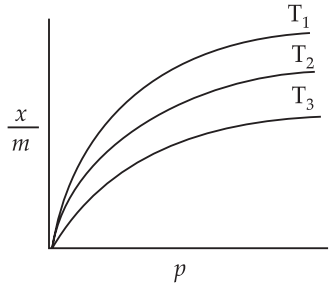
65. The element used for welding metals with high melting points is :
(1) Cl_2 **(2)** H_2
(3) Ne **(4)** He

66. $Na_2B_4O_7 \xrightarrow{heat} X + NaBO_2$
in the above reaction the product "X" is :
(1) H_3BO_3 **(2)** B_2O_3
(3) $Na_2B_2O_5$ **(4)** NaB_3O_5

67. The correct order of first ionization enthalpy for the given four element is :
(1) C < N < F < O **(2)** C < N < O < F
(3) C < O < N < F **(4)** C < F < N < O

68. 0.01 M acetic acid solution is 1% ionised, then pH of this acetic acid solution is :
(1) 3 **(2)** 2
(3) 4 **(4)** 1

69. Shown below are adsorption isotherms for a gas 'X' at temperatures T_1, T_2 and T_3 :



p and $\frac{x}{m}$ represent pressure and extent of adsorption, respectively. The correct order of temperatures for the given adsorption is:
(1) $T_1 > T_2 > T_3$ **(2)** $T_3 > T_2 > T_1$
(3) $T_1 = T_2 = T_3$ **(4)** $T_1 = T_2 > T_3$

70. The half life of a first order reaction is 2000 years. If the concentration after 8000 years is 0.02 M, then the initial concentration was :
(1) 0.16 M **(2)** 0.32 M
(3) 0.08 M **(4)** 0.04 M

71. One mole of an ideal gas at 300 K is expanded isothermally from 1 L to 10 L volume. ΔU for this process is
(Use R = 8.314 J K^{-1} mol^{-1})
(1) 1260 J **(2)** 2520 J
(3) 5040 J **(4)** 0 J

72. What is the hybridization shown by C_1 and C_2 carbons, respectively in the given compound ?
$OHC–CH=CH–CH_2COOCH_3$
(1) sp^2 and sp^3 **(2)** sp^2 and sp^2
(3) sp^3 and sp^2 **(4)** sp^3 and sp^3

73. The density of the solution is 2.15 g mL^{-1}, then mass of 2.5 mL solution in correct significant figures is
(1) 5375×10^{-3} g **(2)** 5.4 g
(3) 5.38 g **(4)** 53.75 g

74. Flourine is a stronger oxidising agent than chlorine because :
(1) F-F bond has a low enthalpy of dissociation.

(2) Flouride ion (F^-) has high hydration enthalpy

(3) Electron gain enthalpy of flourine is less negative than chlorine.

(4) Flourine has a very small size.

Choose the most appropriate answer from the options given :

(1) (a) and (b) only **(2)** (a) and (c) only

(3) (a) and (d) only **(4)** (b) and (c) only

75. Match List-I with List-II :

List-I (Complexes)		List-II (Types)	
(a)	$[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5ONO]Cl_2$	**(i)**	ionisation isomerism
(b)	$[Cr(NH_3)_6][Co(CN)_6]$ and $[Cr(CN)_6][Co(NH_3)_6]$	**(ii)**	coordination isomerism
(c)	$[Co(NH_3)_5(SO_4)]Br$ and $[Co(NH_3)_5Br]SO_4$	**(iii)**	linkage isomerism
(d)	$[Cr(H_2O)_6]Cl_3$ and $[Cr(H_2O)_5Cl]Cl_2.H_2O$	**(iv)**	solvate isomerism

Choose the **correct answer** from the options given below :

(1) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)

(2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

(3) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)

(4) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

76. The incorrect statement about denaturation of proteins is

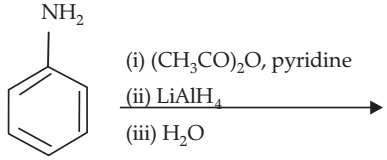
(1) It results due to change of temperature and/or pH

(2) It results in loss of biological activity of proteins.

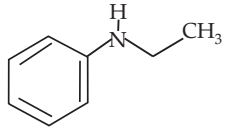
(3) A protein is formed from amino acids linked by peptide bonds.

(4) Uncoiling of the helical structure takes place.

77. The product formed from the following reaction sequence is



(1)



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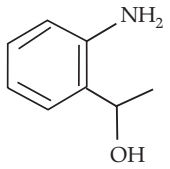
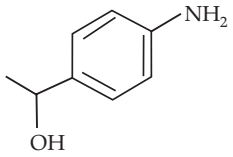
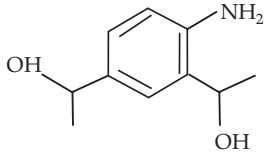


(3)



(4)



78. Match List-I with List-II : Out of Syllabus

List-I (Defects)		List-II (Shown by)	
(a)	Frenkel defect	**(i)**	non-ionic solids and density of the solid decreases
(b)	Schottky defect	**(ii)**	non-ionic solids and density of the solid increases
(c)	Vacancy defect	**(iii)**	ionic solids and density of the solid decreases
(d)	Interstitial defect	**(iv)**	ionic solids and density of the solid remains constant.

Choose the **correct answer** from the options given below :

(1) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

(2) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)

(3) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

(4) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

79. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A) : Chlorine is an electron withdrawing group but it is ortho, para directing in electrophilic aromatic substitution.

Reason (R) : Inductive effect of chlorine destabilises the intermediate carbocation formed during the

electrophilic substitution, however due to the more pronounced resonance effect, the halogen stabilises the carbocation at ortho and para positions.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**

(2) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**

(3) **(A)** is correct but **(R)** is not correct

(4) **(A)** is not correct but **(R)** is correct

80. Which of the following reactions is not an example for nucleophilic addition-elimination reaction?

(1) $CH_3CHO + NaHSO_3$

$$\rightleftharpoons CH_3-\underset{\underset{H}{|}}{\overset{\overset{OH}{|}}{C}}-OSO_2Na$$

(2) $CH_3CHO + NH_2OH \rightleftharpoons CH_3CH = N—OH + H_2O$

(3) $CH_3CHO + C_6H_5NHNH_2 \rightleftharpoons CH_3CH = N — NHC_6H_5 + H_2O$

(4) $CH_3CHO + NH_3 \rightleftharpoons CH_3CH = NH + H_2O$

81. Four gas cylinders containing He, N_2, CO_2 and NH_3 gases separately are graudally cooled from a temperature of 500 K. Which gas will liquify first ?

Out of Syllabus

(Given T_C in K – He : 5.3, N_2 : 126, CO_2 : 304.1 and NH_3 : 405.5)

(1) He **(2)** N_2

(3) CO_2 **(4)** NH_3

82. Decrease in size from left to right in actinoid series is greater and gradual than that in lanthanoid series due to:

(1) 4*f* orbitals are penultimate

(2) 4*f* orbitals have greater shielding effect

(3) 5*f* orbitals have poor shielding effect

(4) 5*f* orbitals have greater shielding effect

83. The decreasing order of boiling points of the following alkanes is:

(a) Heptane

(b) butane

(c) 2-methylbutane

(d) 2-methylpropane

(e) hexane

Choose the **correct answer** from the options given below:

(1) (a) > (c) > (e) > (d) > (b)

(2) (c) > (d) > (a) > (e) > (b)

(3) (a) > (e) > (b) > (c) > (d)

(4) (a) > (e) > (c) > (b) > (d)

84. Match the regents **(List-I)** with the product **(List-II)** obtained from phenol.

List-I		List-II	
(a)	(i) NaOH (ii) CO_2 (iii) H^+	**(i)**	Benzoquinone
(b)	(i) Aqueous NaOH + $CHCl_3$ (ii) H^+	**(ii)**	Benzene
(c)	Zn duct, Δ	**(iii)**	Salicyl aldehyde
(d)	$Na_2Cr_2O_7$, H_2SO_4	**(iv)**	Salicylic acid

Choose the **correct answer** from the options given below :

(1) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

(2) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

(3) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

(4) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)

85. Match List-I with List-II:

List-I (quantum number)		List-II (Orbital)	
(a)	$n = 2, l = 1$	**(i)**	2*s*
(b)	$n = 3, l = 2$	**(ii)**	3*s*
(c)	$n = 3, l = 0$	**(iii)**	2*p*
(d)	$n = 2, l = 0$	**(iv)**	3*d*

Choose the **correct answer** from the options given below :

(1) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

(2) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

(3) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

(4) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

Section B

86. Which one of the following is not a calcination reaction?

(1) $ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2$

(2) $Fe_2O_3.xH_2O \xrightarrow{\Delta} Fe_2O_3 + xH_2O$

(3) $CaCO_3.MgCO_3 \xrightarrow{\Delta} CaO + MgO + 2CO_2$

(4) $CaCO_3.2HCl \xrightarrow{\Delta} CaCl_2 + H_2O + CO_2$

87. When electromagnetic radiation of wavelength 300 nm falls on the surface of a metal, electrons are emitted with the kinetic energy of 1.68×10^5 J mol^{-1}. What is the minimum energy needed to remove an electron from the metal?
($h = 6.626 \times 10^{-34}$ Js, $c = 3 \times 10^8$ ms^{-1}, $N_A = 6.022 \times 10^{23}$ mol^{-1}

(1) 2.31×10^6 J mol^{-1}

(2) 3.84×10^4 J mol^{-1}

(3) 3.84×10^{-19} J mol^{-1}

(4) 2.31×10^5 J mol^{-1}

88. For a chemical reaction
$4A + 3B \rightarrow 6C + 9D$
rate of formation of C is 6×10^{-2} mol L^{-1} s^{-1} and rate of disappearance of A is 4×10^{-2} mol L^{-1} s^{-1}. The rate of reaction and amount of B consumed in interval of 10 seconds, respectively will be:

(1) 1×10^{-2} mol L^{-1} s^{-1} and 30×10^{-2} mol L^{-1}

(2) 10×10^{-2} mol L^{-1} s^{-1} and 10×10^{-2} mol L^{-1}

(3) 1×10^{-2} mol L^{-1} s^{-1} and 10×10^{-2} mol L^{-1}

(4) 10×10^{-2} mol L^{-1} s^{-1} and 30×10^{-2} mol L^{-1}

89. The incorrect method for the synthesis of alkenes is:

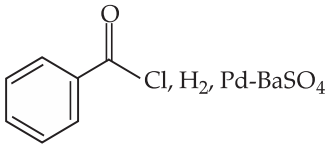
(1) treatment of alkynes with Na in liquid NH_3

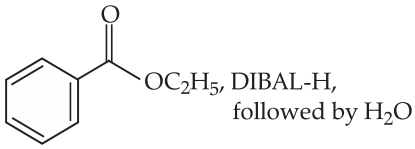
(2) heating alkyl halides with alcoholic KOH

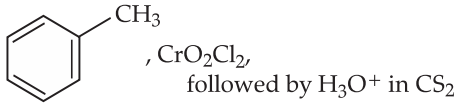
(3) treating alkyl halides in aqueous KOH solution

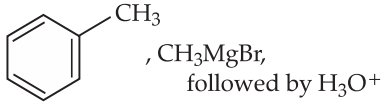
(4) treating vicinal dihalides with Zn metal

90. The incorrect method to synthesize benzaldehyde is:

(1) 

(2) 

(3) 

(4) 

91. What fraction of Fe exists as Fe(III) in $Fe_{0.96}O$?

(Consider $Fe_{0.96}$ to be made up of Fe(II) and Fe(III) only) Out of Syllabus

(1) $\frac{1}{12}$ **(2)** 0.08

(3) $\frac{1}{16}$ **(4)** $\frac{1}{20}$

92. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A):
The metal carbon bond in metal carbonyls possesses both σ and π character.

Reason (R):
The ligand to metal bond is a π bond and metal to ligand bond is a σ bond.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

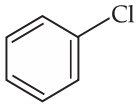
(3) (A) is correct but (R) is not correct.

(4) (A) is not correct but (R) is correct.

93. Which one of the following reaction sequence is incorrect method to prepare phenol?

(1) Aniline, $NaNO_2$ + HCl, H_2O, heating

(2) Cumene, O_2, H_3O^+

(3) 

, NaOH, STP condition

(4) 
, oleum, NaOH, H_3O^+

94. A vessel contains 3.2 g of dioxygen gas at STP (273.15 K and 1 atm pressure). The gas is now transferred to another vessel at constant temperature, where pressure becomes one third of the original pressure. The volume of new vessel in L is : Out of Syllabus

(Given - molar volume at STP is 22.4 L)

(1) 6.72 **(2)** 2.24

(3) 22.4 **(4)** 67.2

95. Match List-I with List-II: Out of Syllabus

List-I		List-II	
(a)	Biochemical oxygen demand	**(i)**	Oxidising mixture
(b)	Photochemical smog	**(ii)**	Polar stratospheric cloud
(c)	Classical smog	**(iii)**	organic matter in water
(d)	Ozone depletion	**(iv)**	reducing mixture

Choose the **correct answer** from the options given below:

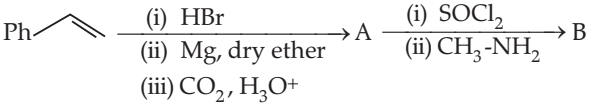
(1) (a)-(i), (b)-(iv), (c)-(ii), (d)-(iii)

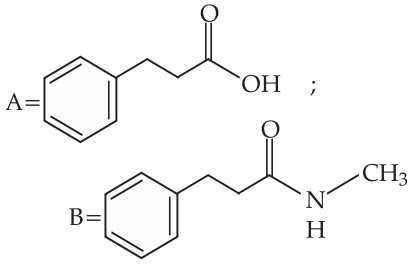
(2) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

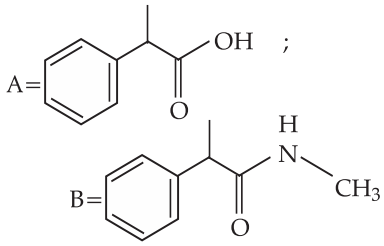
(3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

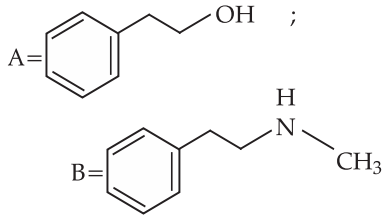
(4) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

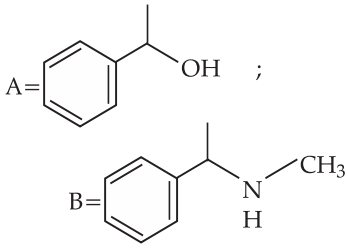
96. The products A and B in the following reaction sequence are :



(1) 

(2) 

(3) 

(4) 

97. Given below are two statements:

Statement I:

Cr^{2+} is oxidising and Mn^{3+} is reducing in nature.

Statement II:

Sc^{3+} compounds are repelled by the applied magnetic field.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both Statement I and Statement II are correct

(2) Both Statement I and Statement II are incorrect

(3) Statement I is correct but Statement II is incorrect

(4) Statement I is incorrect but Statement II is correct

98. K_P for the following reaction is 3.0 at 1000 K.

$CO_2(g) + C(s) \rightleftharpoons 2CO(g)$

What will be the value of K_C for the reaction at the same temperature?

(Given: R = 0.083 L bar K^{-1} mol^{-1})

(1) 0.36 **(2)** 3.6×10^{-2}

(3) 3.6×10^{-3} **(4)** 3.6

99. Standard electrode potential for the cell with cell reaction

$Zn(s) + Cu^{2+}(aq) \longrightarrow Zn^{2+}(aq) + Cu(s)$

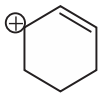
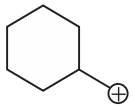
is 1.1 V. Calculate the standard gibbs energy change for the cell reaction.

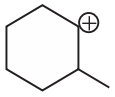
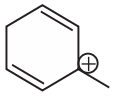
(Given F = 96487 C mol^{-1})

(1) –200.27 kJ mol^{-1} **(2)** –212.27 kJ mol^{-1}

(3) –212.27 J mol^{-1} **(4)** –200.27 J mol^{-1}

100. Which of the following is the most stable carbocation?

(1)  **(2)** 

(3)  **(4)** 

❐❐❐

BOTANY

Section A

101. Which stage of meiosis can last for months or years in the oocytes of some verterbrates?

(1) Leptotene **(2)** Pachytene

(3) Diplotene **(4)** Diakinesis

102. When one CO_2 molecule is fixed as one molecule of triose phosphate, which of the following photochemically made, high energy chemical intermediates are used in the reduction phase ?

(1) 1 ATP + 1 NADPH

(2) 1 ATP + 2 NADPH

(3) 2 ATP + 1 NADPH

(4) 2 ATP + 2 NADPH

103. In *lac* operon, *z* gene codes for :

(1) β-galactosidase **(2)** Permease

(3) Repressor **(4)** Transacetylase

104. Initiation of lateral roots and vascular cambium during secondary growth takes place in cells of :

Out of Syllabus

(1) Epiblema **(2)** Cortex

(3) Endodermis **(4)** Pericycle

105. Match **List - I** with **List - II** :

List - I		List - II	
(a)	Adenine	**(i)**	Pigment
(b)	Anthocyanin	**(ii)**	Polysaccharide

(c)	Chitin	**(iii)**	Alkaloid
(d)	Codeine	**(iv)**	Purine

Choose the **correct answer** from the options given below :

(1) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)
(2) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)
(3) (a) - (iii), (b) - (i), (c) - (iv), (d) - (ii)
(4) (a) - (i), (b) - (iv), (c) - (iii), (d) - (ii)

106. Match **List - I** with **List - II** :

List - I		List - II	
(a)	In *lac* operon *i* gene codes for	**(i)**	transacetylase
(b)	In *lac* operon *z* gene codes for	**(ii)**	permease
(c)	In *lac* operon *y* gene codes for	**(iii)**	β-galactosidase
(d)	In *lac* operon *a* gene	**(iv)**	Repressor codes for

Choose the **correct answer** from the options given below :

(1) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)
(2) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)
(3) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)
(4) (a) - (iii), (b) - (i), (c) - (iv), (d) - (ii)

107. Match **List - I** with **List - II** :

List - I		List - II	
(a)	*Chlamydomonas*	**(i)**	Moss
(b)	Cycas	**(ii)**	Pteridophyte
(c)	*Selaginella*	**(iii)**	Alga
(d)	*Sphagnum*	**(iv)**	Gymnosperm

Choose the **correct answer** from the options given below :

(1) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv)
(2) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)
(3) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)
(4) (a) - (ii), (b) - (iii), (c) - (i), (d) - (iv)

108. Given below are two statements :

Statement I :

DNA polymerases catalyse polymerisation only in one direction, that is 5' → 3'

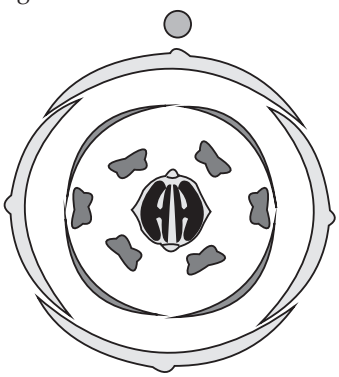
Statement II :

During replication of DNA, on one strand the replication is continuous while on other strand it is discontinuous.

In the light of the above statements, choose the **correct answer** from the options given below :

(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct but Statement II is incorrect
(4) Statement I is incorrect but Statement II is correct

109. The Floral Diagram represents which one of the following families ?



(1) Fabaceae **(2)** Brassicaceae
(3) Solanaceae **(4)** Liliaceae

110. The pioneer species in a hydrarch succession are:

Out of Syllabus

(1) Free-floating angiosperms
(2) Submerged rooted plants
(3) Phytoplanktons
(4) Filamentous algae

111. The number of time(s) decarboxylation of isocitrate occurs during single TCA cycle is :

(1) One **(2)** Two
(3) Three **(4)** Four

112. Given below are two statements :

Statement I :

Sickle cell anaemia and Haemophilia are autosomal dominant traits .

Statement II :

Sickle cell anaemia and Haemophilia are disorders of the blood.

In the light of the above statements, choose the **correct answer** from the options given below :

(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct but Statement II is incorrect
(4) Statement I is incorrect but Statement II is correct

113. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :

When a particular restriction enzyme cuts strand of DNA, overhanging stretches or sticky ends are formed.

Reason (R) :

Some restriction enzymes cut the strand of DNA a little away from the centre of palindromic site.

In the light of the above statements, choose the **correct answer** from the options given below :

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(3) (A) is correct but (R) is not correct
(4) (A) is not correct but (R) is correct

114. Give the correct descending order of organisms with reference to their estimated number found in Amazon forest.

(a) Plants **(b)** Invertebrates
(c) Fishes **(d)** Mammals
(e) Birds

Choose the **correct answer** from the options given below :

(1) (a) > (b) > (e) > (d) > (c)
(2) (a) > (c) > (d) > (b) > (e)
(3) (b) > (a) > (e) > (d) > (c)
(4) (b) > (a) > (c) > (e) > (d)

115. Match List - I with List - II :

List - I		List - II	
(a)	Porins nodules	**(i)**	Pink coloured
(b)	*leg* haemoglobin	**(ii)**	Lumen of thylakoid
(c)	H^+ accumulation	**(iii)**	Amphibolic pathway
(d)	Respiration	**(iv)**	Huge pores in outer membrane of mitochondria

Choose the correct answer from the options given below :

(1) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
(2) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)
(3) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)
(4) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

116. Which of the following growth regulators is an adenine derivative ?

(1) Auxin **(2)** Cytokinin
(3) Ethylene **(4)** Abscisic acid

117. The type of tissue commonly found in the fruit wall of nuts is :

(1) Parenchyma **(2)** Collenchyma
(3) Sclerenchyma **(4)** Sclereid

118. The species that come to appear in bare area are called : Out of Syllabus

(1) Pioneer species
(2) Invasive species
(3) Competitive species
(4) Species of seral community

119. In general the egg apparatus of embryo sac in angiosperm consists of :

(1) One egg cell, two synergids, three antipodal cells, two Polar nuclei
(2) One egg cell, two synergids, two antipodal cells, three Polar nuclei
(3) One egg cell, three synergids, two antipodal cells, two Polar nuclei
(4) One egg cell, two synergids, two antipodal cells, two Polar nuclei

120. Match List - I with List - II :

List - I		List - II	
(a)	Imbricate	**(i)**	*Calotropis*
(b)	Valvate	**(ii)**	*Cassia*
(c)	Vexillary	**(iii)**	Cotton
(d)	Twisted	**(iv)**	Bean

Choose the **correct answer** from the options given below :

(1) (a) - (ii), (b) - (i), (c) - (iii), (d) - (iv)
(2) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
(3) (a) - (ii), (b) - (iv), (c) - (iii), (d) - (i)
(4) (a) - (i), (b) - (iii), (c) - (iv), (d) - (ii)

121. All successions irrespective of the habitat proceed to which type of climax community ? Out of Syllabus

(1) Xeric **(2)** Mesic
(3) Hydrophytic **(4)** Edaphic

122. Separation of DNA, fragments is done by a technique known as :

(1) Polymerase Chain Reaction
(2) Recombinant technology
(3) Southern blotting
(4) Gel electrophoresis

123. The phenomenon by which the undividing parenchyma cells start to divide mitotically during plant tissue culture is called as :

(1) Differentiation **(2)** Dedifferentiation
(3) Redifferentiation **(4)** Secondary growth

124. In meiosis, crossing over and exchange of genetic material between homologous chromosomes are catalyzed by the enzyme.

(1) Phosphorylase **(2)** Recombinase
(3) Transferase **(4)** Polymerase

125. The 5-C compound formed during TCA cycle is :

(1) α-ketoglutaric acid
(2) Oxalo succinic acid
(3) Succinic acid
(4) Fumaric acid

126. When a carrier protein facilitates the movement of two molecules across the membrane in same direction, it is called :

(1) Uniport **(2)** Transport
(3) Antiport **(4)** Symport

127. The World Summit on sustainable development held in 2002 in Johannesburg, South Africa pledged for:

(1) A significant reduction in the current rate of biodiversity loss.
(2) Declaration of more biodiversity hotspots.
(3) Increase in agricultural production
(4) Collection and preservation of seeds of different genetic strains of commercially important plants.

128. Interfascicular cambium is present between :
Out of Syllabus
(1) Primary xylem and primary phloem
(2) Pericycle and endodermis
(3) Two vascular bundles
(4) Secondary xylem and secondary phloem

129. The ascent of xylem sap in plants is mainly accomplished by the :
Out of Syllabus
(1) size of the stomatal aperture
(2) distribution of stomata on the upper and lower epidermis
(3) cohesion and adhesion between water molecules
(4) root pressure

130. Which of the following statement is not correct?
(1) Rhizome is a condensed form of stem
(2) The apical bud in rhizome always remains above the ground
(3) The rhizome is aerial with no distinct nodes and internodes
(4) The rhizome is thick, prostrate and branched

131. To ensure that only the desired pollens fall on the stigma in artifical hybridization process :
(a) the female flower buds of plant producing unisexual flower need not be bagged.
(b) there is no need to emasculate unisexual flowers of selected female parent
(c) emasculated flowers are to be bagged immediately after cross pollination
(d) emasculated flowers are to be bagged after removal of anthers
(e) bisexual flowers, showing protogyny are never selected for cross
Choose the **correct answer** from the options given below :
(1) (a), (b) and (c) only
(2) (b), (c) and (d) only
(3) (b), (c) and (e) only
(4) (a), (d) and (e) only

132. The residual persistent part which forms the perisperm in the seeds of beet is :
(1) Calyx **(2)** Endosperm
(3) Nucellus **(4)** Integument

133. The chromosomal theory of inheritance was proposed by :
(1) Thomas Morgan **(2)** Sutton and Boveri
(3) Gregor Mendel **(4)** Robert Brown

134. Which of the following protects nitrogenase inside the root nodule of a leguminous plant?
(1) Catalase
(2) leg haemoglobin
(3) Transaminase
(4) Glutamate dehydrogenase

135. The ability of plants to follow different pathways in response to environment leading to formation of different kinds of structures is called :
(1) Redifferentiation **(2)** Development
(3) Plasticity **(4)** Differentiation

Section B

136. Which of the following pair represents free living nitrogen fixing aerobic bacteria?
(1) *Rhizobium* and *Frankia*
(2) *Azotobacter* and *Beijerinckia*
(3) *Anabaena* and *Rhodospirillum*
(4) *Pseudomonas* and *Thiobacillus*

137. Match List-I with List-II :

List - I		List - II	
(a)	Sacred groves	**(i)**	Alien species
(b)	Zoological park	**(ii)**	Release of large quantity of oxygen
(c)	Nile perch	**(iii)**	*Ex-situ* conservation
(d)	Amazon forest	**(iv)**	Khasi Hills in Meghalaya

Choose the **correct answer** from the options given below :
(1) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)
(2) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)
(3) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)
(4) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

138. Primary proteins are also called as polypeptides because :
(1) They are linear chains
(2) They are polymers of peptide monomers
(3) Successive amino acids are joined by peptide bonds
(4) They can assume many conformations

139. Match **List-I** with **List-II** :

List - I		List - II	
(a)	Gene gun	**(i)**	Replacement of a faulty gene by a normal healthy gene
(b)	Gene therapy	**(ii)**	Used for transfer of gene
(c)	Gene cloning	**(iii)**	Total DNA in the cells of an organism
(d)	Genome	**(iv)**	To obtain indentical copies of a particular DNA molecule

Choose the **correct answer** from the options given below :
(1) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)

(2) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)
(3) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)
(4) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

140. Match **List-I** with **List-II** :

List - I		List - II	
(a)	Bacteriophage $\phi \times 174$	**(i)**	48502 base pairs
(b)	Bacteriophage lambda	**(ii)**	5386 nucleotides
(c)	*Escherichia coli*	**(iii)**	3.3×10^9 base pairs
(d)	Haploid content of human DNA	**(iv)**	4.6×10^6 base pairs

Choose the **correct answer** from the options given below:

(1) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)
(2) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)
(3) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
(4) (a) - (i), (b) - (ii), (c) - (iv), (d) - (iii)

141. Which of the following can be expected if scientists succeed in introducing apomictic gene into hybrid varieties of crops ?

(1) Polyembryony will be seen and each seed will produce many plantlets
(2) Seeds of hybrid plants will show longer dormancy
(3) Farmers can keep on using the seeds produced by the hybrids to raise new crop year after year
(4) There will be segregation of the desired characters only in the progeny

142. Read the following statements and identify the characters related to the alga shown in the diagram:

(a) It is a member of Chlorophyceae
(b) Food is stored in the form of starch
(c) It is a monoecious plant showing oogonium and antheridium
(d) Food is stored in the form of laminarin or mannitol
(e) It shows dominance of pigments chlorophyll a, c and Fucoxanthin.

Choose the **correct answer** from the options given below :

(1) (a) and (b) only
(2) (a), (b) and (c) only
(3) (a), (c) and (d) only
(4) (c), (d) and (e) only

143. Frugivorous birds are found in large numbers in tropical forests mainly because of :

(1) lack of niche specialisation
(2) higher annual rainfall
(3) availability of fruits throughout the year
(4) temperature conducive for their breeding

144. Which type of substance would face difficulty to pass through the cell membrane?

(1) Substance with hydrophobic moiety
(2) Substance with hydrophilic moiety
(3) All substance irrespective of hydrophobic and hydrophilic moiety
(4) Substance soluble in lipids

145. Identify the correct statements regarding chemiosmotic hypothesis :

(a) Splitting of the water molecule takes place on the inner side of the membrane.
(b) Protons accumulate within the lumen of the thylakoids.
(c) Primary acceptor of electron transfers the electrons to an electron carrier.
(d) NADP reductase enzyme is located on the stroma side of the membrane.
(e) Protons increase in number in stroma.

Choose the **correct answer** from the options given below:

(1) (a), (b) and (e) **(2)** (a), (b) and (d)
(3) (b), (c) and (d) **(4)** (b), (c) and (e)

146. If a female individual is with small round head, furrowed tongue, partially open mouth and broad palm with characteristic palm crease. Also the physical, psychomotor and mental development is retarded. The karyotype analysis of such an individual will show :

(1) 47 chromosomes with XXY sex chromosomes
(2) 45 chromosomes with XO sex chromosomes
(3) 47 chromosomes with XYY sex chromosomes
(4) Trisomy of chromosome 21

147. Identify the **correct** sequence of events during Prophase I of meiosis :

(a) Synapsis of homologous chromosomes
(b) Chromosomes become gradually visible under microscope
(c) Crossing over between non-sister chromatids of homologous chromosomes
(d) Terminalisation of chiasmata
(e) Dissolution of synaptonemal complex

Choose the **correct answer** from the options given below :

(1) (a), (b), (c), (d), (e) **(2)** (b), (c), (d), (e), (a)
(3) (b), (a), (c), (e), (d) **(4)** (a), (c), (d), (e), (b)

148. The enzyme (a) is needed for isolating genetic material from plant cells and enzyme (b) for isolating genetic material from fungus. Choose the correct pair of options from the following :

(1) (a) Cellulase (b) Protease
(2) (a) Cellulase (b) Chitinase
(3) (a) Chitinase (b) Lipase
(4) (a) Cellulase (b) Lipase

149. Match the **List-I** with **List-II** :

List - I		List - II	
(a)	Carbon dissolved in oceans	**(i)**	55 billion tons
(b)	Annual fixation of carbon through photosynthesis	**(ii)**	71%
(c)	PAR captured by plants	**(iii)**	4×10^3 kg
(d)	Productivity of oceans	**(iv)**	2 to 10%

Choose the **correct answer** from the options given below :

(1) (a) - (ii), (b) - (iv), (c) - (iii), (d) - (i)
(2) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)
(3) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
(4) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)

150. What is the expected percentage of F_2 progeny with yellow and inflated pod in dihybrid cross experiment involving pea plants with green coloured, inflated pod and yellow coloured constricted pod ?

(1) 100% **(2)** 56.25%
(3) 18.75 % **(4)** 9%

ZOOLOGY

Section A

151. Pathogenic bacteria gain resistance to antibiotics due to changes in their :

(1) Cosmids **(2)** Plasmids
(3) Nucleus **(4)** Nucleoid

152. Milk of transgenic 'Cow Rosie' was nutritionally more balanced product for human babies than natural cow milk because it contained:

(1) Human protein α–1–antitrypsin
(2) Human alpha–lactalbumin
(3) Human insulin–like growth factor
(4) Human enzyme Adenosine Deaminase (ADA)

153. If the pH in lysosomes is increased to alkaline, what will be the outcome?

(1) Hydrolytic enzymes will function more efficiently
(2) Hydrolytic enzymes will become inactive
(3) Lysosomal enzymes will be released into the cytoplasm
(4) Lysosomal enzymes will be more active

154. Choose the incorrect enzymatic reaction :

(1) Maltose $\xrightarrow{\text{Maltase}}$ Glucose + Galactose
(2) Sucrose $\xrightarrow{\text{Sucrase}}$ Glucose + Fructose
(3) Lactose $\xrightarrow{\text{Lactase}}$ Glucose + Galactose
(4) Dipeptides $\xrightarrow{\text{Dipeptidases}}$ Amino acids

155. Which of the following reasons in mainly responsible for graft rejection in transplantation of organs ?

(1) Inability of recipient to differentiate between 'self and 'non–self' tissues/cells
(2) Humoral immune response only
(3) Auto–immune response
(4) Cell–mediated response

156. If DNA contained sulphur instead of phosphorus and proteins contained phosphorus instead of sulfur, what would have been the outcome of Hershey and Chase experiment?

(1) No radioactive sulfur in bacterial cells
(2) Both radioactive sulfur and phosphorus in bacterial cells
(3) Radioactive sulfur in bacterial cells
(4) Radioactive phosphorus in bacterial cells

157. Two butterfly species are competing for the same nectar of a flower in a garden. To survive and coexist together, they may avoid competition in the same garden by:

(1) feeding at the same time
(2) choosing different foraging patterns
(3) increasing time spent on attacking each other
(4) predating on each other

158. Mad cow disease in cattle and Cr Jacob disease in humans are due to infection by_____ .

(1) Bacterium **(2)** Virus
(3) Viroid **(4)** Prion

159. Which of the following is not an Intra Uterine device?

(1) Progestogens **(2)** Multiload 375
(3) Lippes loop **(4)** Progestasert

160. Match **List–I** with **List-II** :

List - I		List - II	
(a)	*Chlamydomonas*	**(i)**	Conidia
(b)	*Penicillium*	**(ii)**	Zoospores
(c)	*Hydra*	**(iii)**	Gemmules
(d)	*Sponge*	**(iv)**	Buds

Choose the **correct answer** from the options given below:

(1) (a) – (i), (b) – (iv), (c) – (iii), (d) – (ii)
(2) (a) – (ii), (b) – (i), (c) – (iv), (d) – (iii)
(3) (a) – (iii), (b) – (ii), (c) – (i), (d) – (iv)
(4) (a) – (iv), (b) – (iii), (c) – (ii), (d) – (i)

161. According to the sliding filament theory:

(1) Actin and myosin filaments slide over each other to increase the length of the sarcomere.
(2) Length of A–band does not change.
(3) I–band increases in length
(4) The actin filaments slide away from A–band resulting in shortening of sarcomere.

162. The amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis is called:

(1) Secondary production
(2) Primary production
(3) Gross primary production
(4) Net primary production

163. Given below are two statements:

Statement I :

Amino acids have a property of ionizable nature of $–NH_2$ and –COOH groups, hence have different structures at different pH.

Statement II :

Amino acids can exist as Zwitterionic form at acidic and basic pH.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are Incorrect
(3) Statement I is correct but Statement II is incorrect
(4) Statement I is incorrect but Statement II is correct

164. Which of the following types of epithelium is present in the bronchioles and Fallopian tubes?

(1) Simple squamous epithelium
(2) Simple columnar epithelium
(3) Ciliated epithelium
(4) Stratified squamous epithelium

165. Western Ghats have a large number of plants and animal species that are not found any where else. Which of the following term is used to notify such species?

(1) Threatened species
(2) Keystone species
(3) Endemic species
(4) Vulnerable species

166. Gout is a type of disorder which leads to:

(1) Inflammation of joints due to accumulation of uric acid crystals
(2) Weakening of bones due to decreased bone mass
(3) Inflammation of joints due to cartilage degeneration
(4) Weakening of bones due to low calcium level

167. Which of the following statements are correct with respect to vital capacity?

(a) It includes ERV, TV and IRV
(b) Total volume of air a person can inspire after a normal expiration
(c) The maximum volume of air a person can breathe in after forced expiration
(d) It includes ERV, RV and IRV.
(e) The maximum volume of air a person can breath out after a forced inspiration.

Choose the **most appropriate answer** from the options given below:

(1) (b), (d) and (e) **(2)** (a), (c) and (d)
(3) (a), (c) and (e) **(4)** (a) and (e)

168. A unique vascular connection between the digestive tract and liver is called _____ . Out of Syllabus

(1) Hepato–pancreatic system
(2) Hepatic portal system
(3) Renal portal system
(4) Hepato–cystic system

169. Match **List–I** with **List-II** regarding the organs of Cockroach:

List - I		List - II	
(a)	Crop	**(i)**	grinding the food particles
(b)	Proventriculus	**(ii)**	secretion of digestive juice
(c)	Hepatic caecae	**(iii)**	removal of nitrogenous waste
(d)	Malpighian tubules	**(iv)**	storage of food

Choose the **correct answer** from the options given below:

(1) (a) – (iv), (b) – (i), (c) – (ii), (d) – (iii)
(2) (a) – (iii), (b) – (ii), (c) – (i), (d) – (iv)
(3) (a) – (ii), (b) – (iv), (c) – (i), (d) – (iii)
(4) (a) – (i), (b) – (iv), (c) – (iii), (d) – (ii)

170. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R) :**

Assertion (A) :

Spirulina is a microbe that can be used for reducing environmental pollution.

Reason (R) :

Spirulina is a rich source of protein, carbohydrates, fats, minerals and vitamins.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(3) (A) is correct but (R) is not correct
(4) (A) is not correct but (R) is correct

171. Panspermia, an idea that is still a favourite for some astronomers, means :

(1) Creation of life from dead and decaying matter
(2) Creation of life from chemicals
(3) Origin of sperm in human testes
(4) Transfer of spores as unit of life from other planets of Earth

172. Arrange the components of mammary gland. (from proximal to distal)

(a) Mammary duct
(b) Lactiferous duct
(c) Alveoll
(d) Mammary ampulla
(e) Mammary tubules

Choose the most appropriate answer from the options given below :

(1) (c) → (a) → (d) → (e) → (b)
(2) (b) → (c) → (e) → (d) → (a)
(3) (c) → (e) → (a) → (d) → (b)
(4) (e) → (c) → (d) → (b) → (a)

173. Select the **incorrect** match regarding the symbols used in Pedigree analysis:

(1)  - Sex unspecified
(2)  - Affected individual
(3)  - Consanguineous mating
(4)  - Parent with male child affected with disease

174. Why CNG is considered better fuel than **diesel?**

Out of Syllabus

(a) It can not be adulterated
(b) It takes less time to fill the fuel tank
(c) It burns more efficiently
(d) It is cheaper
(e) It is less inflammable.

Choose the **most appropriate answer** from the options given below

(1) (a), (b), (c), (e) only **(2)** (a), (c), (d) only
(3) (a), (b), (d), (e) only **(4)** (c), (d), (e) only

175. Which of the following methods is not commonly used for introducing foreign DNA into the plant cell?

(1) *Agrobacterium* mediated transformation
(2) Gene gun
(3) 'Disarmed pathogen' vectors
(4) Bacteriophages

176. Identify the region of human brain which has pneumotaxic centre that alters respiratory rate by reducing the duration of inspiration.

(1) Medulla **(2)** Pons
(3) Thalamus **(4)** Cerebrum

177. How many secondary spermatocytes are required to form 400 million spermatozoa ?

(1) 50 million **(2)** 100 million
(3) 200 million **(4)** 400 million

178. Choose the **correct** statement about a muscular tissue :

(1) Skeletal muscle fibres are uninucleated and found in parallel bundles.
(2) Intercalated discs allow the cardiac muscle cells to contract as a unit.
(3) The walls of blood vessels are made up of columnar epithelium.
(4) Smooth muscles are multinucleated and involuntary.

179. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :

FSH which interacts with membrane bound receptors does not enter the target cell.

Reason (R) :

Binding of FSH to its receptors generates second messenger (cyclic AMP) for its biochemical and physiological responses.

In the light of the above statements, choose **the most appropriate answer** from the options given below ;

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(3) (A) is correct but (R) is not correct
(4) (A) is not correct but (R) is correct

180. Which of the following animals has three chambered heart ?

(1) *Scoliodon* **(2)** *Hippocampus*
(3) *Chelone* **(4)** *Pteropus*

181. Given below are two statements : one is **labelled** as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :

During pregnancy the level of thyroxine is increased in the maternal blood.

Reason (R) :

Pregnancy is characterised by metabolic changes in the mother.

In the light of the above statements, choose **the most appropriate answer** from the options given below :

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(3) (A) is correct but (R) is not correct
(4) (A) is not correct but (R) is correct

182. Select the **Incorrect** statements with respect to Cyclostomes :

(a) They lack scales and paired fins.
(b) They have circular mouth with Jaws.
(c) They bear 6-15 pairs of gills.
(d) They migrate to deep sea for spawning.

Choose **the most appropriate answer** from the options given below :

(1) (a) and (b) only

(2) (b) and (c) only
(3) (b) and (d) only
(4) (a) and (d) only

183. Role of enamel is to : Out of Syllabus
(1) Connect crown of tooth with its root.
(2) Masticate the food.
(3) Form bolus.
(4) Give basic shape to the teeth.

184. Choose the **correct** statements :
(a) Bones support and protect softer tissues and organs
(b) Weight bearing function is served by limb bones
(c) Ligament is the site of production of blood cells.
(d) Adipose tissue is specialised to store fats.
(e) Tendons attach one bone to another.
Choose **the most appropriate answer** from the options given below :
(1) (a), (b) and (d) only
(2) (b), (c) and (e) only
(3) (a), (c) and (d) only
(4) (a), (b) and (e) only

185. Bivalent or Tetrad formation is a characteristic feature observed during :
(1) Synaptonemal complex in zygotene stage
(2) Chiasmata in Diplotene stage
(3) Synaptonemal complex in Pachytene stage
(4) Chiasmata in zygotene stage

Section B

186. Which of the following are true about the taxonomical aid 'key' ?
(a) Keys are based on the similarities and dissimilarities.
(b) Key is analytical in nature.
(c) Keys are based on the contrasting characters in pair called couplet.
(d) Same key can be used for all taxonomic categories.
(e) Each statement in the key is called Lead.
Choose **the most appropriate answer** from the options given below :
(1) (a), (b) and (c) only
(2) (b), (c) and (d) only
(3) (a), (b), (c) and (e) only
(4) (a), (c), (d) and (e) only

187. A normal girl, whose mother is haemophilic marries a male with no ancestral history of haemophilia.
What will be the possible phenotypes of the offsprings ?
(a) Haemophilic son and haemophilic daughter.
(b) Haemophilic son and carrier daughter.
(c) Normal daughter and normal son.
(d) Normal son and haemophilic daughter.
Choose **the most appropriate answer** from the options given below :
(1) (a) and (b) only
(2) (b) and (c) only
(3) (a) and (d) only
(4) (b) and (d) only

188. IUDs are small objects made up of plastic or copper that are inserted in the uterine cavity. Which of the following statements are correct about IUDs ?
(a) IUDs decrease phagocytosis of sperm within the uterus.
(b) The released copper ions suppress the sperm motility.
(c) IUDs do not make the cervix hostile to the sperm.
(d) IUDs suppress the fertilization capacity of sperm.
(e) The IUDs require surgical intervention for their insertion in the uterine cavity.
Choose **the most appropriate answer** from the options given below :
(1) (a), (d) and (e) only
(2) (b) and (c) only
(3) (b) and (d) only
(4) (d) only

189. Refer to the following statements for agarose-gel electrophoresis :
(a) Agarose is a natural polymer obtained from sea-weed.
(b) The separation of DNA molecules in agarose-gel electrophoresis depends on the size of DNA.
(c) The DNA migrates from negatively-charged electrode to the positively-charged electrode
(d) The DNA migrates from positively-charged electrode to the negatively-charged electrode.
Choose **the most appropriate answer** from the options given below :
(1) (a) and (b) only
(2) (a), (b) and (c) only
(3) (a), (b) and (d) only
(4) (b), (c) and (d) only

190. Match List - I with List - II

List - I		List - II	
(a)	Multipolar neuron	**(i)**	Somatic neural system
(b)	Bipolar neuron	**(ii)**	Cerebral cortex
(c)	Myelinated nerve fibre	**(iii)**	Retina of Eye
(d)	Unmyelinated nerve fibre	**(iv)**	Spinal nerves

Choose the **correct answer** from the options given below :

(1) (a) – (iii), (b) – (i), (c) – (iv), (d) – (ii)
(2) (a) – (ii), (b) – (iv), (c) – (iii), (d) – (i)
(3) (a) – (ii), (b) – (iii), (c) – (i), (d) – (iv)
(4) (a) – (ii), (b) – (iii), (c) – (iv), (d) – (i)

191. Excretion in cockroach is performed by all, EXCEPT : Out of Syllabus

(1) Urecose glands
(2) Malpighian tubules
(3) Fat body
(4) Hepatic caeca

192. Select the **correct** statement regarding mutation theory of evolution.

(1) This theory was proposed by Alfred Wallace
(2) Variations are small directional changes
(3) Single step large mutation is a cause of speciation
(4) Large differences due to mutations arise gradually in a population

193. Arrange the following formed elements in the decreasing order of their abundance in blood in humans :

(a) Platelets **(b)** Neutrophils
(c) Erythrocytes **(d)** Eosinophils
(e) Monocytes

Choose **the most appropriate answer** from the options given below :

(1) (c), (a), (b), (e), (d)
(2) (c), (b), (a), (e), (d)
(3) (d), (e), (b), (a), (c)
(4) (a), (c), (b), (d), (e)

194. In the enzyme which catalyses the breakdown of: $H_2O_2 \rightarrow H_2O + O_2$ the prosthetic group is :

(1) Nicotinamide adenine dinucleotide
(2) Haem
(3) Zinc
(4) Niacin

195. Against the codon 5' UAC 3', what would be the sequence of anticodon on tRNA ?

(1) 5' AUG 3' **(2)** 5' ATG 3'
(3) 5' GTA 3' **(4)** 5' GUA 3'

196. Select the **correct** statements.

(a) Angiotensin II activates the cortex of adrenal gland to release aldosterone.
(b) Aldosterone leads to increase in blood pressure.
(c) ANF acts as a check on renin-angiotensin mechanism.
(d) ADH causes vasodilation.
(e) Vasopressin is released from adenohypophysis.

Choose **the most appropriate answer** from the options given below :

(1) (a), (b) and (e) only
(2) (c), (d) and (e) only
(3) (b), (c) and (d) only
(4) (a), (b) and (c) only

197. With respect to metaphase, which of the following statements is incorrect ?

(1) Complete disintegration of nuclear envelope takes place
(2) Chromosomes are highly condensed
(3) Metaphase chromosomes are made up of four sister chromatids held together by centromere
(4) Chromosomes lie at the equator of the cell

198. Select the **incorrect** statement with respect to inbreeding of animals.

(1) It is used for evolving pure lines in cattle.
(2) It helps in accumulation of superior genes and elimination of less desirable genes.
(3) It decreases homozygosity.
(4) It exposes harmful recessive genes that are eliminated by selection.

199. Match **List - I** with **List - II :**

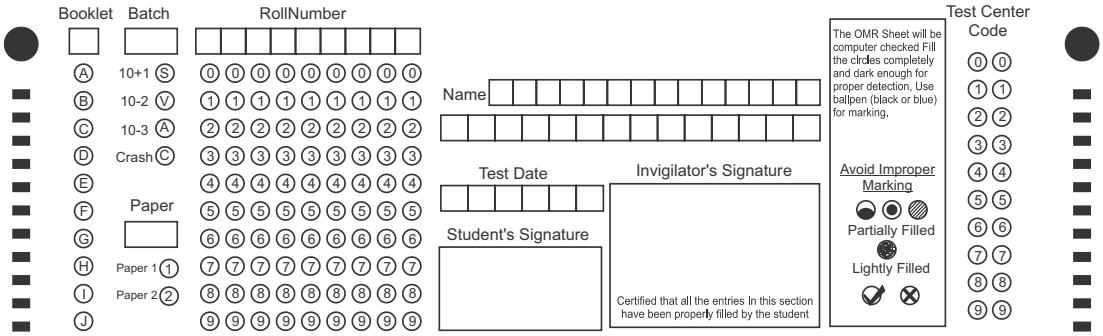
List - I		List - II	
(a)	Cellular barrier	**(i)**	Interferons
(b)	Cytokine barrier	**(ii)**	Mucus
(c)	Physical barrier	**(iii)**	Neutrophils
(d)	Physiological juice	**(iv)**	HCI in gastric barrier

Choose the **correct** answer from the options given below :

(1) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
(2) (a) - (ii), (b) - (iii), (c) - (i), (d) - (iv)
(3) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)
(4) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv)

200. If A and C make 30% and 20% of DNA, respectively, what will be the percentage composition of T and G?

(1) T : 20%, G : 30%
(2) T : 30%, G : 20%
(3) T : 30%, G : 30%
(4) T : 20%, G : 20%



1	a	b	c	d	6	a	b	c	d	11	a	b	c	d	16	a	b	c	d	21	a	b	c	d	26	a	b	c	d
2	a	b	c	d	7	a	b	c	d	12	a	b	c	d	17	a	b	c	d	22	a	b	c	d	27	a	b	c	d
3	a	b	c	d	8	a	b	c	d	13	a	b	c	d	18	a	b	c	d	23	a	b	c	d	28	a	b	c	d
4	a	b	c	d	9	a	b	c	d	14	a	b	c	d	19	a	b	c	d	24	a	b	c	d	29	a	b	c	d
5	a	b	c	d	10	a	b	c	d	15	a	b	c	d	20	a	b	c	d	25	a	b	c	d	30	a	b	c	d
31	a	b	c	d	36	a	b	c	d	41	a	b	c	d	46	a	b	c	d	51	a	b	c	d	56	a	b	c	d
32	a	b	c	d	37	a	b	c	d	42	a	b	c	d	47	a	b	c	d	52	a	b	c	d	57	a	b	c	d
33	a	b	c	d	38	a	b	c	d	43	a	b	c	d	48	a	b	c	d	53	a	b	c	d	58	a	b	c	d
34	a	b	c	d	39	a	b	c	d	44	a	b	c	d	49	a	b	c	d	54	a	b	c	d	59	a	b	c	d
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64	a	b	c	d	69	a	b	c	d	74	a	b	c	d	79	a	b	c	d	84	a	b	c	d	89	a	b	c	d
65	a	b	c	d	70	a	b	c	d	75	a	b	c	d	80	a	b	c	d	85	a	b	c	d	90	a	b	c	d
91	a	b	c	d	96	a	b	c	d	101	a	b	c	d	106	a	b	c	d	111	a	b	c	d	116	a	b	c	d
92	a	b	c	d	97	a	b	c	d	102	a	b	c	d	107	a	b	c	d	112	a	b	c	d	117	a	b	c	d
93	a	b	c	d	98	a	b	c	d	103	a	b	c	d	108	a	b	c	d	113	a	b	c	d	118	a	b	c	d
94	a	b	c	d	99	a	b	c	d	104	a	b	c	d	109	a	b	c	d	114	a	b	c	d	119	a	b	c	d
95	a	b	c	d	100	a	b	c	d	105	a	b	c	d	110	a	b	c	d	115	a	b	c	d	120	a	b	c	d
121	a	b	c	d	126	a	b	c	d	131	a	b	c	d	136	a	b	c	d	141	a	b	c	d	146	a	b	c	d
122	a	b	c	d	127	a	b	c	d	132	a	b	c	d	137	a	b	c	d	142	a	b	c	d	147	a	b	c	d
123	a	b	c	d	128	a	b	c	d	133	a	b	c	d	138	a	b	c	d	143	a	b	c	d	148	a	b	c	d
124	a	b	c	d	129	a	b	c	d	134	a	b	c	d	139	a	b	c	d	144	a	b	c	d	149	a	b	c	d
125	a	b	c	d	130	a	b	c	d	135	a	b	c	d	140	a	b	c	d	145	a	b	c	d	150	a	b	c	d
151	a	b	c	d	156	a	b	c	d	161	a	b	c	d	166	a	b	c	d	171	a	b	c	d	176	a	b	c	d
152	a	b	c	d	157	a	b	c	d	162	a	b	c	d	167	a	b	c	d	172	a	b	c	d	177	a	b	c	d
153	a	b	c	d	158	a	b	c	d	163	a	b	c	d	168	a	b	c	d	173	a	b	c	d	178	a	b	c	d
154	a	b	c	d	159	a	b	c	d	164	a	b	c	d	169	a	b	c	d	174	a	b	c	d	179	a	b	c	d
155	a	b	c	d	160	a	b	c	d	165	a	b	c	d	170	a	b	c	d	175	a	b	c	d	180	a	b	c	d
181	a	b	c	d	186	a	b	c	d	191	a	b	c	d	196	a	b	c	d									
182	a	b	c	d	187	a	b	c	d	192	a	b	c	d	197	a	b	c	d									
183	a	b	c	d	188	a	b	c	d	193	a	b	c	d	198	a	b	c	d									
184	a	b	c	d	189	a	b	c	d	194	a	b	c	d	199	a	b	c	d									
185	a	b	c	d	190	a	b	c	d	195	a	b	c	d	200	a	b	c	d									

Q. No.	Answer Key	Topic's Name	Chapter's Name
		SECTION-A (PHYSICS)	
1	1	Electronic Devices	Electronic Devices
2	4	Electromagnetic Waves	Electromagnetic Waves
3	3	Electronic Devices	Electronic Devices
4	1	Current Electricity	Current Electricity
5	3	Alternating Currents	Electromagnetic Induction and Alternating Current
6	3	Current Electricity	Current Electricity
7	1	Motion in a Straight Line	Kinematics
8	4	Magnetic Effects of Current	Magnetic Effects of Current and Magnetism
9	3	Alternating Currents	Electromagnetic Induction and Alternating Current
10	3	Ray Optics and Optical Instruments	Optics
11	2	Dual Nature of Matter and Radiation	Dual Nature of Matter and Radiation
12	1	Laws of Motion	Laws of Motion
13	1	Electronic Devices	Electronic Devices
14	1	Mechanical Properties of Fluids	Properties of Bulk Matter
15	4	Electrostatic Potential and Capacitance	Electrostatics
16	1	Mechanical Properties of Fluids	Properties of Bulk Matter
17	3	Concept of Vector and Motion in a Plane	Kinematics
18	3	Ray Optics and Optical Instruments	Optics
19	4	Oscillations	Oscillations and Waves
20	3	Wave Optics	Optics
21	3	Electrostatic Potential and Capacitance	Electrostatics
22	1	Motion in a Straight Line	Kinematics
23	1	Gravitation	Gravitation
24	4	Current Electricity	Current Electricity
25	4	Motion of System of Particles and Rigid Body	Motion of System of Particles and Rigid Body
26	3	Dual Nature of Matter and Radiation	Dual Nature of Matter and Radiation
27	2	Electromagnetic Waves	Electromagnetic Waves
28	2	Magnetic Effects of Current	Magnetic Effects of Current and Magnetism
29	2	Motion in a Straight Line	Kinematics
30	2	Nuclei	Atoms and Nuclei
31	3	Behaviour of Perfect Gas and Kinetic theory	Behaviour of Perfect Gas and Kinetic theory

32	1	Alternating Currents	Electromagnetic Induction and Alternating Currents
33	1	Atoms	Atoms and Nuclei
34	3	Units and Measurements	Physical World and Measurement
35	1	Motion of System of Particles and Rigid Body	Motion of System of Particles and Rigid Body
SECTION-B (PHYSICS)			
36	4	Electromagnetic Induction	Electromagnetic Induction and Alternating Currents
37	4	Ray Optics and Optical Instruments	Optics
38	2	Nuclei	Atoms and Nuclei
39	1	Electrostatic Potential and Capacitance	Electrostatics
40	2	Waves	Oscillations and Waves
41	1	Motion in a Straight Line	Kinematics
42	3	Electronic Devices	Electronic Devices
43	3	Behaviour of Perfect Gas and Kinetic theory	Behaviour of Perfect Gas and Kinetic theory
44	3	Gravitation	Gravitation
45	3	Magnetic Effects of Current	Magnetic Effects of Current and Magnetism
46	1	Magnetic Effects of Current	Magnetic Effects of Current and Magnetism
47	4	Thermal Properties of Matter	Bulk Properties of Matter
48	1	Current Electricity	Current Electricity
49	1	Electrostatics and Gravitation	Electrostatics and Gravitation
50	3	Units and Measurements	Physical World and Measurement
SECTION-A (CHEMISTRY)			
51.	1	Bond angles	Chemical bonding and molecular structure
52.	1	Henry's law	Solutions
53.	2	Preparations of nitric acid	*p*-Block Elements
54.	3	Properties of alkaline earth metals	*s*-Block Elements (Alkali and Alkaline Earth Metals)
55.	2	Chemical reactions of aldehydes	Aldehydes, Ketones and Carboxylic Acids
56.	4	Chemical reactions of functonal groups	Alcohols, Phenols and Ethers & Organic Compounds Containing Nitrogen
57.	3	Soaps & Detergents	Chemistry in Everyday Life
58.	1	Redox reactions	Redox reactions
59.	1	Properties of *s*-Block elements	*s*-Block Elements (Alkali and Alkaline Earth Metals)
60.	3	Nucleophilic substitution reactions	Haloalkanes and Haloarenes
61.	2	VSEPR Theory	Chemical bonding and molecular structure

62.	2	Thermoplastic polymers	Polymers
63.	1	Compounds of Boron	Some *p*-Block Elements Principles and Process
64.	3	Electrochemistry	Electrochemistry
65.	2	Applications of hydrogen	Hydrogen
66.	2	Compounds of Boron	Some *p*-Block Elements Principles and Process
67.	3	Properties of *p*-block elements	Some *p*-Block Elements Principles and Process
68.	3	pH	Equilibrium
69.	2	Adsorption isotherm	Surface Chemistry
70.	2	Chemical Kinetics	Chemical Kinetics
71.	4	Thermodynamics	Thermodynamics
72.	1	Hybridisation of organic compounds	Organic Chemistry: Some Basic Principles and Techniques
73.	2	Significant figures	Some Basic Concepts of Chemistry
74.	1	Properties of group-17 elements	Some *p*-Block Elements Principles and Process
75.	3	Isomerism in coordination compounds	Coordination Compounds
76.	3	Proteins	Biomolecules
77.	1	Chemical reactions of amines	Amines
78.	4	Defects in solids	Solid state
79.	1	Inductive effect	Organic Chemistry Some Basic Principles and Techniques
80.	1	Chemical reactions of aldehydes	Aldehydes, Ketones and Carboxylic Acids
81.	4	Critical temperature	States of Matter: Gases and Liquids
82.	3	Properties of actinoides	*d* and *f*-Block Elements
83.	4	Physical properties of alkanes	Hydrocarbons
84.	3	Phenols	Alcohols, Phenols and Ethers
85.	4	Quantum numbers	Structure of Atom
86.	4	General Principles and Processes of Isolation of Elements	General Principles and Processes of Isolation of Elements
87.	4	Structure of Atom	Structure of Atom
88.	1	Rate of Chemical Reaction	Chemical Kinetics
89.	3	Synthesis of alkenes	Hydrocarbons
89	1	Structure of atom	Structure of atom
90.	4	Synthesis of benzaldehyde	Aldehydes, Ketones and Carboxylic Acids
91.	1	Solid State	Solid State
92.	3	Metal carbonyls	Coordination Compounds
93.	3	Preparation of phenol	Alcohols, Phenols and Ethers
94.	1	Boyle's law	States of Matter : Gases and Liquids

95.	3	Environmental Chemistry	Environmental Chemistry
96.	2	Chemical reactions of functonal groups	Haloalkanes and Haloarenes & Aldehydes, ketones & carboxylic acids
97.	4	First transition series	*d* and *f*-Block Elements
98.	2	Equilibrium	Equilibrium
99.	2	Electrochemistry	Electrochemistry
100.	4	Reaction Intermediates	Organic Chemistry: Some Basic Principles and Techniques
SECTION-A (BOTANY)			
101	3	Cell cycle and cell division	Cell cycle and cell division
102	1	Photosynthesis in higher plants	Photosynthesis in higher plants
103	1	Lac operon	Molecular basis of inheritance
104	4	Secondary growth	Anatomy of flowering plants
105	1	Secondary metabolites	Biomolecules
106	2	*Lac* operon	Molecular basis of inheritance
107	2	(i) Moss (ii) Pteridophyte (iii) Alga (iv) Gymnosperm	Plant kingdom
108	1	DNA Replication	Molecular basis of inheritance
109	2	Description of Some Important Families	Morphology of flowering plants
110	3	Successions	Ecosystem
111	2	Metabolic pathways	Respiration in plants
112	4	Genetic disorders	Principles of inheritance and variation
113	1	Restriction enzymes	Biotechnology: Principles and processes
114	4	Biodiversity	Biodiversity and its conservation
115	2	Mineral nutrition & respiration in plants	Mineral nutrition
116	2	Phytohormones	Plant growth and development
117	4	Plant tissues	Anatomy of flowering plants
118	1	Succession of plants	Ecosystem
119	1	Double fertilisation	Sexual reproduction in flowering plants
120	2	Description of Some Important Families	Morphology of flowering plants
121	2	Successions	Ecosystem
122	4	Gel electrophoresis	Biotechnology: Principles and processes
123	2	Plant tissues	Anatomy of flowering plants
124	2	Cell cycle and cell division	Cell cycle and cell division
125	1	Metabolic pathways	Respiration in plants
126	4	Active and passive transport	Transport in plants
127	1	*Ex-situ* and *in-situ* conservation	Biodiversity and its conservation

128	3	Plant tissues	Anatomy of flowering plants
129	3	Transpiration	Transport in plants
130	3	Characteristics of flowering plants	Morphology of flowering plants
131	2	artifical hybridisation process	Sexual reproduction in flowering plants
132	3	Parts of a flowering plant	Sexual reproduction in flowering plants
133	2	Chromosomal theory of inheritance	Principles of inheritance and variation
134	2	Leguminous plants	Mineral nutrition
135	3	Growth and development	Plant growth and development
136	2	Nitrogen fixing bacteria	Mineral nutrition
137	1	Ex-situ and in-situ conservation	Biodiversity and its conservation
138	3	Structure of protein	Biomolecules
139	1	Recombinant DNA technology	Biotechnology and its applications
140	3	The DNA	Molecular basis of inheritance
141	3	Apomictic gene	Sexual reproduction in flowering plants
141	1	Population and its Attributes	Organisms and populations
142	2	Phaeophyceae	Plant kingdom
143	3	Species area relationship	Biodiversity and its conservation
144	2	Biomolecules	Biomolecules
145	2	Chemiosmotic hypothesis	Photosynthesis in higher plants
146	4	Down's syndrome	Principles of inheritance and variation
147	3	Cell cycle and cell division	Cell cycle and cell division
148	2	DNA isolation	Biotechnology: Principles and processes
149	3	Fixation in plants	Photosynthesis in higher plants
150	3	Mendel's breeding experiment	Principles of inheritance and variation
151	2	Antibiotic resistance	Biotechnology: Principles and processes
152	2	Gene cloning	Biotechnology and its applications
153	2	Cell organelles	Cell -The unit of life
154	1	Enzymatic reactions	Biomolecules
155	4	Immune system	Human Health and Disease
156	3	Hershey and Chase experiment	Molecular basis of inheritance
157	2	Species interactions	Organisms and population
158	4	Viruses, Viroids, Prions and Lichens	Biological classification
159	1	Birth control methods	Reproductive health
160	2	Asexual reproduction	Reproduction in organisms
161	2	sliding filament theory	Locomotion and movement
162	2	Productivity	Ecosystem
163	1	Amino acids	Biomolecules
164	3	Types of epithelium	Structural organisation in animals
165	3	Endemic species	Biodiversity and its conservation
166	1	Disorders of muscular and skeletal system	Locomotion and movement

167	3	Vital capacity	Breathing and exchange of gases
168	2	Double circulation	Body fluids and circulation
169	1	Digestive system	Structural organisation in animals
170	2	Single cell protein	Strategies for enhancement in food production
171	4	Theory of spontaneous generation	Evolution
172	3	Components of mammary gland	Human reproduction
173	3	Pedigree analysis	Principles of inheritance and variation
174	2	Environmental issues	Environmental issues
175	4	Gene transfer methods	Biotechnology: Principles and processes
176	2	Respiratory rate	Breathing and exchange of gases
177	3	Spermatogenesis	Human reproduction
178	2	Muscular tissues	Structural organisation in animals
179	2	Hormones	Human reproduction
180	3	Structure of heart	Animal kingdom
181	1	Metabolic changes during pregnancy	Human reproduction
182	3	Cyclostomes	Animal kingdom
183	2	Role of enamel	Digestion and absorption
184	1	Tissues	Structural organisation in animals
185	1	Cell cycle and cell division	Cell cycle and cell division
185	4	Coagulation Of Blood	Body Fluids And Circulation
186	3	Taxonomical aid 'key'	The living world
187	2	Genetic disorders	Principles of inheritance and variation
188	3	Birth control methods	Reproductive health
189	2	Agarose-gel electrophoresis :	Biotechnology and its applications
190	4	Types of neurons	Neural control and co-ordination
191	4	Excretion in cockroach	Excretory products and their elimination
192	3	Mutation theory of evolution.	Evolution
193	1	Types of cells	Cell- The unit of life
194	2	Role of enzymes	Biomolecules
195	4	tRNA sequence	Molecular basis of inheritance
196	4	Renin-angiotensin mechanism.	Excretory products and their elimination
197	3	Cell cycle and cell division	Cell cycle and cell division
198	3	Inbreeding of animals	Strategies for enhancement in food production
199	4	Physical and physiological barriers	Human Health and Disease
200	2	Nitrogenous bases	Molecular basis of inheritance

NEET (UG)
(Re-examination)
4th September 2022 Paper

ANSWERS WITH EXPLANATIONS

PHYSICS

Section-A

1. Option (1) is correct.
Explanation: Only option (1) is representing non-periodic motion as it is an exponential function.

2. Option (4) is correct.
Explanation: Given, $B = 3 \times 10^{-8} \cos (1.6 \times 10^3 x + 48 \times 10^{10} t)$ …(1)

$$B = B_0 \cos (kx + \omega t) \quad \ldots(2)$$

On comparing equations (1) & (2), we get;

$$B_0 = 3 \times 10^{-8}$$

$$c = \frac{\omega}{k} = \frac{48 \times 10^{10}}{1.6 \times 10^3}$$

$$= 3 \times 10^8$$

And also, $c = \frac{E_0}{B_0}$

Hence, $E_0 = B_0 \times c$

$$= 3 \times 10^{-8} \times 3 \times 10^8$$

$$= 9$$

So, the required equation is:

$$E = 9 \cos(1.6 \times 10^3 x + 48 \times 10^{10} t)$$

3. Option (3) is correct.
Explanation: Zener diode is highly doped *p-n* junction, and zener voltage is constant. Its depletion region is very thin.

4. Option (1) is correct.

Explanation: As, $i = \frac{E}{R + r}$

Hence, $i = \frac{4}{7.5 + 0.5} = \frac{4}{8} = \frac{1}{2}$

And, $V = E - ir$

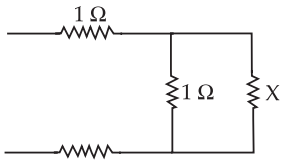
(where, the symbols have their usual meanings)

$$V = 4 - 0.5 \times 0.5$$

$$V = 3.75 \text{ volt}$$

5. Option (3) is correct.
Explanation: In pure capacitive circuits, the current leads the voltage by $\frac{\pi}{2}$ or 90°.

6. Option (3) is correct.
Explanation: Let effective resistance be X.



Then, $X = 1 + \frac{X}{X+1} + 1$

$$X = \frac{X + 1 + X + X + 1}{X + 1}$$

$$X(X + 1) = 3X + 2$$

$$X^2 - 2X - 2 = 0$$

$$X = \frac{2 \pm \sqrt{12}}{2}$$

$$X = 1 \pm \sqrt{3}\ \Omega$$

$$X = 1 + \sqrt{3}\ \Omega$$

(as R can't be negative)

7. Option (1) is correct.

Explanation: As, $H = \frac{u^2 \sin^2 \theta}{2g}$

$$= \frac{(20)^2 \sin^2 30°}{2(10)} = 5 \text{ m}$$

8. Option (4) is correct.
Explanation: As, magnetic field at centre of coil,

$$B = \frac{\mu_0 N i}{2R}$$

$$B = \frac{4\pi \times 10^{-7} \times 1000 \times 1}{2 \times 62.8 \times 10^{-2}}$$

$$= \frac{4 \times 3.14 \times 10^{-7} \times 10^3}{2 \times 62.8 \times 10^{-2}}$$

$$= 10^{-3} \text{ T}$$

9. Option (3) is correct.
Explanation: For AC circuits,

$$X_L = \omega L$$

$$X_L = 2\pi n L \quad (\because \omega = 2\pi n)$$

$$X_L = 0.628\ \Omega$$

Hence, $X_1 = 0.628\ \Omega$

For DC circuits, $\omega = 0$

$$X_L = \omega L$$

$$X_L = 0$$

Hence $X_2 = 0$

10. Option (3) is correct.
Explanation: Secondary rainbow is formed due to double internal reflection and is formed above the primary rainbow. The secondary rainbow is brighter than the primary rainbow.

11. Option (2) is correct.
Explanation: By Einstein photoelectric equation, we have;

$$K.E. = h\nu - \phi$$

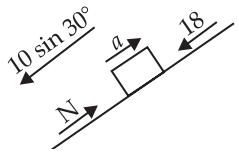
$$eV_0 = 4.2\text{ eV} - 2.2\text{ eV}$$
$$eV_0 = 2\text{ eV} = 2\text{ volt}$$

12. Option (1) is correct.

Explanation: Total force along inclined plane,

$$f = -F_1 + 6g\sin 30° + F_2$$
$$f = -60 + 6g\sin 30° + 18$$
$$f = -60 + 6 \times 10 \times \frac{1}{2} + 18$$
$$f = 12\text{ N (downwards)}$$

acceleration, $a = \frac{f}{m} = \frac{12}{6} = 2\text{ m/s}^2$



As per question, the normal force between 2 kg and 1 kg is,

$$N - 18 - 10\sin 30° = ma$$
$$N - 18 - 10 \times \frac{1}{2} = 1 \times 2$$
$$N = 2 + 23$$
$$N = 25\text{ N}$$

13. Option (1) is correct.

Explanation: As per question, the current flows only when the switch is ON.

A	B	Output
0	0	0
0	1	1
1	0	1
1	1	1

The truth table represents the OR Gate.

14. Option (1) is correct.

Explanation: Pressure, $P = h\rho g$ …(1)

In above equation, ρ represents density of water, g represents acceleration due to gravity and h is the height of the vessel.

As both vessels have same height and containing water, then densities are also same. Hence, the pressure on the base area of vessels A and B is same.

15. Option (4) is correct.

Explanation: The capacitance of parallel plate capacitor,

$$C = \frac{\varepsilon_0 A}{d} \quad \text{…(i)}$$

(where, the symbols have their usual meanings.)

Given, $d' = 2d$ & $A' = \frac{A}{2}$

Then, $C' = \frac{\varepsilon_0\left(\frac{A}{2}\right)}{2d} = \frac{\varepsilon_0 A}{4d} = \frac{C}{4}$

16. Option (1) is correct.

Explanation: By Stobal's law,

$keF = 6\pi\eta rv$

(where, the symbols have their usual meanings)

$$F = 6 \times 3.14 \times 0.9 \times 5 \times 10^{-3} \times 10 \times 10^{-2}$$
$$F = 84.78 \times 10^{-4}$$
$$= 8.478 \times 10^{-3}\text{ N} = 8.48 \times 10^{-3}\text{ N}$$

17. Option (3) is correct.

Explanation: $\vec{F} = 2\hat{i} + \hat{j} - \hat{k}$

$\vec{r} = 3\hat{i} + 2\hat{j} - 2\hat{k}$ (given)

The scalar product of $\vec{F}$ and $\vec{r}$ is

$$\vec{F}.\vec{r} = (2)(3) + (1)(2) + (-1)(-2)$$
$$= 6 + 2 + 2 = 10$$

The vector product of $\vec{F}$ and $\vec{r}$ is

$$\vec{F} \times \vec{r} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 1 & -1 \\ 3 & 2 & -2 \end{vmatrix}$$

$$= \hat{i}[(1 \times -2) - (2 \times -1)] - \hat{j}[(2 \times -2) - (-1 \times 3)] + \hat{k}[(2 \times 2) - (3 \times 1)]$$
$$= \hat{i}(0) - \hat{j}(-1) + \hat{k}(1) = \hat{j} + \hat{k}$$

Magnitude $= \sqrt{(1)^2 + (1)^2} = \sqrt{2}$

18. Option (3) is correct.

Explanation: As per Malus law, $I = I_0\cos^2\phi$, where symbols have their usual meanings.

$$I' = I\cos^2 30°$$
$$I' = I\left(\frac{\sqrt{3}}{2}\right)^2$$
$$I' = \frac{3I}{4}$$

19. Option (4) is correct.

Explanation: Restoring force of spring,

$$F \propto -x$$

(where, x is the displacement)

Only graph (4) is representing the above equation.

20. Option (3) is correct.

Explanation: As per YDSE, $x = \frac{\lambda D}{d}$,

(where, symbols have their usual meanings)

If the screen is moving away from the slits then D increases, and hence the fringe width (x) increases.

21. Option (3) is correct.

Explanation:

$$C_p = C_1 + C_2 \quad \text{...(1)}$$
$$\frac{1}{C_s} = \frac{1}{C_1} + \frac{1}{C_2} \quad \text{...(2)}$$

C_1 and C_2 are individual capacitance, C_s is the series capacitance & C_p is the parallel capacitance.

Hence, $16 = C_1 + C_2$ ...(3)

$$\frac{1}{3} = \frac{1}{C_1} + \frac{1}{C_2} \quad \text{...(4)}$$

By using equations (3) & (4), we have;

$$\frac{1}{3} = \frac{1}{C_1} + \frac{1}{(16 - C_1)}$$

$$\frac{1}{3} = \frac{16 - C_1 + C_1}{C_1 \times (16 - C_1)}$$

$$\Rightarrow \quad \frac{1}{3} = \frac{16}{16C_1 - C_1^2}$$

$$\Rightarrow \quad C_1^2 - 16C + 48 = 0$$

$$\Rightarrow \quad C_1 = \frac{16 \pm \sqrt{256 - 192}}{2}$$

[By Dharacharya rule, we have; $C = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$]

$$\Rightarrow \quad C_1 = \frac{16 \pm \sqrt{64}}{2}$$

$$\Rightarrow \quad C_1 = \frac{16 \pm \sqrt{8}}{2}$$

$$C_1 = 12 \text{ or } 4 \text{ (in } \mu F)$$

Hence, $C_2 = 4 \text{ or } 12 \text{ (in } \mu F)$

22. Option (1) is correct.

Explanation: Given,

$m = 5$ g $= 0.005$ kg,

$P = mv = 0.3$ kg m/s, and

$t = 5$ s,

(where, symbols have their usual meanings.)

$$P = mv = 0.3$$

Hence, $V = \frac{0.3}{m} = \frac{0.3}{0.005} = 60$ m/s

Hence, the distance covered = speed × time

$= 60 \times 5 = 300$ m

23. Option (1) is correct.

Explanation: Since, gravitational force is a conservative force and hence the work done is independent of the paths covered between points A and B.

24. Option (4) is correct.

Explanation: Conductance $\propto \frac{1}{\text{Resistance}}$

25. Option (4) is correct.

Explanation: As no external force acts along x-axis, hence centre of mass will move with same speed in x-direction before and after the explosion.

26. Option (3) is correct.

Explanation: By using Einstein's photoelectric equation, we have,

$$KE = h\nu - \phi$$

$$KE = h\nu - h\nu_0$$

$$= h(4\nu_0) - h\nu_0$$

$$= 3h\nu_0$$

where, h = Planck's constant,

ν & ν_0 = frequencies, and

ϕ = work function.

27. Option (2) is correct.

Explanation: As per question,

$$\frac{B_0}{E_0} = \frac{1}{c} = \sqrt{\mu_0 \varepsilon_0}$$

(where, the symbols have their usual meanings.)

28. Option (2) is correct.

Explanation: Straight current carrying wire produces circular magnetic field.

29. Option (2) is correct.

Explanation:

(a) Amplitude decreases continuously (damped oscillation)

(b) $a \propto -x$

(c) Amplitude is constant

(d) Total (K.E + P.E.) = constant

30. Out of Syllabus

31. Option (3) is correct.

Explanation: As per question,

$$PV^2 = C \qquad ...(1)$$

And by ideal gas equation, we have;

$$PV = nRT \qquad ...(2)$$

Hence, $\left(\frac{nRT}{V}\right)V^2 = C$

Hence, $TV = \text{constant}$

& $T \propto \frac{1}{V} \therefore V_2 > V_1 \text{ and } T_1 > T_2$

32. Option (1) is correct.

Explanation: Power,

$$P = I_{rms} V_{rms}$$

$$I_{rms} = \frac{P}{V_{rms}} = \frac{100}{200} = \frac{1}{2}$$

$$I_0 = \sqrt{2} I_{rms}$$

$$I_0 = \sqrt{2} \times \frac{1}{2}$$

$$I_0 = \frac{1}{\sqrt{2}} = 0.707 \text{ A}$$

33. Option (1) is correct.

Explanation: As,

$$R_n = 0.529 \frac{n^2}{Z}$$

Hence, $\frac{R_1}{R_2} = \frac{0.529 \frac{n_1^2}{Z_1}}{0.529 \frac{n_2^2}{Z_2}}$

$$\frac{R_1}{R_2} = \frac{n_1^2}{n_2^2} = \frac{(2)^2}{(4)^2}$$

$$\therefore \quad \frac{R_1}{R_2} = \frac{1}{4} = 0.25$$

(where, the symbols have their usual meanings)

34. Option (3) is correct.

Explanation: Dimensions of Pressure = $[ML^{-1}T^{-2}]$

Dimension of Force = $[MLT^{-2}]$

Dimension of Momentum = $[MLT^{-1}]$

Dimension of Young's modulus of elasticity = $[ML^{-1}T^{-2}]$

Dimension of coefficient of viscosity = $[ML^{-1}T^{-1}]$

35. Option (1) is correct.

Explanation: Given,

$$\omega_1 = 60 \text{ rpm} = 60 \times \frac{2\pi}{60} = 2\pi \text{ rad/s}$$

$$\omega_2 = 360 \text{ rpm} = 360 \times \frac{2\pi}{60} = 12\pi \text{ rad/s}$$

Change in kinetic energy,

$$\Delta \text{K.E} = \frac{1}{2} I(\omega_2^2 - \omega_1^2)$$

$$484 = \frac{1}{2} \times I(\omega_2 + \omega_1)(\omega_2 - \omega_1)$$

$$\Rightarrow \quad I = \frac{484 \times 2}{14\pi \times 10\pi} = 0.7 \text{ kg.m}^2$$

(where, the symbols have their usual meanings)

Section-B

36. Option (4) is correct.

Explanation: Given :

$\phi = 2t^3 + 4t^2 + 2t + 5$, and

& $t = 5\ s$

By Faraday's law of EMI, we have,

$$\text{emf}, = -\frac{d\phi}{dt}$$

(where, the symbols have their usual meanings)

$$e = \left|\frac{d\phi}{dt}\right| = \left|\frac{d}{dt}(2t^3 + 4t^2 + 2t + 5)\right|$$

$$= 6t^2 + 8t + 2$$

At $t = 5\ s$,

$$e = 6(5)^2 + 8(5) + 2$$

$$= 192 \text{ V}$$

37. Option (4) is correct.

Explanation: Given,

$f_e = 2$ cm, and

$f_o = 20$ m $= 2000$ cm

For normal adjustment,

$$\text{Magnification power} = \frac{-fo}{fe} = \frac{-2000}{2}$$

$$= -1000$$

$$\text{Length of telescope} = fo + fe$$

$$= 2000 + 2$$

$$= 2002 \text{ cm}$$

$$= 20.02 \text{ m}$$

The image formed is inverted and magnified, and the aperture of objective is larger than eye piece of the telescope.

(f_o & f_e are focal lengths of objective & eye piece respectively.)

38. Out of Syllabus

39. Option (1) is correct.

Explanation:

$$\text{Work done} = \text{Change in potential energy}$$

$$W = U_f - U_i$$

Hence, $W = 0$

40. Option (2) is correct.

Explanation: As per question, we have;

$$\text{frequency}, \quad f = \frac{v}{4l}$$

$$\text{Hence,} \quad \frac{f_1}{f_2} = \frac{\frac{v_1}{4l}}{\frac{v_2}{4l}}$$

$$\Rightarrow \quad \frac{400}{f_2} = \frac{v_1}{v_2}$$

$$\Rightarrow \quad \frac{400}{f_2} = \sqrt{\frac{T_1}{T_2}} \qquad [\because V \propto \sqrt{T}\,]$$

$$\Rightarrow \quad \frac{400}{f_2} = \sqrt{\frac{300}{363}}$$

$$\Rightarrow \quad f_2 = \sqrt{\frac{363}{300}} \times 400$$

$$\Rightarrow \quad f_2 = 440 \text{ Hz}$$

41. Option (1) is correct.

Explanation: As $x = \frac{1}{2}at^2$, hence the graph between x and t is upward parabola.

42. Out of Syllabus

43. Option (3) is correct.

Explanation: As, $V_{rms} = \sqrt{\frac{3KT}{m}}$

Hence, $v_{rms} \propto \frac{1}{m}$

So, lower the mass, higher/greater the velocity.

(where, the symbols have their usual meanings)

44. Option (3) is correct.

Explanation: Given,

$$V = \frac{-K}{x}(J/kg)$$

As, $E_x = \frac{-dv}{dx}$

$$= K\frac{d(x-1)}{dx}$$

$$= \frac{-K}{x^2} = \frac{-K}{(2)^2} \qquad (\text{at } x = 2)$$

$$= \frac{-K}{4}$$

45. Option (3) is correct.

Explanation: As per question,

$$\frac{F}{l} = \frac{\mu_o}{4\pi} \times \frac{2I_1I_2}{r}$$

$$= \frac{4\pi \times 10^{-7} \times 2 \times 5 \times 10}{2\pi \times 0.1}$$

$$= 10^{-4}\ \text{Nm}^{-1}$$

The nature of the force is attractive.

(where, the symbols have their usual meanings)

46. Option (1) is correct.

Explanation: As per question, we have;

$$B = B_0 \sin^3\theta$$

$$= \frac{\mu_0 I}{2\pi} \sin^3(45^o)$$

$$= \frac{4\pi \times 10^{-7} \times \sqrt{2}}{2 \times 1}\left(\frac{1}{\sqrt{2}}\right)^3$$

$$= 3.14 \times 10^{-7}\ \text{T}$$

47. Option (4) is correct.

Explanation: As per question, we have;

100°C | Cu | Steel | 0°C

θ = ?

As $K = \frac{Qd}{A\Delta t}$,

where, K = thermal conductivity
Q = amount of heat transferred
d = distance between two planes
A = area of surface, and
ΔT = difference in Temp.

$$\frac{\Delta Q}{\Delta t} = \frac{385 \times A \times (100°C - \theta)}{l}$$

$$= \frac{50 \times A \times (\theta - 0°C)}{l}$$

$\Rightarrow$ $385\,(100°C - \theta) = 50(\theta - 0°C)$

$\Rightarrow$ $\theta = 88.5°C$

48. Out of Syllabus

49. Option (1) is correct.

Explanation: A.T.Q, we have,

$$\frac{F_e}{F_G} = \frac{\frac{1}{4\pi\varepsilon_0}\frac{q_1q_2}{r^2}}{\frac{Gm_1m_2}{r^2}}$$

$$2.4 \times 10^{39} = \frac{K}{G} \times \frac{(1.6 \times 10^{-19})^2}{(9.1 \times 10^{-31} \times 1.67 \times 10^{-27})}$$

$$\left[\because K = \frac{1}{4\pi\varepsilon_0}\right]$$

Hence,

$$\frac{K}{G} = \frac{2.4 \times 10^{39} \times 9.1 \times 10^{-31} \times 1.67 \times 10^{-27}}{1.6 \times 10^{-19} \times 1.6 \times 10^{-19}}$$

$$= 14.247 \times 10^{19}$$

$$= 1.4247 \times 10^{20} \approx 10^{20}$$

50. Option (3) is correct.

Explanation: Given:

$$g = \frac{4\pi^2 L}{T^2}$$

L = (10 ± 0.1) cm, and

T = (100 ± 1) s

Hence, error in measurement of g is

$$\frac{\Delta g}{g} = \frac{\Delta L}{L} + 2\frac{\Delta T}{T}$$

$$= \frac{0.1}{10} \times 100 + 2 \times \frac{1}{100} \times 100$$

$$= 3\%$$

❑❑❑

CHEMISTRY

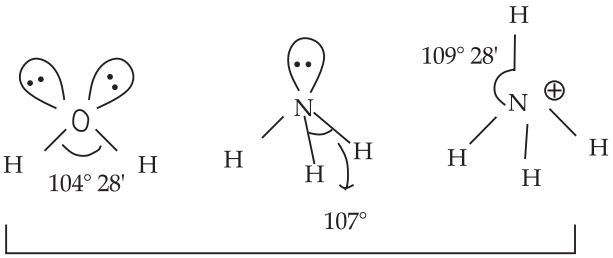
Section A

51. Option (1) is correct.

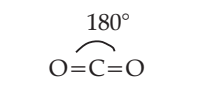
Explanation: According to VSEPR theory, bond angle decreases with increase in lone pair, for molecules of same hybridisation.

With increase in *s*-character, bond angle increase.

$\therefore$ order of bond angle =



sp^3 hybridisation



sp hybridisation

52. Option (1) is correct.

Explanation: K_H = Henry Law constant of gas in water, released to solubility as:

$$\text{Solubility of a gas} \propto \frac{1}{K_H \text{ Value}}$$

This means higher is the value of K_H, lower will be the solubility of gas in water.

$\therefore$ Solubility order of given gas in water

$= HCHO > CH_4 > CO_2 > Ar$

53. Out of Syllabus

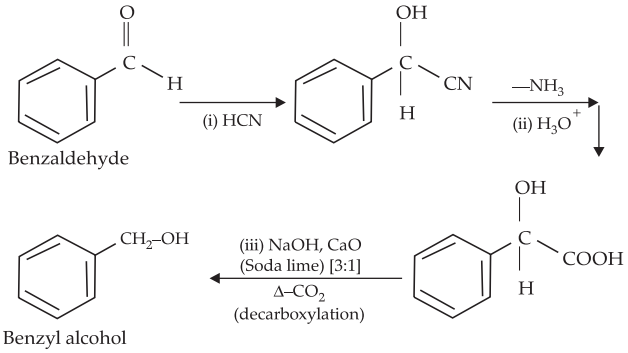
54. Option (3) is correct.

Explanation: Bleaching powder is prepared by passing Cl_2 gas through dry slaked lime.

$$2Ca(OH)_2 + 2Cl_2 \longrightarrow \underbrace{Ca(OCl)_2 + CaCl_2 + 2H_2O}_{\text{Bleaching Powder}}$$

55. Option (2) is correct.

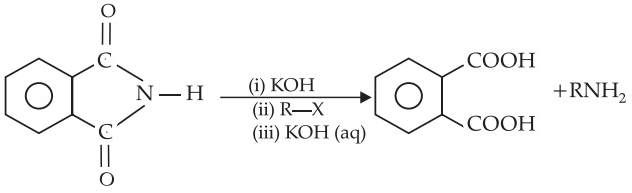
Explanation:



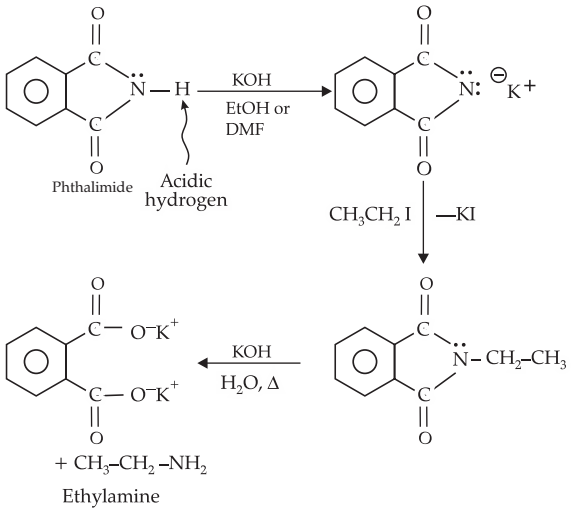
56. Option (4) is correct.

Explanation:

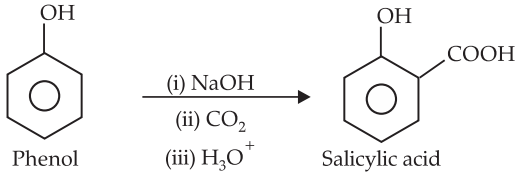
(a) Gabriel synthesis $\longrightarrow$ (iii) Primary amines



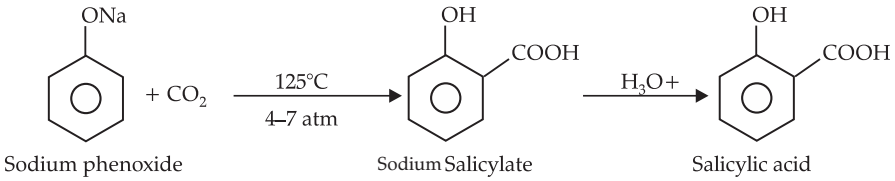
Phthalimide is alkylated with primary or unbranched secondary alkyl halides or sulphonate. The product thus obtained is hydrolysed to give primary amines.



(b) Kolbe's synthesis ⟶ (iv) Salicylic acid.



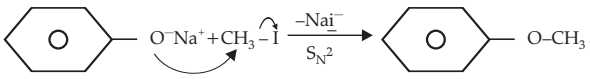
Heating of sodium phenoxide with CO_2 gas under pressure produces sodium salicylate as the major product, which on further acidification gives salicylic acid.



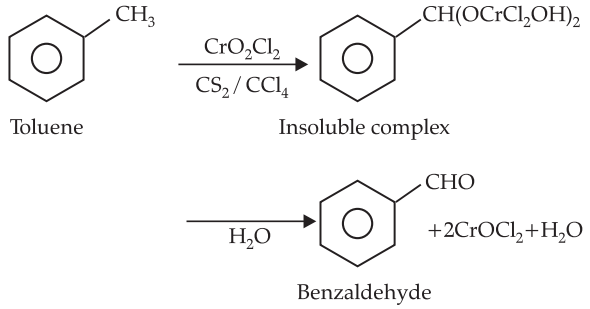
(c) Williamson synthesis ⟶ **(ii)** Ethers

$R—O^-Na^+ + R—X \xrightarrow{-Nax} R—O—R$

e.g., $CH_3–CH_2–\bar{O}\,Na^+ + CH_3–CH_2–Br \xrightarrow[S_N2]{-NaBr} CH_3CH_2OCH_2CH_3$



(d) Etard Reaction ⟶ **(i)** Benzaldehyde

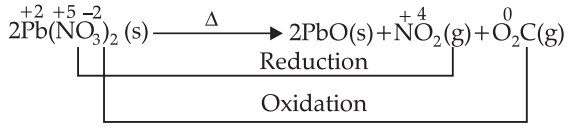


Treatment of toluene with chromyl chloride in an inert solvent like CS_2 or CCl_4 forms an insoluble complex $C_6H_5CH(OCrCl_2OH)_2$ which further on hydrolysis produces benzaldehyde.

57. Out of Syllabus

58. Option (1) is correct.

Explanation: Redox decomposition reaction is associated with breakdown of a large molecule into smaller molecule with change in oxidation state.



59. Option (1) is correct.

Explanation: The highest jump ion successive ionisation energy indicates a stable noble gas configuration.

$X(g) \xrightarrow[+419\ kJ\ mol^{-1}]{IE_1} X^+(g) \xrightarrow[+3069\ kJ\ mol^{-1}]{IE_2} X^{2+}(g)$

The highest jump is observed in the IE_1 & IE_2. It shows the attainment of stable noble gas configuration of X after losing one electron. Hence, X is an alkali metal.

The IE_1 of Y is $+590\ kJ\ mol^{-1}$ which is greater than IE_1 of X due to ns^2 configuration.

∴ X = Alkali metal and Y = Alkaline Earth metal

60. Option (3) is correct.

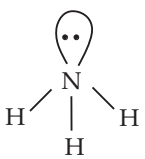
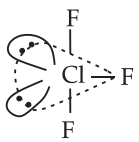
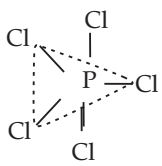
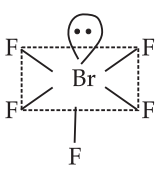
Explanation: The rate of reaction decreases with increase in steric crowding around the substrate centre.

∴ Rate of $S_N2 \propto \dfrac{1}{\text{Steric crowding}}$

∴ Rate of reactivity order is : I > III > II > IV

61. Option (2) is correct.

Explanation:

NH_3	ClF_3	PCl_5	BrF_5
bp = 3, lp =1 Steric No. = 4 Hybrid -sp^3	bp = 3, lp =2 Steric No. = 5 Hybrid -sp^3d	bp = 5, lp =0 Steric No. = 5 Hybrid sp^3d	bp = 5, lp =1 Steric No. = 6 Hybrid sp^3d^2
			
Trigonal pyramidal	T-shaped	Trigonal Bipyramidal	Square Pyramidal

62. Out of Syllabus

63. Out of Syllabus

64. **Option (3) is correct.**

Explanation: The cell reaction is written as :

$E^\circ_{Co^{2+}/Co^{3+}} = -1.81$ V (SOP)

$\therefore$ $E^\circ_{Co^{3+}/Co^{2+}} = +1.81$ V (SRP)

$E^\circ_{Al/Al^{3+}} = +1.66$ V (SOP)

$\therefore$ $E^\circ_{Al^{3+}/Al} = -1.66$ V (SRP)

Here E° is given in standard Reduction Potential

$E^\circ_{Co^{3+}/Co} > E^\circ_{Al^{3+}/Al}$

$\therefore$ Co^{3+}/Co will undergo reduction acting as cathode and Al^{3+}/Al will undergo oxidation acting as anode.

$\therefore$ $E^\circ_{cell} = E^\circ_{cathode\ (Red.)} - E^\circ_{Anode\ (oxide)}$

$E^\circ_{cell} = 1.81 - (-1.66)$

$E^\circ_{cell} = +3.47$ V

65. **Option (2) is correct.**

Explanation: Oxy-hydrogen flame produces a very high temperature which is used for welding and melting of metals with high melting point.

66. **Option (2) is correct.**

Explanation: $Na_2B_4O_7.10H_2O \xrightarrow[-10H_2O]{\Delta} Na_2B_4O_7$

$$Na_2B_4O_7 \xrightarrow{\Delta} 2NaBO_2 + \underset{(X)}{B_2O_3}$$

X = Boric anhydride

67. **Option (3) is correct.**

Explanation:

C	N	O	F
$2s^2 2p^2$	$2s^2 2p^3$	$2s^2 2p^4$	$2s^2 2p^5$
	(Half-filled)		

Across the period Z_{eff} increases but nitrogen has half-filled orbital which makes it more stable.

$\therefore$ Order of IE_1 = C < O < N < F

68. **Option (3) is correct.**

Explanation:

$$\underset{C-\alpha}{CH_3COOH} \rightleftharpoons \underset{\dot{C}\alpha}{CH_3COO^-} + \underset{\dot{C}\alpha}{H^+}$$

Ionisation of CH_3COOH is 1% in aqueous solution.

$$\text{So, } [H^+] = \frac{1}{100} \times \text{concentration of } CH_3COOH$$

$$= \frac{1}{100} \times 10^{-2} = 10^{-4}$$

$$pH = -\log [H^+] = -\log (1 \times 10^{-4})$$

$$pH = 4$$

69. **Option (2) is correct.**

Explanation: '*x*' is mass of gas adsorbed on mass '*m*' of the adsorbent at pressure '*p*'. The curves in the given adsorption isotherm indicates that at a fixed pressure, there is decrease in physical adsorption with increase in temperature and vice versa.

So, the correct order of temperature is :

$$T_3 > T_2 > T_1$$

70. **Option (2) is correct.**

Explanation: Half life period ($t_{1/2}$) = 2000 years

$$k = \frac{0.693}{2000}$$

$$k = \frac{2.303}{t} \log \frac{[A]_o}{[A]_t}$$

$$\frac{0.693}{2000} = \frac{2.303}{8000} \log \frac{[A]_o}{0.02}$$

$\therefore$ $[A]_o = 0.32$ M

71. **Option (4) is correct.**

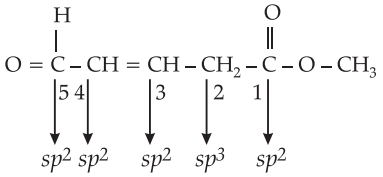
Explanation: In an isothermal expansion or compression process, the temperature of system remains constant throughout the process. Since, for an ideal gas, U depends only on temperature, it follows that

$$dU = 0$$

72. **Option (1) is correct.**

Explanation: Priority : —C—O—R > —C—H

$\therefore$ The priority of numbering goes to alkoxy carbonyl group.



73. **Option (2) is correct.**

Explanation: $\text{Density} = \frac{\text{Mass}}{\text{Volume}}$

Density = 2.15 g/mL, Volume of solution = 2.5 mL

$\therefore$ $2.15 = \frac{\text{Mass}}{2.5} \Rightarrow$ Mass = 5.375 g

The correct significant figure should have the same number of significant digits as the number with least number of significant digits.

$\therefore$ Mass = 5.4 g

74. **Option (1) is correct.**

Explanation: Even though fluorine has lower electron gain enthalpy than chlorine, it is a strong oxidising agent. The correct reason that can be attributed for this behaviour is:

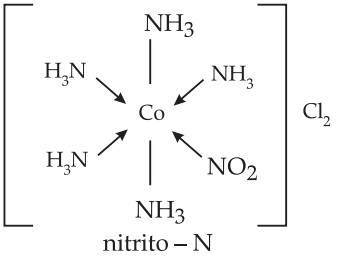
(i) Small size of fluorine, makes it suitable for its high hydration enthalpy.

(ii) The bond dissociation enthalpy of fluorine is lower than chlorine due to high lone pair lone pair repulsion.

75. **Option (3) is correct.**

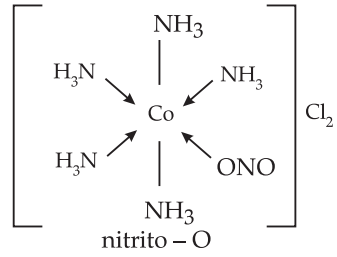
Explanation:

(a) $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5ONO]Cl_2$ – linkage Isomerism due to difference in binding site.



nitrito – N

and



nitrito – O

(b) $[Cr(NH_3)_6][Co(CN)_6]$ and $[Cr(CN)_6]\ [Co(NH_3)_6]$

– It is an example of coordination Isomerism due to exchange of ligands between the two coordination spheres.

(c) $[Co(NH_3)_5(SO_4)]Br$ and $[Co(NH_3)_5Br]SO_4$

– It is an example of Ionisation Iosmerism arising due to formation of different ions due to ionisation. The case arises due to exchange of ions between the coordination sphere and ionisation sphere.

(d) $[Cr(H_2O)_6]\ Cl_3$ and $[Cr(H_2O)_5Cl]\ Cl_2.H_2O$

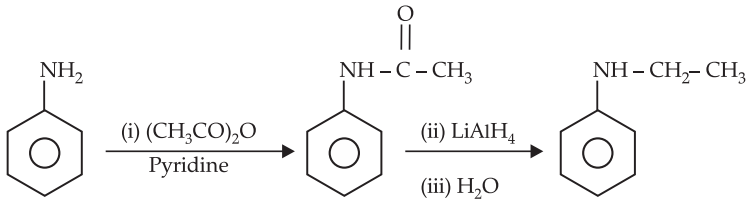
– It is an example of solvate isomerism arising due to difference in H_2O molecules acting as potential ligand and as water of crystallisation.

76. Option (3) is correct.

Explanation: Enzymes act at optimum temperature and pH. Tertiary structure is responsible for biological activities of proteins. With increase in temperature H-bond breaks and denaturation occurs resulting in uncoiling of helical structure.

77. Option (1) is correct.

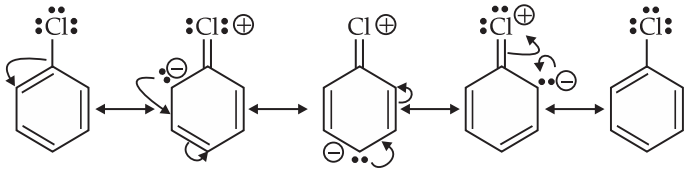
Explanation:



78. Out of Syllabus

79. Option (1) is correct.

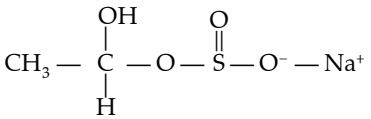
Explanation: Chlorine is *ortho* directing in electrophilic aromatic substitution instead of its electron withdrawing nature because inductive effect of chlorine destabilises the intermediate carbocation which is formed during the electrophilic substitution. But because of more strong resonance effect, the halogen stabilies the carbocation at *ortho*- and *para*- position.



80. Option (1) is correct.

Explanation: Nucleophilic addition – elimination reaction is associated with elimination of H_2O.

$CH_3CHO + NaHSO_3 \rightleftharpoons$



Here the above reaction is an addition reaction.

81. Out of Syllabus

82. Option (3) is correct.

Explanation: More is the number of poor shielders, greater will be Z_{eff} and hence, smaller is the size.

Actinoids consists of more no. of poor shielders (3*d*, 4*d*, 5*d*, 4*f*). Therefore, size continuously decreases left to right.

83. Option (4) is correct.

Explanation: With increase in molecular mass, Van Der Waal force increases and hence boiling point also increases.

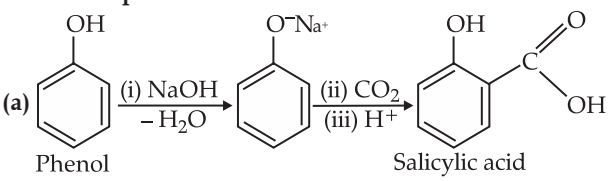
$\therefore$ BP : Heptane > Hexone > 2- Methyl butane

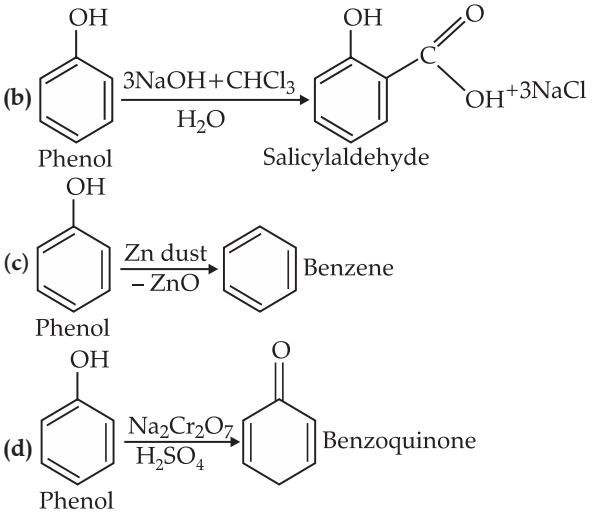
with the increase in branching, surface area decreases of molecules of same molecular mass which results in decrease in boiling point.

$\therefore$ BP : butane > α- methyl propane.

84. Option (3) is correct.

Explanation:





85. Option (4) is correct.

Explanation:

$n = 1$	$l = 0$ (s)	$n = 4$	$l = 0$ (s)
$n = 2$	$l = 0$ (s)		1 (p)
	1 (p)		2 (d)
$n = 3$	$l = 0$ (s)		3 (f)
	1 (p)		
	2 (d)		

Principle QN (n)	Azimuthal QN (l)	Possible values ($n-1$)	Subshell
$n = 1$	0		s
$n = 2$	0		s
	1		p
$n = 3$	0		s
	1		p
	2		d
$n = 4$	0		s
	1		p
	2		d
	3		f

So, for $n = 2, l = 1$, orbital is $2p$
for $n = 3, l = 2$, orbital is $3d$
for $n = 3, l = 0$, orbital is $3s$
for $n = 2, l = 0$, orbital is $2s$

86. Option (4) is correct.

Explanation: Calcination process involves heating of ore in absence of air below melting point. But here reaction taking place is a displacement reaction.

87. Option (4) is correct.

Explanation: Since, the striking photon has energy equal to $h\nu$and the minimum energy required to eject the electron is $h\nu_0$ (work function W_0), the difference in energy ($h\nu - h\nu_0$) is transferred as the kinetic energy of the photoelectron.

$h\nu = h\nu_0 + KE$

$h\nu_0$ = minimum energy required to remove electron)

Energy of a 300 nm photon is given by

$$\Rightarrow E = \frac{hc}{\lambda}$$

$$= \frac{6.626 \times 10^{-34}\ Js \times 3 \times 10^{8}\ ms^{-1}}{300 \times 10^{-9}\ m}$$

$= 6.626 \times 10^{-19}$ J

Energy of one mole of photons

$= 6.626 \times 10^{-19}\ J \times 6.022 \times 10^{23}\ mol^{-1}$

$= 3.99 \times 10^{5}\ J\ mol^{-1}$

The minimum energy needed to remove one mole of electrons $= (3.99 - 1.68) \times 10^{5}\ J\ mol^{-1}$

$= 2.31 \times 10^{5}\ J\ mol^{-1}$

88. Option (1) is correct.

Explanation: $4A + 3B \longrightarrow 6C + 9D$

$$\text{Rate of reaction} = -\frac{1}{4}\frac{d[A]}{dt} = -\frac{1}{3}\frac{d[B]}{dt}$$

$$= \frac{1}{6}\frac{d[C]}{dt} = \frac{1}{9}\frac{d[D]}{dt}$$

Rate of reaction = Rate of formation of C.

$$\therefore \quad r = \frac{1}{6}\frac{d[C]}{dt} = \frac{1}{6} \times 6 \times 10^{-2}$$

$= 1 \times 10^{-2}\ mol\ L^{-1}\ s^{-1}$

Also, rate of reaction = Rate of disappearance of B

$$r = -\frac{1}{3}\frac{d[B]}{dt} = \frac{d[B]}{dt} = 3 \times r$$

$= 3 \times 10^{-2}\ mol\ L^{-1}\ s^{-1}$

Consumption of B in 10 seconds $= 3 \times 10^{-2} \times 10$

$= 30 \times 10^{-2}\ mol\ L^{-1}$

89. Option (3) is correct.

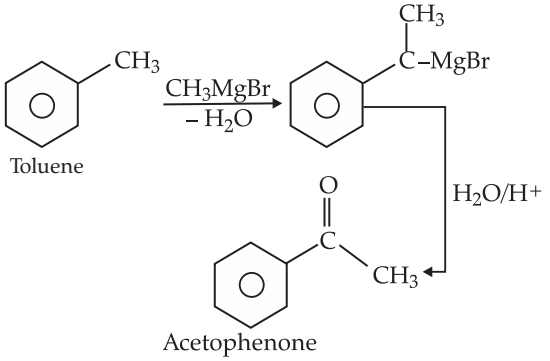
Explanation: Alkyl halide in aqueous KOH results in formation of alcohol.

$R — X + KOH\ (aq) \longrightarrow R — OH$

Alcohol

90. Option (4) is correct.

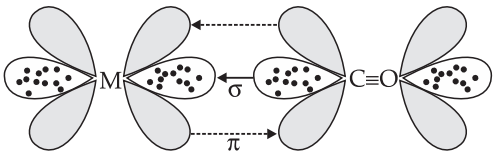
Explanation:



91. Out of Syllabus

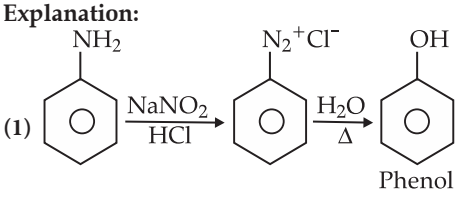
92. Option (3) is correct.

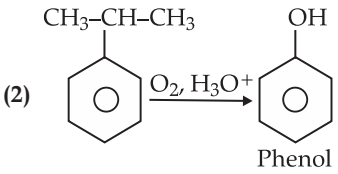
Explanation:

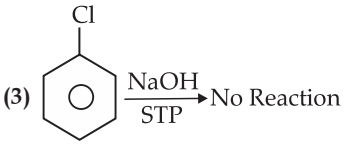


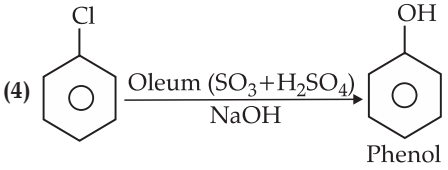
93. Option (3) is correct.

Explanation:







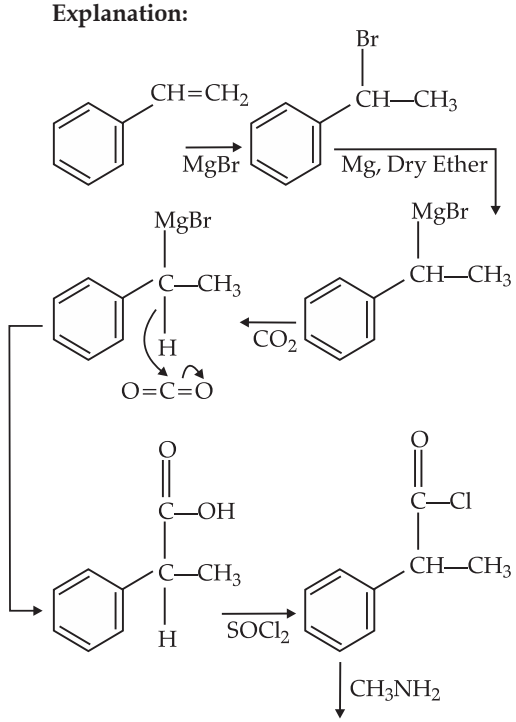


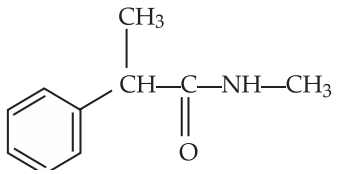
94. Out of Syllabus

95. Out of Syllabus

96. Option (2) is correct.

Explanation:

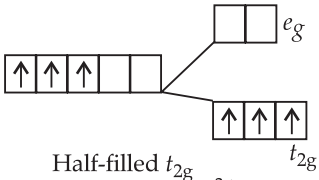




97. Option (4) is correct.

Explanation:

$$Cr^{2+}\ [Ar]\ 3d^4 \xrightarrow{-e^-} Cr^{3+}\ [Ar]\ 3d^3$$



Half-filled t_{2g} Orbital makes Cr^{3+} more stable

Therefore, Cr^{2+} acts as a reducing agent.

$$Mn^{3+}\ [Ar]\ 3d^4 \xrightarrow{+e^-} Mn^{2+}\ [Ar]\ 3d^5$$

Half filled *d*-orbital (more stable)

Therefore, Mn^{3+} acts as an oxidising agent.

Sc^{3+}— [Ar] All elements are paired making it diamagnetic. Hence Sc^{3+} compounds are repelled when placed in an external magnetic field.

98. Option (2) is correct.

Explanation: $CO_2(g) + C(s) \rightleftharpoons 2CO(g)$

$K_p = K_c.(RT)^{\Delta n_g}$

$K_p = 3.0$. $R = 0.083$ L bar K^{-1} mol^{-1}

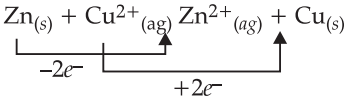
$\Delta n_g = 2 - 1 = 1$

$\therefore \quad 3.0 = K_c\,(0.083 \times 1000)^1$

$$K_c = \frac{3}{83} = 3.6 \times 10^{-2}$$

99. Option (2) is correct.

Explanation:



$E^\circ_{Cell} = 1.1$ V, $n = 2$, $f = 96487$ C mol^{-1}

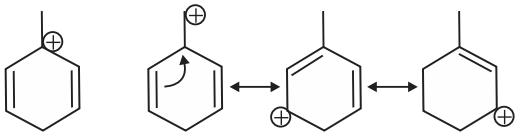
$\Delta G^\circ = -n\,FE^\circ_{Cell}$

$= -2 \times 96487 \times 1.1$ J

$= -212.27$ kJ

100. Option (4) is correct.

Explanation:



– No. of α-H = 3

– 3° carbocation

– Resonanse stabilised

❐❐❐

BOTANY

Section A

101. Option (3) is correct.

Explanation: Diplotene (a stage of Prophase-I of Meiosis) which can delay for months or years in oocyte of some vertebrates such as humans. In human female, cycle the cell arrest during embryonic stage and continue after puberty. It is completed at the time of ovulation during menstruation.

102. Option (1) is correct.

Explanation: During C_3 cycle (calvin cycle) 3 phases continue, namely **carboxylation**, **Reduction** & **regeneration**. During reduction or fixation phase, each CO_2 molecule require one mole of ATP and one mole of NADPH.

103. Option (1) is correct.

lac **operon** is an example of polycistronic operon in which 3 gene are present namely Z, Y and A.

Z — β-galactosidase

Y — Permease

A — Transacetylase

104. Out of Syllabus

105. Option (1) is correct.

Explanation:

Adenine	— A nitrogenous purine base
Anthocyanin	— Purple coloured pigment in vacuole
Chitin	— Polymer of aminated sugar i.e., N-acetyl-D-glucosamine, present in the exoskeleton of insects, molluscs, nematodes, cell wall of fungi etc.
Codeine	— Alkaloid (acts on CNS to relieve mild to moderate pain)

106. Option (2) is correct.

Explanation: i-gene in *lac* operon code for repressor while z codes for **β-galactosidase, *y* for permease** and **a is for Transacetylase.** All these genes are a part of single structure called ***lac* operon**.

107. Option (2) is correct.

Explanation:

Chlamydomonas	— *A* green algae
Cycas	— Fossil gymnosperm
Selaginella	— Pteridophyte, Microphyllous
Sphagnum	— Moss, Peat Mass/cotton mass.

108. Option (1) is correct.

Explanation: DNA polymerase can read template DNA in only one direction i.e., 3' → 5' thus DNA replication can continue only in 5' → 3' direction, thus it can continue only on one strand of DNA. The DNA stand on which replication is continuous is called **leading strand** whereas the strand on which replication is discontinuous is said to be **lagging strand**.

109. Option (2) is correct.

Explanation: Above mentioned floral diagram is of the family **Brassicaceae.** It is indicated by two unique characters—(1) Tetrameric flower i.e., (four petalled cross-shaped) and (2) Tetradynamous condition of stamens (two long and two short).

110. Out of Syllabus

111. Option (2) is correct.

Explanation: Isocitrate (Isocitric acid) undergoes two times decarboxylation during TCA cycle. During first decarboxylation, it forms **α-Ketoglutaric** acid and in the second time, it forms succinyl Co-A

112. Option (4) is correct.

Explanation: Sickle cell anemia is autosomal recessive trait while haemophilia is X-linked recessive trait.

Sickle cell anaemia is blood disorder while haemophilia is the disorder of blood clotting.

113. Option (1) is correct.

Explanation: With the help of most restriction enzymes sticky ends in DNA can be created. The flanking region in DNA can be formed due to cutting of DNA strand little away from restriction site.

114. Option (4) is correct.

Explanation: Amazon rain forest contains following number of species in respective group.

Invertebrates	125000
Plants	40000
Fishes	3000
Birds	1300
Mammals	427

115. Option (2) is correct.

Explanation:

Porins	Huge pores in outer membrane of Mitochondria, Chloroplast & some bacteria.
Leg Haemoglobin	Pink coloured pigment, O_2 scavanger
H^+ accumulation	Lumen of thylakoid (Inside chloroplast)
Respiration	Amphibolic (catabolic + Anabolic) pathway.

116. Option (2) is correct.

Explanation: Cytokinin is a cell division inducing hormone derived from **Adenine**, a purine type nitrogenous base.

→ Cytokinin was first obtained from autoclaved Herring sperm DNA.

117. Option (4) is correct.

Explanation: In fruit wall of several nuts, various types of sclereid tissues are present. These are called **stone cells**. These are dead cells with obliterated lumen.

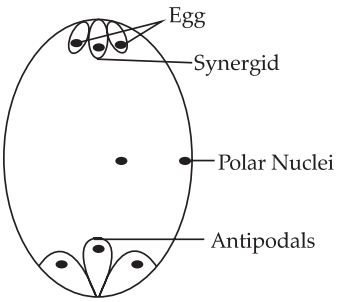
118. Out of Syllabus

119. **Option (1) is correct.**

Explanation: A typical embryo sac is 8 nucleate, 7 celled structure formed in most angiosperms.

It has a 3 celled egg apparatus in which one egg cell and two synergids are present.

Note: The answer has been provided with respect to the embryo sac, not egg apparatus.



120. **Option (2) is correct.**

Explanation:

Imbricate	Gulmohar, *Cassia* etc (Fabaceae)
Valvate	*Calotropis* (Asclepiadaceae)
Vexillary	**Beans** (Fabaceae or legumi-nosae)
Twisted	Cotton (Malvaceae)

121. Out of Syllabus

122. **Option (4) is correct.**

Explanation: With the help of Gel electrophoresis technique, separation of DNA fragments, based on their size (mol. wt) can take place. DNA fragments can be separated on Agarose gel with the help of electrode and can be visualised with the help of ethidium bromide under UV-light.

123. **Option (2) is correct.**

Explanation: The process of conversion of a **Non-dividing** (permanent cell) to a dividing cell is called **de-differentiation.** This is an important process for secondary growth which taken place in plants.

124. **Option (2) is correct.**

Explanation: During Meiosis-I, the stage **Prophase** I occurs in which various substages are present. Of these substages, the most important is **Pachytene stage** in which exchange of chromosomal segments take place between non-sister chromatids of homologous chromosome, with the help of enzyme recombinase.

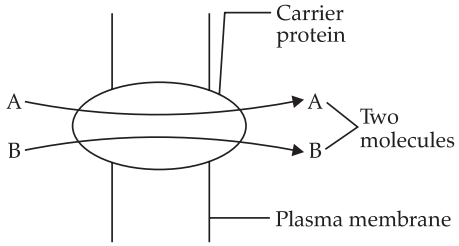
125. **Option (1) is correct.**

Explanation: During TCA cycle, after first decarboxylation of oxalosuccinic acid, α-Ketoglutaric acid 5-C compound (α-KGA) is formed.

α-KGA undergoes further decarboxylation to form a 4 carbon compound i.e., succinyl-CO-A.

126. **Option (4) is correct.**

Explanation:



Above condition is called **Symport** in which the two molecules are moving in the same direction. This is a type of **Facilitated diffusion** of non-Polar substance from plasma membrane.

127. **Option (1) is correct.**

Explanation: World summit on sustainable development takes place to ensure significant reduction in the current rate of Biodiversity loss. This summit was held in 2002 in Johannerburg, South Africa.

128. Out of Syllabus

129. Out of Syllabus

130. **Option (3) is correct.**

Explanation: The Rhizome is underground stem modification in which nodes and internodes are distinct. The nodes contain several buds from which new plants arise. It is prostate and branched. e.g. **Sugarcane, Banana,** etc.

131. **Option (2) is correct.**

Explanation: During the process of artificial pollination in pea plant, emasculation is only needed in Bisexual plant, selected as female parent. After removing stamens from such flower and transferring selected pollens, it needs to be bagged to prevent non-desired pollen to come in contact with this flower.

132. **Option (3) is correct.**

Explanation: Persistent nucellus in beet and pepper in called **Perisperm**. Nucellus is diploid sporogenous tissue which is generally degraded, but present in above mentioned seeds.

133. **Option (2) is correct.**

Explanation: Chromosomal theory of inheritance was proposed by **Sutton** and **Boveri** in 1902. They both connect the idea of Mendelian factor to the new concept of chromosome and find very close similarity between these two.

134. **Option (2) is correct.**

Explanation: *Leg*-Haemoglobin is a pink O_2-scavanger- pigment present in root nodules of leguminous plants. It helps in protection of **Nitrogenase** from the O_2, as it is O_2-sensitive enzyme.

135. **Option (3) is correct.**

Explanation: Phenotypic plasticity is the process through which plant follow different pathways in response to different environmental conditions. For example Heterophylly in **Cotton, Coriander** and **Larkspur**.

Section B

136. Option (2) is correct.

Explanation: Azotobacter and *Beijerinckia* are free living, N_2 fixing, Aerobic bacteria. *Rhizobium* and *Frankia* are associated bacteria. *Pseudomonas* and *Thiobacillus* are denitrifying bacteria while *Rhodospirillum* is **anaerobic** non, N_2 Fixing bacteria.

137. Option (1) is correct.

Explanation:

Sacred grooves	Khasi Hill in Meghalaya
Zoological park	*Ex-situ* (off site) conservation
Nile perch	Alien species—causes loss of 200 species of unique Assemblage of **Chichilid Fishes**
Amazon forest	Lungs of planet Earth, release about 20% of total oxygen.

138. Option (3) is correct.

Explanation: Primary structure in proteins are continuous, in which successive amino acids are added with the help of peptide bond formation. It is simplest yet generally non-Functional structure of proteins.

139. Option (1) is correct.

Explanation:

Gene gun	Particle gun, used for transfer of gene.
Gene therepy	Replacement of non-working gene by a working gene.
Gene cloning	To obtain identical copies of a particular DNA molecule.
Genome	Total DNA in the cells of an organism in Haploid state (n)

140. Option (3) is correct.

Explanation:

Organism	**Genome size**
Bacteriophage $\phi \times 174$	5386 Nucleotides (SS)
Bacteriophage lambda	48502 bp
E. Coli	4.6×10^6 bp
Haplid content of Human DNA	3.3×10^9 bp

141. Option (3) is correct.

Explanation: It Apomictic gene are introduced into hybrid crop. Varieties, the seed formed in them without fertilisation, leads to continuation of desired combination of characters. For unlimited generations, thus Farmers can keep their seeds for next year.

142. Option (2) is correct.

Explanation: The given figure is of *Chara*, a green algae of family **chlorophyceae**, pigments are **chl** a, **b** and **carotene**. Stored food material is in the form of starch. It is monoecious and contain **Oogonium** (female sex organ) and **Antheridium** (male sex organ).

143. Option (3) is correct.

Explanation: Fruit eating birds (Frugivorous) are present in tropical forest as food is available in throughout the year. For example, fig plant support such birds in their survival. Thus, Fig is also called **Keystone** species in TRF.

144. Option (2) is correct.

Explanation: As plasma membrane is made up to phospholipid, it only allow free transfer of **Fat soluble substances** (Hydrophobic) it does not allow Hydrophilic substance to pass from it.

145. Option (2) is correct.

Explanation: Chemi-osmotic hypothesis of ATP formation was given by **P. A. Mitcheli**. According to which proton flow causes ATP formation. Primary acceptor of electrons, i.e., Phaeophytin transfers its electron to **proton carrier** that is Plastoquinone, non an e^- carrier.

146. Option (4) is correct.

Explanation: The symptoms mentioned in the question are of down's syndrome which is caused by trisomy of chromosome 21. Total chromosome number turn to be 47. It is also called **Mongoloid Idiocy.**

147. Option (3) is correct.

Explanation: The order of events during prophase I of Meiosis-I is as follows:

Leptotene → Thickening of chromosome
Zygotene → Synapsis of chromosome
Pachytene → Crossing over
Diplotene → Dissolution of synaptonemal complex
Diakinesis → Terminalisation of chiasmata.

148. Option (2) is correct.

Explanation: Cellulase can degrade cellulosic cell wall of plant cell while chitinase is used for degrading **Chitin** (Fungal cellulase) for obtaining DNA from cell.

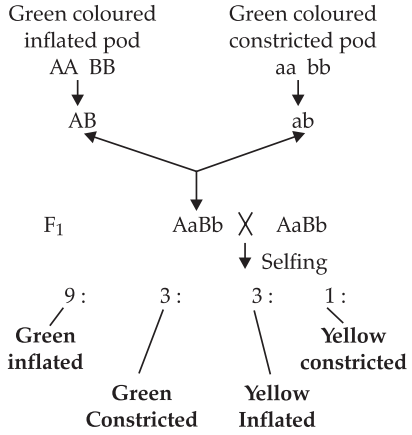
149. Option (3) is correct.

Explanation:

- Carbon dissolved in oceans = About 71%
- Annual fixation of CO_2 through photosynthesis is = 4×10^{13} kg
- PAR captured by plants = 2 – 10%
- Productivity of oceans = 55 billion tonnes

150. Option (3) is correct.

Explanation:



$$\frac{3}{16} \times 100 = 18.75\%$$

ZOOLOGY

Section A

151. Option (2) is correct.

Explanation: Plasmids are extra chromosomal DNA in bacterial cytoplasm which provide additional feature to the bacteria such as antibiotic resistance, N_2-Fixation, fertility, etc.

Plasmid may contain resistance genes for several antibiotics.

152. Option (2) is correct.

Explanation: Transgenic cow **Rosie** produced milk rich in Human protein **α-Lactalbumin** which is easily digestible to babies with lactose intolerance.

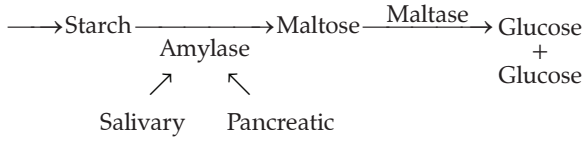
→ Such proteins which are produced in other organisms through DNA recombinant technology are called **recombinant proteins**.

153. Option (2) is correct.

Explanation: Lysosomal enzymes are generally **Hydrolytic** enzymes which are functional in Acidic pH only. When pH is turned to basic, medium these enzymes will become inactive.

154. Option (1) is correct.

Explanation: Maltase leads to breakdown of disaccharide maltose into two glucose subunits.



155. Option (4) is correct.

Explanation: During organ transplantation, the graft rejection takes place due to cell mediated response, in which T-cell controls the identification of **Self** from **Non-self**.

This rejection can be prevented by **Immuno-suppressive agent** i.e., **Cyclosporin-A**.

156. Option (3) is correct.

Explanation: If **Sulphur and Phosphorus** change their presence in DNA and protein respectively the result of **Hershey** and **Chase** experiment will be reversed. Bacteria with radioactive sulphur formed at the base of Test Tube.

157. Option (2) is correct.

Explanation: Two competing species can co-exist for the same type of resource by changing their foraging pattern. These butterflies can obtain nectar at different times and chase different floral parts to avoid competition.

158. Option (4) is correct.

Explanation: Mad cow disease (Bovine spongiform encephalopathy) and Cr. Jacob disease in humans are caused by misfolded, Infectious protein particle called **Prion.** These are proteins which attack neural tissues, generally.

159. Option (1) is correct.

Explanation: Progestogens are pills containing progesterone. These are NOT **IUDs** as they can be taken in the form of daily/weekly or monthly pills.

160. Option (2) is correct.

Explanation:

Chlamydomonas	Zoospore
Penicillium	Conidia
Hydra	Budding (External budding)
Sponges	Gemmule (internal budding)

These all are methods of Asexual reproduction.

161. Option (2) is correct.

Explanation: According to **Sliding filament theory**, thin. Filament slide over **Thick filament** (mainly myosin). That is why the length of A band does not change as A band is made up of thick filament.

162. Option (2) is correct.

Explanation: Productivity is the total amount of biomass or organic matter produced per unit area. Over a period of time by plants. This is also called **Primary production**.

→ Productivity of consumer is called Secondary production.

163. Option (1) is correct.

Explanation: Amino acids can exist in zwitterionic form which contains both positive and negative charges together, thus called **Amphoteric molecule**. These forms of amino acids, are having both moieties.

164. Option (3) is correct.

Explanation: Epithelium of Bronchiole and Fallopian tube is lined by the cilia for the movement of attached substances in specific direction.

→ Egg movement towards uterus is due to these surface outgrowths.

165. Option (3) is correct.

Explanation: Western ghats have large number of endemic species which are absent in all other parts of the world. These consist of amphibians and large number of flowering plants. Western-ghats is one of biodiversity hotspots in India.

166. Option (1) is correct.

Explanation: Accumulation of uric acid crystals leads to inflammation of joints which is commonly called as **Gout.** It is a metabolic disorder in which Uric acid degrading enzyme remains inactive or absent.

167. Option (3) is correct.

Explanation: Vital capacity does not include **RV** as this cannot be measure of by using respirometer. Vital capacity is the maximum inspiration after force full expiration.

168. Out of Syllabus

169. Option (1) is correct.

Explanation:

Crop	→ Storage chamber for food.
Pro. ventriculus (Gizzard)	→ Have Chitinous/Cuticular teeth for grinding the food particular.

Hepatic caecae Malpighian Tubule	→ Gastric caeca — Secrete digestive juice → Main excretory structure for the removal of nitrogenous waste

170. Option (2) is correct.

Explanation: *Spirulina* (a BGA) can be used as an agent reduce environmental pollution. It absorb heavy metals and other harmful substances from environment thus reduce pollution. If can also be used as SCP (Single cell protein) as source of protein, carbohydrate, fat, mineral & vitamins.

171. Option (4) is correct.

Explanation: Panspermia is a hypothesis which explains the origin of life on earth due to transfer of spores from other planet of earth. The theory faces high level of criticism as environment between two planets cannot support Life.

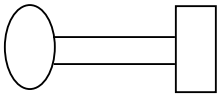
172. Option (3) is correct.

Explanation: Mammary glands have various structures arranged in defined order—from proximal to distal they shows—

Alveoli → Mammary tubules → Mammary duct → Mammary ampulla → Lacticiferous duct

173. Option (3) is correct.

Explanation: In consanguine marriage/mating occurs between two close relatives and can be represented by two lateral lines between male and female as follows:



This lead to expression of numerous harmful genes.

174. Out of Syllabus

175. Option (4) is correct.

Explanation: Bacteriophage can be used in introducing DNA into animal and bacterial cell, not plant cell.

Gene Gun, *Agrobacterium* **mediated Transfer** and **Disarmed pathogen** are used as vector for plant cells.

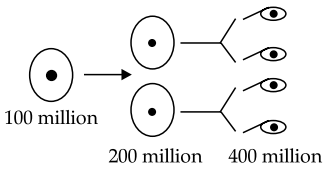
176. Option (2) is correct.

Explanation: Pneumotaxic centre present in the pons region of brain controls the respiratory rhythm centre. Single from this centre can control the duration of inspiration and expiration thus control and alter respiratory rate.

177. Option (3) is correct.

Explanation: Spermatogenes is the formation of spermatozoa in males. Each secondary spermatocyte undergo Meiosis II and form two spermatids.

→ Thus 200 million spermatocytes are required to produce 400 million spermatozoa.



178. Option (2) is correct.

Explanation: Skeletal muscle fibres are multinucleated and bundled in a parallel manner.

Communication junction (Gap junction) in the intercalated disc of cardiac muscles allow the cardiac muscle cells to contract as a unit.

Blood vessel lining contains simple squamous epithelium.

179. Option (2) is correct.

Explanation: Because FSH (Follicle Stimulating Hormone) is a fat soluble hormone, it cannot cross the plasma membrane for entering into target cell, but generate secondary messenger (cAMP) which in turn regulate cellular metabolism.

180. Option (3) is correct.

Explanation: 3 chambered heart is present in *Chelone* (Turtle), as Reptiles have 3 chambered heart.

Pteropus is fire fox (a mammal) with 4 chambered heart.

→ *Scoliodon* → 2 chambered Heart.

181. Option (1) is correct.

Explanation: During pregnancy, thyroxine level increases in material blood because metabolic rate in body increases during pregnency. As thyroxine maintain Basal Metabolic rate (BMR) to generate heat.

182. Option (3) is correct.

Explanation: Cyclostomes are jawless thus option with jawed behaviour is not correct.

They normally live in marine water but for spawning they move to fresh water.

→ They are scaleless and contain paired fins.

183. Out of Syllabus

184. Option (1) is correct.

Explanation: Bone protect inner visceral parts and limb bone helps weigh bearing.

→ Adipose tissue store fat.

→ Ligament joins bone to bone and tendons attach muscles to the bones, bone marrow is the site where blood cells are produced not ligament.

185. Option (1) is correct.

Explanation: Bivalent or Tetrad formation is characteristic feature of Synaptonemal complex in **Zygotene** stage of prophase I of **Meiosi I**, during which 4 chromatids can be observed on a single centromere.

Section B

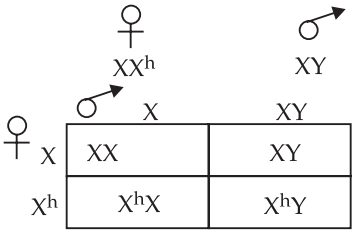
186. Option (3) is correct.

Explanation: Taxonomic keys are specialised taxonomic aid which help in studying taxonomy

and identifying organisms. Each category have different set of keys for its segregation. Each key count aim **couplet** and **lead**.

187. Option (2) is correct.

Explanation: The girl will be carrier (Heterozygous) for Hemophilia while the male have no history of **Haemophilia**. This can be explained with the help of following cross:



188. Option (3) is correct.

Explanation: IUDs suppress the fertilisation capacity of sperm. If also reduces sperm motility. copper releasing IUDs also reduces sperm motility and fertilization capacity. But IUDs increase phagocytosis of sperms. They also make uterus hostile.

189. Option (2) is correct.

Explanation: Agarose gel electrophoresis is the process of separation of DNA fragments based on their size. As DNA is — vely charged, it moves from negative charged electrode to tve charged electrode inside the Gel Agarose gel shows **sieving effect.**

190. Option (4) is correct.

Explanation:

Multipolar neuron	Cerebral cortex, Brain
Bipolar neuron	Retina of eye
Myclinated nerve fibre	Peripheral Nerves e.g., Cranial Nerve
Unmyelinate nerve fibre	Nerve innervations to voluntary muscles.

191. Out of Syllabus

192. Option (3) is correct.

Explanation: The concept of evolution through mutation was given by Hugo de vries.

→ Mutations are sudden aberration/change that arise in the population thus they are discontinuous in nature.

→ Large single step changes are called Saltation which lead to speciation.

193. Option (1) is correct.

Explanation: Number or abundance of blood cells can be arranged in decreasing order as follows:

RBCs > Platelets > Neutrophills > Monocytes > Eosinophills > Platelets

194. Option (2) is correct.

Explanation: The enzyme which catalyse the breakdown of H_2O_2 as :

$$H_2O_2 \longrightarrow H_2O + O_2$$

is called **Catalase** which have prosthetic group **Haem**. This enzyme is activated by iron. The breakdown occurs inside peroxisome during photorespiration.

195. Option (4) is correct.

Explanation: 5' UAC 3' code on mRNA can be complemented by 5' GUA 3' on anticodon loop of tRNA.

Codon anticodon pairing between mRNA and rRNA is the key of translation process.

196. Option (4) is correct.

Explanation: ADH (Antidiuretic Hormone) called **Vasopressin**. Which is a Vasoconstrictor.

Vasopressin is released from **Posterior Pituitary** not Adenohypophysis.

197. Option (3) is correct.

Explanation: Chromosome with 4 sister chromatids are not present during **Metaphase.**

Metaphasic chromosome consist of 2 chromatids attached together by a centromere. This is the thickest and shortest chromosome with prominent structure.

198. Option (3) is correct.

Explanation: Inbreeding always increases homozygosity thus leads to loss of superior characters.

In breeding can be synonymously used as continuous selling through which purelines can be generated for stability of characters.

199. Option (4) is correct.

Explanation:

Skin and mucous membrane	— Physical barriers
HCl is gastric juice	— Physiological barrier
Phagocytic cells	— Cellular barrier
Interferons	— Cytokine barriers.

200. Option (2) is correct.

Explanation:

A → 30% = T → 30%

C → 20% = G → 20%

According to chargaff's rule, Adenine (A) pairs with Thymine (T) and Cytosine (C) pairs with Guanine (G). So, The ds DNA have equal percentage of A and T or G and C.

❑❑❑

SOLVED PAPER	NEET (UG) 17th July 2022	Code Q3

Important Instructions :

1. *The test is of **3 hours 20 minutes** duration and Test Booklet contains **200** multiple choice questions (four options with a single correct answer) from **Physics, Chemistry and Biology (Botany and Zoology)**. **50** Questions in each subject are divided into two **Section (A and B)** as per details given below:*
   - ***(a) Section A** shall consist of **35 (Thirty-five)** Questions in each subject (Question Nos- 1 to 35, 51 to 85, 101 to 135 and 151 to 185). All questions are compulsory.*
   - ***(b) Section B** shall consist of **15 (Fifteen)** Questions in each subject (Question Nos- 36 to 50, 86 to 100, 136 to 150 and 80 to 200). In Section B, a candidate needs to **attempt any 10 (Ten)** questions out of **15 (Fifteen)** in each subject.*

   Candidates are advised to read all 15 questions in each subject of Section B** before they start attempting the question paper. In the event of a candidate attempting more than ten questions, **the first ten questions answered by the candidate shall be evaluated.
2. *Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, one mark will be deducted from the total scores. **The maximum marks are 720.***
3. *Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses on Answer Sheet.*
4. *Use of Electronic/Manual Calculator is prohibited.*
5. ***No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.***
6. *The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.*
7. *Compensatory time of one hour five minutes will be provided for the examination of three hours and 20 minutes duration, whether such candidate (having a physical limitation to write) uses the facility of scribe or not.*

PHYSICS

Section—A

1. An electric lift with a maximum load of 2000 kg (lift + passengers) is moving up with a constant speed of 1.5 ms^{-1} The frictional force opposing the motion is 3000 N. The maximum power delivered by the motor to the lift in watts is : (g = 10 ms^{-2})

(1) 23000 **(2)** 20000

(3) 34500 **(4)** 23500

2. Two hollow conducting spheres of radii R_1 and R_2 ($R_1 >> R_2$) have equal charges. The potential would be :

(1) more on bigger sphere

(2) more on smaller sphere

(3) equal on both the spheres

(4) dependent on the material property of the sphere

3. A shell of mass m is at rest initially. It explodes into three fragments having mass in the ratio 2 : 2 : 1. If the fragments having equal mass fly off along mutually perpendicular directions with speed v, the speed of the third (lighter) fragment is :

(1) v **(2)** $2\sqrt{2}\,v$

(3) $2\sqrt{2}\,v$ **(4)** $3\sqrt{2}\,v$

4. As the temperature increases, the electrical resistance :

(1) increases for both conductors and semiconductors

(2) decreases for both conductors and semiconductors

(3) increases for conductors but decreases for semiconductors

(4) decreases for conductors but increases for semiconductors

5. A long solenoid of radius 1 mm has 100 turns per mm. If 1 A current flows in the solenoid, the magnetic field strength at the centre of the solenoid is :

(1) 6.28×10^{-2} T **(2)** 12.56×10^{-2} T

(3) 12.56×10^{-4} T **(4)** 6.28×10^{-4} T

6. If the initial tension on a stretched string is doubled, then the ratio of the initial and final speeds of a transverse wave along the string is :

(1) 1 : 1 **(2)** $\sqrt{2} : 1$

(3) $1 : \sqrt{2}$ **(4)** 1 : 2

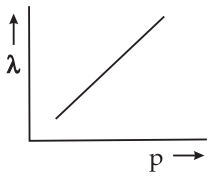
7. Two objects of mass 10 kg and 20 kg respectively are connected to the two ends of a rigid rod of length 10 m with negligible mass. The distance of the center of mass of the system from the 10 kg mass is :

(1) $\frac{10}{3}$m **(2)** $\frac{20}{3}$ m

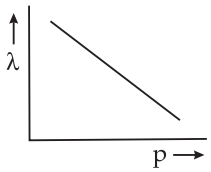
(3) 10 m **(4)** 5 m

8. The graph which shows the variation of the de Broglie wavelength (λ) of a particle and its associated momentum

(1)



(2)



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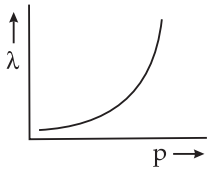
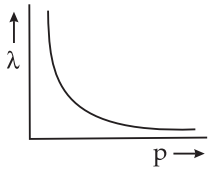
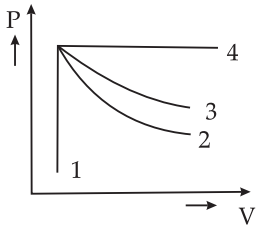


(4)



9. An ideal gas undergoes four different processes from the same initial state as shown in the figure below. Those processes are adiabatic, isothermal, isobaric and isochoric. The curve which represents the adiabatic process among 1, 2, 3 and 4 is :



(1) 1 **(2)** 2

(3) 3 **(4)** 4

10. Plane angle and solid angle have :

(1) Units but no dimensions

(2) Dimensions but no units

(3) No units and no dimensions

(4) Both units and dimensions

11. The angle between the electric lines of force and the equipotential surface is :

(1) 0° **(2)** 45°

(3) 90° **(4)** 180°

12. A copper wire of length 10 m and radius $(10^{-2} / \sqrt{\pi})$ m has electrical resistance of 10 Ω. The current density in the wire for an electric field strength of 10 (V/m) is :

(1) 10^4 A/m^2 **(2)** 10^6 A/m^2

(3) 10^{-5} A/m^2 **(4)** 10^5 A/m^2

13. In the given nuclear reaction, the element X is :

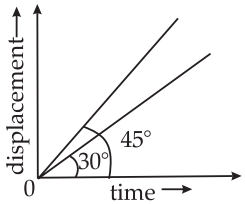
Out of Syllabus

$^{23}_{11}\text{Na} \rightarrow \text{X} + e^+ + \nu$

(1) $^{23}_{11}$Na **(2)** $^{23}_{10}$Ne

(3) $^{22}_{10}$Ne **(4)** $^{22}_{12}$Mg

14. The displacement-time graphs of two moving particles make angles of 30° and 45° with the *x*-axis as shown in the figure. The ratio of their respective velocity is :



(1) $\sqrt{3} : 1$ **(2)** 1 : 1

(3) 1 : 2 **(4)** $1 : \sqrt{3}$

15. In half wave rectification, if the input frequency is 60 Hz, then the output frequency would be :

(1) zero **(2)** 30 Hz

(3) 60 Hz **(4)** 120 Hz

16. The ratio of the radius of gyration of a thin uniform disc about an axis passing through its centre and normal to its plane to the radius of gyration of the disc about its diameter is :

(1) 2 : 1 **(2)** $\sqrt{2}$: 1

(3) 4 : 1 **(4)** 1 : $\sqrt{2}$

17. When two monochromatic lights of frequency, ν and $\frac{\nu}{2}$ are incident on a photoelectric metal, their stopping potential becomes $\frac{V_s}{2}$ and V_s respectively. The threshold frequency for this metal is :

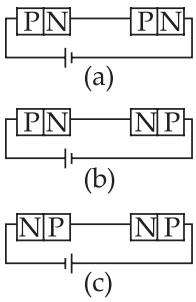
(1) 2ν **(2)** 3ν

(3) $\frac{2}{3}\nu$ (4) $\frac{3}{2}\nu$

18. The dimensions $[MLT^{-2}A^{-2}]$ belong to the :

(1) magnetic flux
(2) self inductance
(3) magnetic permeability
(4) electric permittivity

19.



In the given circuits (a), (b) and (c), the potential drop across the two *p-n* junctions are equal in :

(1) Circuit (a) only
(2) Circuit (b) only
(3) Circuit (c) only
(4) Both circuits (a) and (c)

20. The energy that will be ideally radiated by a 100 kW transmitter in 1 hour is :

(1) 36×10^7 J **(2)** 36×10^4 J

(3) 36×10^5 J **(4)** 1×10^5 J

21. In a Young's double slit experiment, a student observes 8 fringes in a certain segment of screen when a monochromatic light of 600 nm wavelength is used. If the wavelength of light is changed to 400 nm, then the number of fringes he would observe in the same-region of the screen is :

(1) 6 **(2)** 8

(3) 9 **(4)** 12

22. The peak voltage of the ac source is equal to:

(1) the value of voltage supplied to the circuit
(2) the rms value of the ac source
(3) $\sqrt{2}$ times the rms value of the ac source
(4) $1/\sqrt{2}$ times the rms value of the ac source

23. If a soap bubble expands, the pressure inside the bubble :

(1) decreases
(2) increases
(3) remains the same
(4) is equal to the atmospheric pressure

24. A biconvex lens has radii of curvature, 20 cm each. If the refractive index of the material of the lens is 1.5, the power of the lens is :

(1) + 2 D **(2)** + 20 D

(3) + 5 D **(4)** infinity

25. The ratio of the distances travelled by a freely falling body in the 1st, 2nd, 3rd and 4th second:

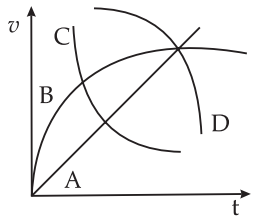
(1) 1 : 2 : 3 : 4
(2) 1 : 4 : 9 : 16
(3) 1 : 3 : 5 : 7
(4) 1 : 1 : 1 : 1

26. The angular speed of a fly wheel moving with uniform angular acceleration changes from 1200 rpm to 3120 rpm in 16 seconds. The angular acceleration in rad/s^2 is :

(1) 2 π **(2)** 4 π

(3) 12 π **(4)** 104 π

27. A spherical ball is dropped in a long column of a highly viscous liquid. The curve in the graph shown, which represents the speed of the ball (v) as a function of time (t) is :



(1) A **(2)** B

(3) C **(4)** D

28. Let T_1 and T_2 be the energy of an electron in the first and second excited states of hydrogen atom, respectively. According to the Bohr's model of an atom, the ratio $T_1 : T_2$ is :

(1) 1 : 4 **(2)** 4 : 1

(3) 4 : 9 **(4)** 9 : 4

29. A square loop of side 1 m and resistance 1 Ω is placed in a magnetic field of 0.5 T. If the plane of loop is perpendicular to the direction of magnetic field, the magnetic flux through the loop is :

(1) 2 weber **(2)** 0.5 weber

(3) 1 weber **(4)** zero weber

30. Two resistors of resistance, 100 Ω and 200 Ω are connected in parallel in an electrical circuit. The ratio of the thermal energy developed in 100 Ω to that in 200 Ω in a given time is :

(1) 1 : 2 **(2)** 2 : 1

(3) 1 : 4 **(4)** 4 : 1

31. Given below are two statements :

Statement I :

Biot-Savart's law gives us the expression for the magnetic field strength of an infinitesimal current element (*Idl*) of a current carrying conductor only.

Statement II :

Biot-Savart's law is analogous to Coulomb's inverse square law of charge q, with the former being related to the field produced by a scalar source. Idl while the latter being produced by a vector source, q.

In light of above statements choose the most appropriate answer from the options given below :

(1) Both Statement I and Statement II are correct

(2) Both Statement I and Statement II are incorrect

(3) Statement I is correct and Statement II is incorrect

(4) Statement I is incorrect and Statement II is correct

32. Match List-I with List-II :

List-I (Electromagnetic Waves)		List-II (Wavelength)	
(1)	AM radio waves	**(i)**	10^{-10} m
(2)	Microwaves	**(ii)**	10^{2} m
(3)	Infrared radiations	**(iii)**	10^{-2} m
(4)	X-rays	**(iv)**	10^{-4} m

(1) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

(2) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)

(3) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

(4) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

33. A light ray falls on a glass surface of refractive index $\sqrt{3}$, at an angle 60°. The angle between the refracted and reflected rays would be :

(1) 30° **(2)** 60°

(3) 90° **(4)** 120º

34. When light propagates through a material medium of relative permittivity ε_r and relative permeability μ_r, the velocity of light, v is given : (c-velocity of light in vacuum) :

(1) $v = c$ **(2)** $v = \sqrt{\dfrac{\mu_r}{\varepsilon_r}}$

(3) $v = \sqrt{\dfrac{\varepsilon_r}{\mu_r}}$ **(4)** $v = \dfrac{c}{\sqrt{\varepsilon_r \mu_r}}$

35. A body of mass 60 g experiences a gravitational force of 3.0 N, when placed at a particular point. The magnitude of the gravitational field intensity at that point is :

(1) 0.05 N/kg **(2)** 50 N/kg

(3) 20 N/kg **(4)** 180 N/kg

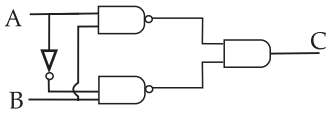
Section—B

36. Two pendulums of length 121 cm and 100 cm start vibrating in phase. At some instant, the two are at their mean position in the same phase. The minimum number of vibrations of the shorter pendulum after which the two are again in phase at the mean position is :

(1) 11 **(2)** 9

(3) 10 **(4)** 8

37.



The truth table for the given logic circuit is :

(1)

A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

(2)

A	B	C
0	0	1
0	1	0
1	0	0
1	1	1

(3)

A	B	C
0	0	1
0	1	0
1	0	1
1	1	0

(4)

A	B	C
0	0	0
0	1	1
1	0	0
1	1	1

38. A series LCR circuit with inductance 10 H, capacitance 10 μF, resistance 50 Ω is connected to an ac source of voltage, V = 200 sin (100t) volt. If the resonant frequency of the LCR circuit is ν_o and the frequency of the ac source is ν, then:

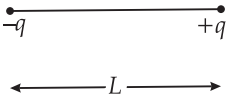
(1) $\nu_o = \nu = 50$ Hz

(2) $\nu_o = \nu = \dfrac{50}{\pi}$ Hz

(3) $\nu_o = \dfrac{50}{\pi}$ Hz, $\nu = 50$ Hz

(4) $\nu = 100$ Hz, $\nu_o = \dfrac{100}{\pi}$ Hz

39. Two points charges – q and + q are placed at a distance of L, as shown in the figure :

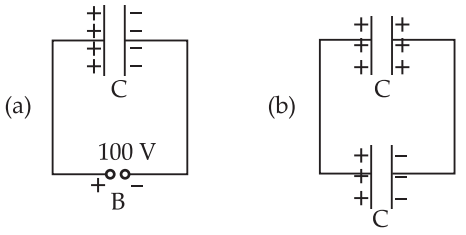


The magnitude of electric field intensity at a distance R ($R >> L$) varies as :

(1) $\frac{1}{R^2}$ **(2)** $\frac{1}{R^3}$

(3) $\frac{1}{R^4}$ **(4)** $\frac{1}{R^6}$

40. A capacitor of capacitance C = 900 pF is charge fully by 100 V battery B as shown in figure (a). Then it is disconnected from the battery and connected to another uncharged capacitor of capacitance C = 900 pF as shown in figure (b). The electrostatic energy stored by the system (b) is:



(1) 4.5×10^{-6} J **(2)** 3.25×10^{-6} J

(3) 2.25×10^{-6} J **(4)** 1.5×10^{-6} J

41. Given below are two statements : One is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A) : The stretching of a spring is determined by the shear modulus of the material of the spring.

Reason (R) : A coil spring of copper has more tensile strength than a steel spring of same dimensions.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

42. The transparent media A and B are separated by a plane boundary. The speed of light in those media are 1.5×10^8 m/s and 2.0×10^8 m/s, respectively. The critical angle for a ray of light for these two media is :

(1) $\sin^{-1}(0.500)$ **(2)** $\sin^{-1}(0.750)$

(3) $\tan^{-1}(0.500)$ **(4)** $\tan^{-1}(0.750)$

43. The volume occupied by the molecules contained in 4.5 kg water at STP, if the intermolecular forces vanish away is :

(1) 5.6×10^6 m^3 **(2)** 5.6×10^3 m^3

(3) 5.6×10^{-3} m^3 **(4)** 5.6 m^3

44. A nucleus of mass number of 189 splits into two nuclei having mass number 125 and 64. The ratio of radius of two daughter nuclei respectively is :

(1) 1 : 1 **(2)** 4 : 5

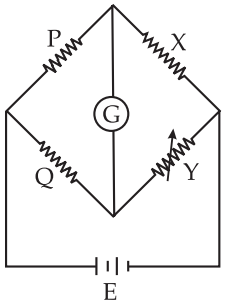
(3) 5 : 4 **(4)** 25 : 16

45. The area of a rectangular field (in m^2) of length 55.3 m and breadth 25 m after rounding off the value for correct significant digits is :

(1) 138×10^1 **(2)** 1382

(3) 1382.5 **(4)** 14×10^2

46. A wheatstone bridge is used to determine the value of unknown resistance X by adjusting the variable resistance Y as shown in the figure. For the most precise measurement of X, the resistances P and Q :



(1) should be approximately equal to 2X

(2) should be approximately equal and are small

(3) should be very large and unequal

(4) do not play any significant role

47. A ball is projected with a velocity, 10 ms^{-1}, at an angle of 60° with the vertical direction. Its speed at the highest point of its trajectory will be :

(1) Zero **(2)** $5\sqrt{3}$ ms^{-1}

(3) 5 ms^{-1} **(4)** 10 ms^{-1}

48. Match List-I with List-II :

List-I		List-II	
(1)	Gravitation constant (G)	**(i)**	$[L^2T^{-2}]$
(2)	Gravitational potential energy	**(ii)**	$[M^{-1}L^3T^{-2}]$
(3)	Gravitational potential	**(iii)**	$[LT^{-2}]$
(4)	Gravitational intensity	**(iv)**	$[ML^2T^{-2}]$

Choose the correct answer from the options given below :

(1) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

(2) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

(3) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

(4) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)

49. From Ampere's circuital law for a long straight wire of circular cross-section carrying a steady current, the variation of magnetic field in the inside and outside region of the wire is :

(1) uniform and remains constant for both the regions

(2) a linearly increasing function of distance upto the boundary of the wire and then linearly decreasing for the outside region

(3) a linearly increasing function of distance r upto the boundary of the wire and then decreasing one with $1/r$ dependence for the outside region.

(4) a linearly decreasing function of distance upto the boundary of the wire and then a linearly increasing one for the outside region

50. A big circular coil of 1000 turns and average radius 10 m is rotating about its horizontal diameter at 2 rad s^{-1}. If the vertical component of earth's magnetic field at that place is 2×10^{-5} T and electrical resistance of the coil is 12.56 Ω, then the maximum induced current in the coil will be :

(1) 0.25 A **(2)** 1.5 A

(3) 1 A **(4)** 2 A

❐❐❐

CHEMISTRY

Section A

51. Choose the correct statement :

(1) Diamond and graphite have two dimensional network.

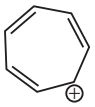
(2) Diamond is covalent and graphite is ionic.

(3) Diamond is sp^3 hybridized and graphite is sp^2 hybridized.

(4) Both diamond and graphite are used as dry lubricants.

52. Which compound amongst the following is not an aromatic compound?

(1) 

(2) 

(3) 

(4) 

53. In one molal solution that contains 0.5 mole of a solute, there is

(1) 500 mL of solvent

(2) 500 g of solvent

(3) 100 mL of solvent

(4) 1000 g of solvent

54. The IUPAC name of an element with atomic number 119 is :

(1) ununennium

(2) unnilennium

(3) unununnium

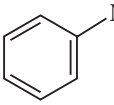
(4) ununoctium

55. Which of the following is suitable to synthesize chlorobenzene ?

(1) Benzene, Cl_2, anhydrous $FeCl_3$

(2) Phenol, $NaNO_2$, HC, CuCl

(3)  , HCl

(4)  , HCl, Heating

56. Given below are two statements :

Statements I :

Primary aliphatic amines react with HNO_2 to give unstable diazonium salts.

Statements II :

Primary aromatic amines react with HNO_2 to form diazonium salts which are stable even above 300 K.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

(1) Both **Statement I** and **Statement II** are correct

(2) Both **Statement I** and **Statement II** are incorrect

(3) **Statement I** is correct but **Statement II** is incorrect

(4) **Statement I** is incorrect but **Statement II** is correct

57. Gadolinium has a low value of third ionization enthalpy because of

(1) small size

(2) high exchange enthalpy

(3) high electronegativity

(4) high basic character.

58. Identify the **incorrect** statement from the following :

(1) All the five 5d orbitals are different in size when compared to the respective 4d orbitals.

(2) All the five 4d orbitals have shapes similar to the respective 3d orbitals.

(3) In an atom, all the five 3d orbitals are equal in energy in free state.

(4) The shapes of $d_{yx,}$ $d_{yz,}$ and d_{zx} orbitals are similar to each other; and $d_{x^2-y^2}$ and d_{z^2} are similar to each other.

59. Given below are two statements :

Statements I :

The acidic strength of monosubstituted nitro-phenol is higher than phenol because of electron withdrawing nitro group.

Statement II :

o-nitrophenol, m-nitrophenol and p-nitro-phenol will have same acidic strength as they have one nitro group attached to the phenolic ring.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **Statement I** and **Statement II** are correct.

(2) Both **Statement I** and **Statement II** are incorrect.

(3) **Statement I** is correct but **Statement II** is incorrect.

(4) **Statement** I is incorrect but **Statement II** is correct.

60. At 298 K, the standard electrode potentials of Cu^{2+}/Cu, Zn^{2+}/Zn, Fe^{2+}/Fe and Ag^{+}/Ag are 0.34 V, – 0.76 V, – 0.44 V and 0.80 V, respectively.

On the basis of standard electrode potential, predict which of the following reaction can not occur ?

(1) $CuSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Cu(s)$

(2) $CuSO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + Cu(s)$

(3) $FeSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Fe(s)$

(4) $2CuSO_4(aq) + 2Ag(s) \rightarrow 2Cu(s) + Ag_2SO_4(aq)$

61. Given below are two statements : Out of Syllabus

Statement I :

In the coagulation of a negative sol, the flocculating power of the three given ions is in the order :

$Al^{3+} > Ba^{2+} > Na^{+}$

Statement II :

In the coagulation of a positive sol, the flocculating power of the three given salts is in the order :

$NaCl > Na_2SO_4 > Na_3PO_4$

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **Statement I** and **Statement II** are correct

(2) Both **Statement I** and **Statement II** are incorrect

(3) **Statement I** is correct but **Statement II** is incorrect

(4) **Statement I** is incorrect but **Statement II** is correct.

62. Which statement regarding polymers is not correct ? Out of Syllabus

(1) Elastomers have polymer chains held together by weak intermolecular forces.

(2) Fibers possess high tensile strength.

(3) Thermoplastic polymers are capable of repeatedly softening and hardening on heating and cooling respectively.

(4) Thermosetting polymers are reusable.

63. Match List-I with List-II :

List-I (Products formed)		List-II (Reaction of carbonyl compound with)	
(a)	Cyanohydrin	(i)	NH_2OH
(b)	Acetal	(ii)	RNH_2
(c)	Schiff's base	(iii)	alcohol
(d)	Oxime	(iv)	HCN

Choose the correct answer from the options given below :

(1) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

(2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

(3) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)

(4) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

64. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R).** Out of Syllabus

Assertion (A) :

In a particular point defect, an ionic solid is electrically neutral, even if few of its cations are missing from its units cells.

Reason (R) :

In an ionic solid, Frenkel defect arises due to dislocation of cation from its lattice site to interstitial site, maintaining overall electrical neutrality.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(3) (A) is correct but (R) is not correct

(4) (A) is not correct but (R) is correct

65. Which one is **not** correct mathematical equation for Dalton's Law of partial pressure ? Out of Syllabus

Here p = total pressure of gaseous mixture:

(1) $p = p_1 + p_2 + p_3$

(2) $p = n_1\frac{RT}{V} + n_2\frac{RT}{V} + n_3\frac{RT}{V}$

(3) $p_i = x_i p_i$ where p_i = partial pressure of i^{th} gas

x_i = mole fraction of i^{th} gas in gaseous mixture

(4) $p_i = x_i p_i^o$, where x_i = mole fraction of i^{th} gas in gaseous mixture

p_i^o = pressure of i^{th} gas in pure state

66. Given below are two statements :

Statements I :

The boiling points of aldehydes and ketones are higher than hydrocarbons of comparable molecular masses because of weak molecular association in aldehydes and ketones due to dipole-dipole interactions.

Statements II :

The boiling points of aldehydes and ketones are lower than the alcohols of similar molecular masses due to the absence of H-bonding.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **Statement I** and **Statement II** are correct

(2) Both **Statement I** and **Statement II** are incorrect

(3) **Statement I** is correct but **Statement II** is incorrect

(4) **Statement I** is incorrect but **Statement II** is correct

67. $RMgX + CO_2 \xrightarrow[ether]{dry} Y \xrightarrow{H_3O^+} RCOOH$

What is Y in the above reaction ?

(1) $RCOO^-Mg^+X$

(2) $R_3CO^-Mg^+X$

(3) $RCOO^-X^+$

(4) $(RCOO)_2Mg$

68. The incorrect statement regarding enzymes is : Out of Syllabus

(1) Enzymes are bio-catalysts.

(2) Like chemical catalysts enzymes reduce the activation energy of bio-processes.

(3) Enzymes are polysaccharides.

(4) Enzymes are very specific for a particular reaction and substrate.

69. Given below are two statements :

Statements I : The boiling points of the following hydrides of group 16 elements increases in the order:

$H_2O < H_2S < H_2Se < H_2Te$

Statements II : The boiling points of these hydrides increase with increase in molar mass.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **Statement I** and **Statement II** are incorrect

(2) Both **Statement I** and **Statement II** are incorrect

(3) **Statement I** is correct but **Statement II** is incorrect

(4) **Statement I** is incorrect but **Statement II** is correct

70. Match **List-I** with **List-II**

List-I (Hydrides)		List-II (Nature)	
(a)	MgH_2	**(i)**	Electron precise
(b)	GeH_4	**(ii)**	Electron deficient
(c)	B_2H_6	**(iii)**	Electron rich
(d)	HF	**(iv)**	Ionic

Choose the **correct answer** from the options below :

(1) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

(2) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)

(3) (a)-(i), (b)-(ii), (c)-(iv), (d)-(iii)

(4) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

71. Match **List-I** with **List-II** : Out of Syllabus

List-I (Drug class)		List-II (Drug molecule)	
(a)	Antacids	**(i)**	Salvarsan
(b)	Antihistamines	**(ii)**	Morphine
(c)	Analgesics	**(iii)**	Cimetidine
(d)	Antimicrobials	**(iv)**	Seldane

Choose the **correct answer** from the options given below :

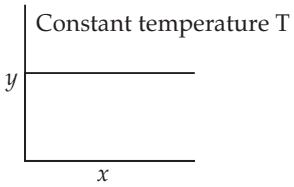
(1) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

(2) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

(3) (a)-(i), (b)-(iv), (c)-(ii), (d)-(iii)

(4) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

72. The given graph is representation of kinetics of a reaction :



The y and x axes for zero and first order reactions, respectively are

(1) zero order (y = concentration and x = time), first order ($y = t_{1/2}$ and x = concentration)

(2) zero order (y concentration and x = time), first order (y = rate constant and x = concentration)

(3) zero order (y = rate and x = concentration), first order ($y = t_{1/2}$ and x = concentration)

(4) zero order (y = rate and concentration), first order (y = rate and $x = t_{1/2}$)

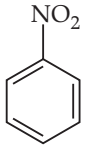
73. The pH of the solution containing 50 mL each of 0.10 M sodium acetate and 0.01 M acetic acid is

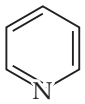
[Given pK_a of CH_3COOH = 4.57]

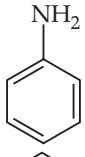
(1) 5.57 **(2)** 3.57

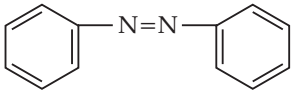
(3) 4.57 **(4)** 2.57

74. The Kjeldahl's method for the estimation of nitrogen can be used to estimate the amount of nitrogen in which one of the following compounds ?

(1) 

(2) 

(3) 

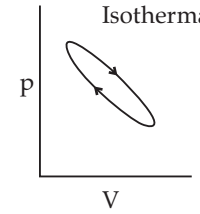
(4) 

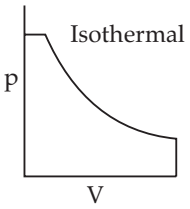
75. Amongst the following which one will have maximum 'lone pair-lone pair' electron repulsions ?

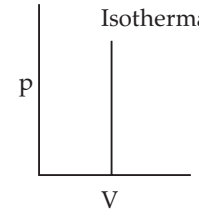
(1) ClF_3 **(2)** IF_5

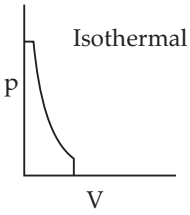
(3) SF_4 **(4)** XeF_2

76. Which of the following p-V curve represents maximum work done ?

(1) 

(2) 

(3) 

(4) 

77. What mass of 95% pure $CaCO_3$ will be required to neutralise 50 mL of 0.5 M HCl solution according to the following reaction?

$CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2(g)} + 2H_2O_{(l)}$

[Calculate upto second place of decimal point]

(1) 1.25 g **(2)** 1.32 g

(3) 3.65 g **(4)** 9.50 g

78. Given below are half cell reactions :

$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$, $E^\circ_{Mn^{2+}/MnO_4^-} = -1.510$ V

$\frac{1}{2}O_2 + 2H^+ + 2e^- \rightarrow H_2O$,

$E^\circ_{O_2/H_2O} = +1.223$ V

Will the permanganate ion, MnO_4^- liberate O_2 from water in the presence of an acid ?

(1) Yes, because $E^\circ_{cell} = +0.287$ V

(2) No, because $E^\circ_{cell} = -0.287$ V

(3) Yes, because $E^\circ_{cell} = +2.733$ V

(4) No, because $E^\circ_{cell} = -2.733$ V

79. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A) I-Cl is more reactive than I_2.

Reason (R) : I-Cl bond is weaker than I-I bond.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Both (A) and (R) are correct and (R) is not the correct explanation of (A).

(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).

(3) (A) is correct but (R) is not correct.

(4) (A) is not correct but (R) is correct.

80. Which amongst the following is incorrect statement ?

(1) The bond orders of O_2^+, O_2, O_2^- and O_2^{2-} are 2.5, 2, 1.5 and 1, respectively.

(2) C_2 molecules has four electrons in its two degenerate π molecular orbitals.

(3) H_2^+ ion has one electron.

(4) O_2^+ ion is diamagnetic.

81. The **incorrect** statement regarding chirality is :

(1) S_N1 reaction yields 1 : 1 mixture of both enantiomers.

(2) The product obtained by S_N2 reaction of haloalkane having chirality at the reactive site shows inversion of configuration.

(3) Enantiomers are superimposable mirror images on each other.

(4) A racemic mixture shows zero optical rotation.

82. Identify the **incorrect** statement from the following :

(1) Alkali metals react with water to form their hydroxides.

(2) The oxidation number of K in KO_2 is +4.

(3) Ionisation enthalpy of alkali metals decreases from top to bottom in the group.

(4) Lithium is the strongest reducing agent among the alkali metals.

83. Which of the following statement is not correct about diborane ?

(1) There are two 3-centre-2-electron bonds.

(2) The four terminal B-H bonds are two centre two electron bonds.

(3) The four terminal Hydrogen atoms and the two Boron atoms lie in one plane.

(4) Both the Boron atoms are sp^2 hybridised.

84. Match **List-I** with **List II** Out of Syllabus

List-I		List-II	
(a)	Li	**(i)**	absorbent for carbon dioxide
(b)	Na	**(ii)**	electrochemical cells
(c)	KOH	**(iii)**	coolant in fast breeder reactors
(d)	Cs	**(iv)**	photoelectric cell

Choose the correct answer from the options given below :

(1) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)

(2) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

(3) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

(4) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)

85. The IUPAC name of the complex :

$[Ag(H_2O)_2][Ag(CN)_2]$ is :

(1) dicyanidosilver (II), diaquaargentate (II)

(2) diaquasilver(II) dicyanidoargentate(II)

(3) dicyanidolosilver(I) diaquaargentate (I)

(4) diaquasilver(I) discyanidoargentate (I)

Section B

86. $3O_2(g) \rightleftharpoons 2O_3(g)$

for the above reaction at 298 K, K_c is found to be 3.0×10^{-59}. If the concentration of O_2 at equilibrium

is 0.040 M then concentration of O_2 at equilibrium is 0.040 M then concentration of O_3 in M is :

(1) 4.38×10^{-32}

(2) 1.9×10^{-63}

(3) 2.4×10^{31}

(4) 1.2×10^{21}

87. Match **List-I** with **List-II**

List-I (Ores)		List-II (Composition)	
(a)	Haematite	**(i)**	Fe_3O_4
(b)	Magnetite	**(ii)**	$ZnCO_3$
(c)	Calamine	**(iii)**	Fe_2O_3
(d)	Kaolinite	**(iv)**	$[Al_2(OH)_4Si_2O_5]$

Choose the **correct answer** from the option given below :

(1) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

(2) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)

(3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

(4) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)

88. Given below are two statement :

Statement I :

In Lucas test, primary, secondary and tertiary alcohols are distinguished on the basis of their reactivity with conc. HCl + $ZnCl_2$, known as Lucas Reagent.

Statement II :

Primary alcohols are most reactive and immediately produce turbidity at room temperature on reaction with Lucas Reagent.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **Statement I** and **Statement II** are correct.

(2) Both **Statement I** and **Statement II** are incorrect

(3) **Statement I** is correct but **Statement II** is incorrect

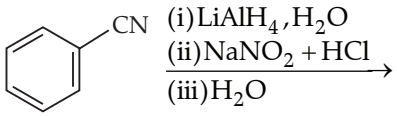
(4) **Statement I** is incorrect but **Statement II** is correct.

89. If radius of second Bohr orbit of the He^+ ion ion is 105.8 pm, what is the radius of third Bohr orbit of Li^{2+} ion ?

(1) 1.587 pm **(2)** 15.87 pm

(3) 1.587 pm **(4)** 158.7 Å

90. The product formed from the following reaction sequence is



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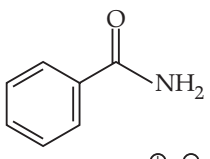
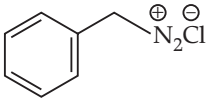
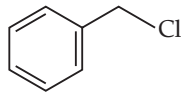
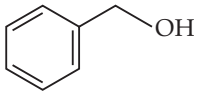
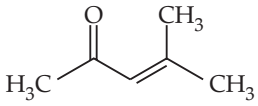


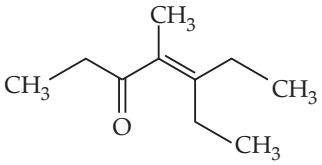
(2)


(3)


(4)


91. Which one of the following is **not** formed when acetone with 2-pentanone in the presence of dilute NaOH followed by heating?

(1)


(2)


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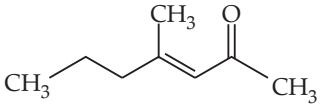
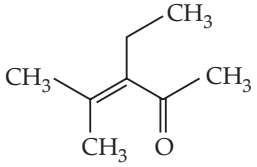


(4)


92. Compound X on reaction with O_3 followed by Zn/H_2O formaldehyde and 2-methyl propanal as products. The compound X is :

(1) 3-Methylbut-1-ene

(2) 2-Methylbut-1-ene

(3) 3-Methylbut-2-ene

(4) Pent-2-ene

93. In the neutral of faintly alkaline medium, $KMnO_4$ oxidizes iodide into iodate. The change in oxidation state of manganese in this reaction is from

(1) + 7 to + 4

(2) + 6 to + 4

(3) + 7 to + 3

(4) + 6 to + 5

94. A 10.0 L flask contains 64 g of oxygen at 27°C. (Assume O_2 gas is behaving ideally). The pressure inside the flask in bar is Out of Syllabus

(Given R = 0.0831 L bar K^{-1} mol^{-1})

(1) 2.5 **(2)** 498.6

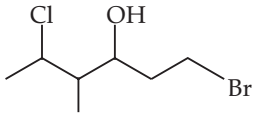
(3) 49.8 **(4)** 4.9

95. For a first order reaction A → Products, initial concentration of A is 0.1 M, which becomes 0.001 M after 5 minutes. Rate constant for the reaction in min^{-1} is :

(1) 1.3818 **(2)** 0.9212

(3) 0.4606 **(4)** 0.2303

96. The correct IUPAC name of the following compound is:



(1) 1-bromo-5-chloro-4-methylhexan-3-ol
(2) 6-bromo-2-chloro-4-methylhexan-4-ol
(3) 1-bromo-4-methyl-5-chlorohexan-3-ol
(4) 6-bromo-4-methyl-2-chlorohexan-4-ol

97. Find the emf of the cell in which the following reaction takes place at 298 K

$Ni(s) + 2Ag^+ (0.001\ M) \rightarrow Ni^{2+} (0.001) + 2\ Ag(s)$

(Given that $E^\circ_{cell} = 10.5\ V$, $\frac{2.303\,RT}{F} = 0.059$ at 298 K)

(1) 1.0385 V
(2) 1.385 V
(3) 0.9615 V
(4) 1.05 V

98. The order of energy absorbed which is responsible for the color of complexes

(A) $[Ni(H_2O)_2(en)_2]^{2+}$
(B) $[Ni(H_2O)_4(en)]^{2+}$ and
(C) $[Ni(en)_2]^{2+}$
(1) (A) > (B) > (C)
(2) (C) > (B) > (A)
(3) (C) > (A) > (B)
(4) (B) > (A) > (C)

99. Copper crystallizes in *fcc* unit cell with cell edge length of 3.608×10^{-8} cm. The density of copper is 8.92 g cm^{-3}. Calculate the atomic mass of copper: Out of Syllabus

(1) 63.1 u **(2)** 31.55 u
(3) 60 u **(4)** 65 u

100. The pollution due to oxides of sulphur gets enhanced due to the presence of: Out of Syllabus

(a) particulate matter
(b) ozone
(c) hydrocarbons
(d) hydrogen peroxide
(1) (a), (d) only **(2)** (a), (b), (d) only
(3) (b), (c), (d) only **(4)** (a), (c), (d) only

❐❐❐

BOTANY

Section A

101. Which one of the following statements cannot be connected to Predation ?
(1) It helps in maintaining species diversityin a community
(2) It might lead to extinction of a species.
(3) Both the interacting species are negati-vely impacted.
(4) It is necessitated by nature to maintain the ecological balance.

102. Given below are two statements :

Statement I : Decomposition is a process in which the detritus is degraded into simpler substances by microbes.

Statement II : Decomposition is faster if the detritus is rich in lignin and chitin

In the light of the above statements, choose the correct answer from the options given below :
(1) Both **Statement I** and **Statement II** are correct.
(2) Both **Statement I** and **Statement II** are incorrect.
(3) **Statement I** is correct but **Statement II** is incorrect.
(4) **Statement I** is incorrect but **Statement II** is correct.

103. Read the following statements about the vascular bundles : Out of Syllabus

(a) In rots, xylem and phloem in a vascular bundle are arranged in an alternate manner along the different radii.
(b) Conjoint closed vascular bundles do not possess cambium.
(c) In open vascular bundles, cambium is present in between xylem and phloem.
(d) The vascular bundles of dicotyledonous stem possess endarch protoxylem.
(e) In monocotyledonous root, usually there are more than six xylem bundles present.

Choose the **correct answer** from the options given below :
(1) (a), (b) and (d) Only
(2) (b), (c), (d) and (e) Only
(3) (a), (b), (c) and (d) Only
(4) (a), (c), (d) and (e) Only

104. Which of the following is not observed during apoplastic pathway Out of Syllabus

(1) Movement of water occurs through intercellular spaces and wall of the cells.
(2) The movement does not involve crossing of cell membrane.
(3) The movement is aided by cytoplasmic streaming.
(4) Apoplast is continuous and does not provide any barrier to water movement.

105. Exoskeleton of arthropods is composed of :
(1) Cutin **(2)** Cellulose
(3) Chitin **(4)** Glucosamine

106. Read the following statements and choose the set of correct statements :

(a) Euchromatin is loosely packed chromatin

(b) Heterochromatin is transcriptionally active

(c) Histone octamer is wrapped by negatively charged DNA in nucleosome.

(d) Histones are rich in lysine and arginine.

(e) A typical nucleosome contains 400 bp of DNA helix.

Choose the **correct answer** from the options below:

(1) (b), (d), (e) Only **(2)** (a), (c), (d) Only

(3) (b), (e) Only **(4)** (a), (c), (e) Only

107. In odd trees the greater part of secondary xylem is dark brown and resistant to insect attack due to :

Out of Syllabus

(a) secretion of secondary metabolites and their deposition in the lumen of vessels

(b) deposition of organic compounds like tannins and resins in the central layers of stem

(c) deposition of suberin and and aromatic substances in the outer layer of stem

(d) deposition of tannins, gum, resin and aromatic substances in the peripheral layers of stem

(e) presence of parenchyma cells, functionally active xylem elements and essentials oils

Choose the **correct answer** from the options given below :

(1) (a) and (b) Only

(2) (c) and (d) Only

(3) (d) and (e) Only

(4) (b) and (d) Only

108. The flowers are Zygomorphic in :

(a) Mustard **(b)** Gulmohar

(c) *Cassia* **(d)** *Datura*

(e) Chilly

Choose the **correct answer** from the options given below :

(1) (a), (b), and (c) Only

(2) (b), (c) Only

(3) (d), (e) Only

(4) (c), (d), (e) Only

109. Which one of the following statement is **not true** regarding gel electrophoresis technique?

(1) The process of extraction of separated DNA strands from gel is called elution.

(2) The separated DNA fragments are stained by using ethidium bromide.

(3) The presence of chromogenic substrate gives blue coloured DNA bands on the gel.

(4) Bright orange coloured bands of DNA can be observed in the gel when exposed to UV light.

110. Which one of the following plants does not show plasticity ?

(1) Cotton **(2)** Coriander

(3) Buttercup **(4)** Maize

111. Which of the following is **incorrectly** matched?

(1) *Ectocarpus* - Fucoxanthin

(2) *Ulothrix* - Mannitol

(3) *Porphyra* - Floridean Starch

(4) *Volvox* - Starch

112. Identify the **incorrect** statement related to Pollination:

(1) Pollination by water is quite rare in flowering plants

(2) Pollination by wind is more common amongst abiotic pollination

(3) Flowers produce foul odours to attract flies and beetles to get pollinated

(4) Moths and butterflies are the most dominant pollinating agents among insects

113. What is the net gain of ATP when each molecule of glucose is converted to two molecules of pyruvic acid ?

(1) Four **(2)** Six

(3) Two **(4)** Eight

114. Habitat loss and fragmentation, over exploitation, alien species invasion and co-extinction are causes for :

(1) Population explosion

(2) Competition

(3) Biodiversity loss

(4) Natality

115. Which of the following is not true regarding the release of energy during ATP synthesis through chemiosmosis ? It involves :

(1) Breakdown of proton gradient

(2) Breakdown of electron gradient

(3) Movement of protons across the membrane to the stroma

(4) Reduction of NADP to $NADPH_2$ on the stroma side of the membrane

116. Which one of the following never occurs during mitotic cell division ?

(1) Spindle fibres attach to kinetochores of chromosomes

(2) Movement of centrioles towards opposite poles

(3) Pairing of homologous chromosomes

(4) Coiling and condensation of the chromatids

117. The appearance of recombination nodules on homologous chromosomes during meiosis characterizes :

(1) Synaptonemal complex

(2) Bivalent

(3) Sites at which crossing over occurs
(4) Terminalization

118. XO type of sex determination can be found in :
(1) *Drosophila* **(2)** Birds
(3) Grasshoppers **(4)** Monkeys

119. Production of Cucumber has increased manifold in recent years. Application of which of the following phytohormones has resulted in this increased yield as the hormone is known to produce female flowers in the plants :
(1) ABA **(2)** Gibberellin
(3) Ethylene **(4)** Cytokinin

120. Given below are two statements :

Statement I : Mendel studied seven pairs of contrasting traits in pea plants and proposed the Laws of Inheritance

Statement II : Seven characters examined by Mendel in his experiment on pea plants were seed shape and colour, flower colour, pod shape and colour, flower position and stem height

In the light of the above statements, choose the **correct answer** from the options given below :
(1) Both **Statement I** and **Statement II** are correct
(2) Both **Statement I** and **Statement II** are incorrect
(3) **Statement I** is correct but **Statement II** is incorrect
(4) **Statement I** is incorrect but **Statement II** is correct

121. What amount of energy is released from glucose during lactic acid fermentation ?
(1) Approximately 15%
(2) More than 18%
(3) About 10%
(4) Less than 7%

122. Identify the **correct set** of statements :
(a) The leaflets are modified into pointed hard thorns in Citrus and *Bougainvillea*
(b) Axillary buds form slender and spirally coiled tendrils in cucumber and pumpkin
(c) Stem is flattened and fleshy in *Opuntia* and modified to perform the function of leaves
(d) *Rhizophora* shows vertically upward growing roots that help to get oxygen for respiration
(e) Subaerially growing stems in grasses and strawberry help in vegetative propagation

Choose the **correct answer** from the options given below :
(1) (b) and (c) Only
(2) (a) and (d) Only
(3) (b), (c) (d) and (e) Only
(4) (a), (b), (d) and (e) Only

123. Hydrocolloid carrageen is obtained from :
(1) Chlorophyceae and Phaeophyceae
(2) Phaeophyceae and Rhodophyceae
(3) Rhodophyceae only
(4) Phaeophyceae only

124. The device which can remove particulate matter present in the exhaust from a thermal power plant is:
Out of Syllabus
(1) STP
(2) Incinerator
(3) Electrostatic Precipitator
(4) Catalytic Convertor

125. Given below are two statements :

Statement I :

Cleistogamous flowers are invariably autogamous

Statement II :

Cleistogamy is disadvantageous as there is no chance for cross pollination

In the light of the above statements, choose the **correct** answer from the options given below:
(1) Both **Statement I** and **Statement II** are correct
(2) Both **Statement I** and **Statement II** are incorrect
(3) **Statement I** is correct but **Statement II** is incorrect
(4) **Statement I** is incorrect but **Statement II** is correct

126. "Girdling Experiment" was performed by Plant Physiologists to identify the plant tissue through which :
(1) water is transported
(2) food is transported
(3) for both water and food transportation
(4) osmosis is observed

127. Which one of the following plants show vexillary aestivation and diadelphous stamens ?
(1) *Colchicum autumnale*
(2) *Pisum sativum*
(3) *Allium cepa*
(4) *Solanum nigrum*

128. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A) : Polymerase chain reaction is used in DNA amplification

Reason (R) : The ampicillin resistant gene is used as a selectable marker to check transformation.

In the light of the above statements, choose the **correct answer** from the options given below :
(1) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
(2) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**

(3) **(A)** is correct but **(R)** is not correct
(4) **(A)** is not correct but **(R)** is correct

129. The gaseous plant growth regulator is used in plants to :
(1) speed up the malting process
(2) promote root growth and root hair formation to increase the absorption surface
(3) help overcome apical dominance
(4) kill dicotyledonous weeds in the fields

130. DNA polymorphism forms the basis of :
(1) Genetic mapping
(2) DNA fingerprinting
(3) Both genetic mapping and DNA finger- printing
(4) Translation

131. Given below are two statements :

Statement I : The primary CO_2 acceptor in C_4 plants is phosphoenolpyruvate and is found in the mesophyll cells

Statement II : Mesophyll cells of C_4 plants lack RuBisCo enzyme. In the light of the above statements, choose the **correct** answer from the options given below :
(1) Both **Statement I** and **Statement II** are correct
(2) Both **Statement I** and **Statement II** are incorrect
(3) **Statement I** is correct but **Statement II** is incorrect
(4) **Statement I** is incorrect but **Statement II** is correct

132. Which one of the following produces nitrogen fixing nodules on the roots of *Alnus* ?
(1) *Rhizobium*
(2) *Frankia*
(3) *Rhodospirillum*
(4) *Beijernickia*

133. Which of the following is not a method of *ex-situ* conservation ?
(1) *Invitro* fertilization
(2) National Parks
(3) Micropropagation
(4) Cryopreservation

134. The process of translation of mRNA to proteins begins as soon as :
(1) The small subunit of ribosome encounters mRNA
(2) The larger subunit of ribosome encounters mRNA
(3) Both the subunits join together to bind with mRNA
(4) The tRNA is activated and the larger subunit of ribosome encounters mRNA

135. Match **List-I** with **List-II**. Out of Syllabus

List-I		List-II	
(a)	Manganese	(i)	Activates the enzyme catalase
(b)	Magnesium	(ii)	Required for pollen germination
(c)	Boron	(iii)	Activates enzymes of respiration
(d)	Iron	(iv)	Functions in splitting of water during photosynthesis

Choose the **correct answer** from the options given below.
(1) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
(2) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
(3) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
(4) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)

Section B

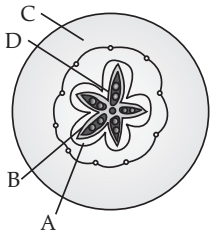
136. The entire fleet of buses in Delhi were converted to CNG from diesel. In reference to this, which one of the following statements is **false** ? Out of Syllabus
(1) CNG burns more efficiently than diesel
(2) The same diesel engine is used in CNG buses making the cost of conversion low
(3) It is cheaper than diesel
(4) It can not be adulterated like diesel

137. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A) : Mendel's law of Independent assortment does not hold good for the genes that are located closely on the same chromosome.

Reason (R) : Closely located genes assort independently. In the light of the above statements, choose the **correct** answer from the options given below:
(1) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
(2) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
(3) **(A)** is correct but **(R)** is not correct
(4) **(A)** is not correct but **(R)** is correct

138. Which part of the fruit, labelled in the given figure makes it a false fruit ?



(1) A → Mesocarp
(2) B → Endocarp
(3) C → Thalamus
(4) D → Seed

139. If a geneticist uses the blind approach for sequencing the whole genome of an organism, followed by assignment of function to different segments, the methodology adopted by him is called as :
(1) Sequence annotation
(2) Gene mapping
(3) Expressed sequence tags
(4) Bioinformatics

140. Which of the following occurs due to the presence of autosome linked dominant trait?
(1) Sickle cell anaemia
(2) Myotonic dystrophy
(3) Haemophilia
(4) Thalessemia

141. While explaining interspecific interaction of population, (+) sign is assigned for beneficial interaction, (–) sign is assigned for detrimental interaction and (0) for neutral interaction. Which of the following interactions can be assigned (+) for one species and (–) for another species involved in the interaction ?
(1) predation **(2)** Amensalism
(3) Commensalism **(4)** Competition

142. What is the role of large bundle sheath cells found around the vascular bundles in C_4 plants ?
(1) To provide the site for photorespiratory pathway
(2) To increase the number of chloroplast for the operation of Calvin cycle
(3) To enable the plant to tolerate high temperature
(4) To protect the vascular tissue from high light intensity

143. Match the plant with the kind of life cycle it exhibits

List-I		List-II	
(a)	*Spirogyra*	(i)	Dominant diploid sporophyte vascular plant, with highly reduced male or female gametophyte
(b)	Fern	(ii)	Dominant haploid free-living gametophyte
(c)	*Funaria*	(iii)	Dominant diploid sporophyte alternating with reduced gametophyte called prothallus
(d)	*Cycas*	(iv)	Dominant haploid leafy gametophyte alternating with partially dependent multicellular sporophyte

Choose the **correct answer** from the options given below.
(1) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
(2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
(3) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
(4) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

144. Read the following statements on lipids and find out **correct** set on statements :
(a) Lecithin found in the plasma membrane is a glycolipid
(b) Saturated fatty acids possess one or more c = c bonds
(c) Gingely oil has lower melting point, hence remains as oil in winter
(d) Lipids are generally insoluble in water but soluble in some organic solvents
(e) when fatty acids is esterified with glycerol, monoglycerides are formed

Choose the **correct answer** from the options given below :
(1) (a), (b) and (c) only
(2) (a), (d) and (e) only
(3) (c), (d) and (e) only
(4) (a), (b) and (d) only

145. Transposons can be used during which one of the following ?
(1) Polymerase Chain Reaction
(2) Gene silencing
(3) Autoradiography
(4) Gene sequencing

146. Match **List-I** with **List-II**.

List-I		List-II	
(a)	Metacentric chromosome	(i)	Centromere situ-ated close to the end forming one extremely short and one very long arms
(b)	Acrocentric chromosome	(ii)	Centromere at the terminal end
(c)	Sub-metacentric	(iii)	Centromere in the middle forming two equal arms of chromosomes
(d)	Telocentric chromosome	(iv)	Centromere slightly away from the middle forming one shorter arm and one longer arm

Choose the **correct answer** from the options given below.
(1) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
(2) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
(3) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
(4) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

147. In the following palindromic base sequences of DNA, which one can be cut easily by particular restriction enzyme ?

(1) 5' G A T A C T 3' ; 3' C T A T G A 5'

(2) 5' G A A T T C 3' ; 3' C T T A A G 5'

(3) 5' C T C A G T 3' ; 3' G A G T C A 5'

(4) 5' G T A T T C 3' ; 3' C A T A A G 5'

148. The anatomy of springwood shows some peculiar features. Identity the **correct** set of statements about springwood : Out of Syllabus

(a) It is also called as the earlywood

(b) In spring season cambium produces xylem elements with narrow vessels

(c) It is lighter in colour

(d) The springwood along with autumn wood shows alternate concentric rings forming annual rings

(e) It has lower density

Choose the correct answer from the options given below :

(1) (a), (b), (d) and (e) Only

(2) (a), (c), (d) and (e) Only

(3) (a), (b) and (d) Only

(4) (c), (d) and (e) Only

149. Which one of the following will accelerate phosphorus cycle ? Out of Syllabus

(1) Burning of fossil fuels

(2) Volcanic activity

(3) Weathering of rocks

(4) Rain fall and storms

150. Addition of more solutes in a given will : Out of Syllabus

(1) raise its water potential

(2) lower its water potential

(3) make its water potential zero

(4) not affect the water potential at all

ZOOLOGY

Section A

151. Breeding crops with higher levels of vitamins and minerals or higher proteins and healthier fats is called :

(1) Bio-magnification

(2) Bio-remediation

(3) Bio-fortification

(4) Bio-accumulation

152. Regarding Meiosis, which of the statements is incorrect?

(1) There are two stages in Meiosis, Meiosis-I and II

(2) DNA replication occurs in S phase of Meiosis-II

(3) Pairing of homologous chromosomes and recombination occurs in Meiosis-II

(4) Four haploid cells are formed at the end of Meiosis-II

153. Given below are two statements :

Statement I : Fatty acids and glycerols cannot be absorbed into the blood.

Statement II : Specialized lymphatic capi-llaries called lacteals carry chylomicrons into lymphatic vessels and ultimately into the blood.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Both **Statement I** and **Statement II** are correct

(2) Both **Statement I** and **Statement II** are incorrect

(3) **Statement I** is correct but **Statement II** is incorrect

(4) **Statement I** is incorrect but **Statement II** is correct

154. At which stage of life the oogenesis process is initiated ?

(1) Puberty

(2) Embryonic development stage

(3) Birth

(4) Adult

155. Detritivores breakdown detritus into smaller particles. This process is called :

(1) Catabolism **(2)** Fragmentation

(3) Humification **(4)** Decomposition

156. if '8' *Drosophila* in a laboratory population of '80' died during a week, the death rate in the population is ..... individuals per *Drosophila* per week.

(1) 0.1 **(2)** 10

(3) 1.0 **(4)** zero

157. In which of the following animals, digestive tract has additional chambers like crop and gizzard ?

(1) *Corvus, Columba, Chameleon*

(2) *Bufo, Balaenoptera, Bangarus*

(3) *Catla, Columba, Crocodilus*

(4) *Pavo, Psittacula, Corvus*

158. Which of the following statements with respect to Endoplasmic Reticulum is incorrect ?

(1) RER has ribosomes attached to ER

(2) SER is devoid of ribosomes

(3) In prokaryotes only RER are present

(4) SER are the sites for lipid synthesis

159. Tegmina in cockroach, arises from : Out of Syllabus

(1) Prothorax

(2) Mesothorax

(3) Metathorax
(4) Prothorax and Mesothorax

160. Which of the following is not the function of conducting part of respiratory system ?
(1) It clears inhaled air from foreign particles
(2) Inhaled air is humidified
(3) Temperature of inhaled air is brought to body temperature
(4) Provides surface for diffusion of O_2 and CO_2

161. Under normal physiological conditions in human being every 100 mL of oxygenated blood can deliver ..... mL of O_2 to the tissues.
(1) 2 mL **(2)** 5 mL
(3) 4 mL **(4)** 10 mL

162. Select the **incorrect statement** with reference to mitosis :
(1) All the chromosomes lie at the equator at metaphase.
(2) Spindle fibres attach to centromere of chromosomes.
(3) Chromosomes decondense at telophase.
(4) Splitting of centromere occurs at anaphase.

163. Which of the following is present between the adjacent bones of the vertebral column?
(1) Intercalated discs **(2)** Cartilage
(3) Areolar tissue **(4)** Smooth muscle

164. If the length of a DNA molecule is 1.1 metres, what will be the approximate number of base pairs ?
(1) 3.3×10^9 bp **(2)** 6.6×10^9 bp
(3) 3.3×10^6 bp **(4)** 6.6×10^6 bp

165. *In-situ* conservation refers to :
(1) Protect and conserve the whole ecosystem
(2) Conserve only high risk species
(3) Conserve only endangered species
(4) Conserve only extinct species

166. Which of the following statements are true for spermatogenesis but do not hold true for Oogenesis?
(a) It results in the formation of haploid gametes
(b) Differentiation of gamete occurs after the completion of meiosis
(c) Meiosis occurs continuously in a mitotically dividing stem cell population
(d) It is controlled by the Luteinising hormone (LH) and Follicle Stimulating Hormone (FSH) secreted by the anterior pituitary
(e) It is initiated at puberty

Choose the most appropriate answer from the options given below.
(1) (c) and (e) only
(2) (b) and (c) only
(3) (b), (d) and (e) only
(4) (b), (c) and (e) only

167. Given below are two statements : One is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A) :

All vertebrates are chordates but all chordates are not vertebrates.

Reason (R) :

Notochord is replaced by vertebral column in the adult vertebrates.

In the light of the above statements, choose the most appropriate answer from the options given below :
(1) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
(2) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
(3) **(A)** is correct but **(R)** is not correct
(4) **(A)** is not correct but **(R)** is correct

168. Given below are two statements :

Statement I : Mycoplasma can pass through less than 1 micron filter size.

Statements II : Mycoplasma are bacteria with cell wall. In the light of the above statements, choose the most appropriate answer from the options give below :
(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct but statement II is incorrect
(4) Statement I is incorrect but Statement II is correct

169. Given below are two statements :

Statement I : Autoimmune disorder is a condition where body defense mechanism recognizes its own cells as foreign bodies.

Statement II : Rheumatoid arthritis is a condition where body does not attack self cells.

In the light of the above statements, choose the most appropriate answer from the options given below :
(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct but Statement II is incorrect
(4) Statement I is incorrect but Statement II is correct

170. In gene therapy of Adenosine Deaminase (ADA) deficiency, the patient requires periodic infusion of genetically engineered lymphocytes because :
(1) Retroviral vector is introduced into these lymphocytes.
(2) Gene isolated from marrow cells producing ADA is introduced into cells at embryonic stages

(3) Lymphocytes from patient's blood are grown in culture, outside the body.

(4) Genetically engineered lymphocytes are not immortal cells.

171. Which of he following is a correct match for disease and its symptoms ?

(1) Arthritis—Inflammed joints

(2) Tetany—high Ca^{2+} level causing rapid spasms.

(3) Myasthenia gravis—Genetic disorder resulting in weakening and paralysis of skeletal muscle.

(4) Muscular dystrophy—An auto immune disorder causing progressive degeneration of skeletal muscle.

172. Given below are two statements :

Statement I :

The release of sperms into the seminiferous tubules is called spermiation.

Statements II :

Spermiogenesis is the process of formation of sperms from spermatogonia.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Both Statement I and Statement II are correct

(2) Both Statement I and Statement II are incorrect

(3) Statement I is correct but statement II is incorrect

(4) Statement I is incorrect but Statement II is correct

173. Nitrogenous waste is excreted in the form of pellet or paste by :

(1) *Ornithorhynchus*

(2) *Salamandra*

(3) *Hippocampus*

(4) *Pavo*

174. Identify the microorganism which is responsible for the production of an immunosuppressive molecule cyclosporin A:

(1) *Trichoderma polysporum*

(2) *Clostridium butylicum*

(3) *Aspergillus niger*

(4) *Streptococcus cerevisiae*

175. Lippe's loop is a type of contraceptive used as :

(1) Cervical barrier

(2) Vault barrier

(3) Non-medicated IUD

(4) Copper releasing IUD

176. A dehydration reaction links two glucose molecules to produce maltose. If the formula for glucose is $C_6H_{12}O_6$ then what is the formula for maltose ?

(1) $C_{12}H_{20}O_{10}$ **(2)** $C_{12}H_{24}O_{12}$

(3) $C_{12}H_{22}O_{11}$ **(4)** $C_{12}H_{24}O_{11}$

177. Which of the following is not a connective tissue ?

(1) Blood **(2)** Adipose tissue

(3) Cartilage **(4)** Neuroglia

178. Which of the following functions is not performed by secretions from salivary glands?

(1) Control bacterial population in mouth

(2) Digestion of complex carbohydrates

(3) Lubrication of oral cavity

(4) Digestion of disaccharides

179. Given below are two statements :

Statement I : Restriction endonucleases recognise specific sequence to cut DNA known as palindromic nucleotide sequence.

Statements II : Restriction endonucleases cut the DNA strand a little away from the centre of the palindromic site.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Both Statement I and Statement II are correct

(2) Both Statement I and Statement II are incorrect

(3) Statement I is correct but Statement II is incorrect

(4) Statement I is incorrect but Statement II is correct

180. Natural selection where more individuals acquire specific character value other than the mean character value, leads to:

(1) Stabilising change

(2) Directional change

(3) Disruptive change

(4) Random change

181. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : Osteoporosis is characterised by decreased bone mass and increased chances of fractures.

Reason (R) : Common cause of Osteoporosis is increased levels of estrogen.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(3) (A) is correct but (R) is not correct

(4) (A) is not correct but (R) is correct

182. In the taxonomic categories which hierarchial arrangement in ascending order is correct in case of animals ?

(1) Kingdom, Phylum, Class, Order, Family, Genus, Species

(2) Kingdom, Class, Phylum, Family, Order, Genus, Species

(3) Kingdom, Order, Class, Phylum, Family, Genus, Species

(4) Kingdom, Order, Phylum, Class, Family, Genus, Species

183. In an *E. coli* strain *i* gene gets mutated and its product can not bind the inducer molecule. If growth medium is provided with lactose, what will be the outcome ?

(1) Only *z* gene will get transcribed

(2) *z*, *y*, a genes will be transcribed

(3) *z*, *y*, a genes will not be translated

(4) RNA polymerase will bind the promoter region

184. Identify the asexual reproductive structure associated with *Penicillium* :

(1) Zoospores **(2)** Conidia

(3) Gemmules **(4)** Buds

185. Given below are two statements :

Statement I :

The coagulum is formed of network of threads called thrombins.

Statement II :

Spleen is the graveyard of erythrocytes.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Both Statement I and Statement II are correct

(2) Both Statement I and Statement II are incorrect

(3) Statement I is correct but Statement II is incorrect

(4) Statement I is incorrect but Statement II is correct

Section B

186. Match List-I with List-II.

List-I (Biological Molecules)		List-II (Biological functions)	
(a)	Glycogen	**(i)**	Hormone
(b)	Globulin	**(ii)**	Biocatalyst
(c)	Steroids	**(iii)**	Antibody
(d)	Thrombin	**(iv)**	Storage product

Choose the correct answer from the options given below :

(1) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

(2) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)

(3) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

(4) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

187. Match List-I with List-II.

List-I		List-II	
(a)	Bronchioles	**(i)**	Dense Regular Connective Tissue
(b)	Goblet cell	**(ii)**	Loose Connective Tissue
(c)	Tendons	**(iii)**	Glandular Tissue
(d)	Adipose Tissue	**(iv)**	Ciliated Epithelium

Choose the correct answer from the options given below :

(1) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

(2) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

(3) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

(4) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

188. Which one of the following statements is correct ?

(1) The atrio-ventricular node (AVN) generates an action potential to stimulate atrial contraction

(2) The tricuspid and the bicuspid valves open due to the pressure exerted by the simultaneous contraction of the atria

(3) Blood moves freely from atrium to the ventricle during joint diastole.

(4) Increased ventricular pressure causes closing of the semilunar valves.

189. Which of the following are not the effect of Parathyroid hormone ?

(a) Stimulates the process of bone resorption

(b) Decreases Ca^{2+} level in blood

(c) Reabsorption of Ca^{2+} by renal tubules

(d) Decreases the absorption of Ca^{2+} from digested food

(e) Increases metabolism of carbohydrates

Choose the most appropriate answer from the options given below :

(1) (a) and (c) only

(2) (b), (d) and (e) only

(3) (a) and (e) only

(4) (b) and (c) only

190. Which of the following is a correct statement?

(1) Cyanobacteria are a group of autotrophic organisms classified under Kingdom Monera.

(2) Bacteria are exclusively heterotrophic organisms.

(3) Slime moulds are saprophytic organisms classified under Kingdom Monera.

(4) Mycoplasma have DNA, Ribosome and cell wall

191. Select the incorrect statement with respect to acquired immunity.

(1) Primary response is produced when our body encounters a pathogen for the first time.

(2) Anamnestic response is elicited on subsequent encounters with the same pathogen.

(3) Anamnestic response is due to memory of first encounter.

(4) Acquired immunity is non-specific type of defence present at the time of birth.

192. Match List-I with List-II with respect to methods of Contraception and their respective actions.

List-I		List-II	
(a)	Diaphragms	**(i)**	Inhibit ovulation and Implantation

(b)	Contraceptive Pills	**(ii)**	Increase phagocytosis of sperm within Uterus
(c)	Intra Uterine Devices	**(iii)**	Absence of Menstrual cycle and ovulation following parturition
(d)	Lactational Amenorrhoea	**(iv)**	They cover the cervix blocking the entry of sperms

Choose the correct answer from the options given below :

(1) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)
(2) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
(3) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)
(4) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)

193. Statements related to human Insulin are given below. Which statements(s) is/are correct about genetically engineered Insulin?

(a) Pro-hormone insulin contain extra stretch of C-peptide
(b) A-peptide and B-peptide chains of insulin were produced separately in *E.coli.*, extracted and combined by creating disulphide bond between them.
(c) Insulin used for treatment of Diabetes was extracted from Cattles and Pigs.
(d) Pro-hormone Insulin needs to be processed for converting into a mature and functional hormone.
(e) Some patients develop allergic reactions to the foreign insulin.

Choose the most appropriate answer from the options given below :

(1) (a), (b) and (d) only
(2) (b) only
(3) (c) and (d) only
(4) (c), (d) and (e) only

194. The recombination frequency between the genes a & c is 5%, b & c is 15%, b & d is 9%, a & b is 20%, c & d is 24% and a & d is 29%. What will be the sequence of these genes on a linear chromosome ?

(1) a, d, b, c **(2)** d, b, a, c
(3) a, b, c, d **(4)** a, c, b, d

195. Ten *E. coli* cells with ^{15}N - dsDNA are incubated in medium containing ^{14}N nucleotide. After 60 minutes, how many *E. coli* cells will have DNA totally free from ^{15}N ?

(1) 20 cells **(2)** 40 cells
(3) 60 cells **(4)** 80 cells

196. Which of the following is not a desirable feature of a cloning vector ?

(1) Presence of origin of replication
(2) Presence of a marker gene
(3) Presence of single restriction enzyme site
(4) Presence of two or more recognition sites

197. Select the incorrect statement regarding synapses :

(1) The membranes of presynaptic and postsynaptic neurons are in close proximity in an electrical synapse.
(2) Electrical current can flow directly from one neuron into the other across the electrical synapse.
(3) Chemical synapses use neurotransmitters
(4) Impulse transmission across a chemical synapse is always faster than that across an electrical synapse.

198. Which of the following statements is not true?

(1) Analogous structures are a result of convergent evolution
(2) Sweet potato and potato is an example of analogy
(3) Homology indicates common ancestry
(4) Flippers of penguins and dolphins are a pair of homologous organs

199. If a colour blind female marries a man whose mother was also colour blind, what are the chances of her progeny having colour

(1) 25% **(2)** 50%
(3) 75% **(4)** 100%

200. Given below are two statements : Out of Syllabus

Statements I :

In a scrubber the exhaust from the thermal plant is passed through the electric wires to charge the dust particles.

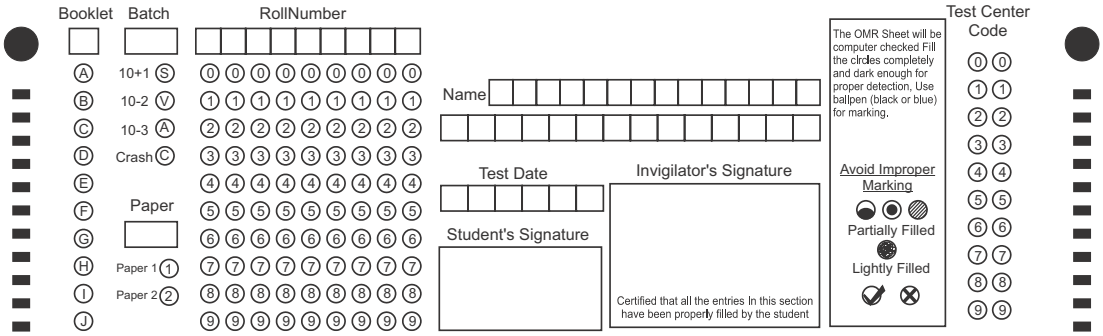
Statements II :

Particular matter (PM 2.5) cannot be removed by scrubber but can be removed by an electrostatic precipitator.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Both **Statement I** and **Statement II** are correct
(2) Both **Statement I** and **Statement II** are incorrect
(3) **Statement I** is correct but **Statement II** is incorrect
(4) **Statement I** is incorrect but **Statement II** is correct

❐❐❐



1 (a) (b) (c) (d)	6 (a) (b) (c) (d)	11 (a) (b) (c) (d)	16 (a) (b) (c) (d)	21 (a) (b) (c) (d)	26 (a) (b) (c) (d)
2 (a) (b) (c) (d)	7 (a) (b) (c) (d)	12 (a) (b) (c) (d)	17 (a) (b) (c) (d)	22 (a) (b) (c) (d)	27 (a) (b) (c) (d)
3 (a) (b) (c) (d)	8 (a) (b) (c) (d)	13 (a) (b) (c) (d)	18 (a) (b) (c) (d)	23 (a) (b) (c) (d)	28 (a) (b) (c) (d)
4 (a) (b) (c) (d)	9 (a) (b) (c) (d)	14 (a) (b) (c) (d)	19 (a) (b) (c) (d)	24 (a) (b) (c) (d)	29 (a) (b) (c) (d)
5 (a) (b) (c) (d)	10 (a) (b) (c) (d)	15 (a) (b) (c) (d)	20 (a) (b) (c) (d)	25 (a) (b) (c) (d)	30 (a) (b) (c) (d)
31 (a) (b) (c) (d)	36 (a) (b) (c) (d)	41 (a) (b) (c) (d)	46 (a) (b) (c) (d)	51 (a) (b) (c) (d)	56 (a) (b) (c) (d)
32 (a) (b) (c) (d)	37 (a) (b) (c) (d)	42 (a) (b) (c) (d)	47 (a) (b) (c) (d)	52 (a) (b) (c) (d)	57 (a) (b) (c) (d)
33 (a) (b) (c) (d)	38 (a) (b) (c) (d)	43 (a) (b) (c) (d)	48 (a) (b) (c) (d)	53 (a) (b) (c) (d)	58 (a) (b) (c) (d)
34 (a) (b) (c) (d)	39 (a) (b) (c) (d)	44 (a) (b) (c) (d)	49 (a) (b) (c) (d)	54 (a) (b) (c) (d)	59 (a) (b) (c) (d)
35 (a) (b) (c) (d)	40 (a) (b) (c) (d)	45 (a) (b) (c) (d)	50 (a) (b) (c) (d)	55 (a) (b) (c) (d)	60 (a) (b) (c) (d)
61 (a) (b) (c) (d)	66 (a) (b) (c) (d)	71 (a) (b) (c) (d)	76 (a) (b) (c) (d)	81 (a) (b) (c) (d)	86 (a) (b) (c) (d)
62 (a) (b) (c) (d)	67 (a) (b) (c) (d)	72 (a) (b) (c) (d)	77 (a) (b) (c) (d)	82 (a) (b) (c) (d)	87 (a) (b) (c) (d)
63 (a) (b) (c) (d)	68 (a) (b) (c) (d)	73 (a) (b) (c) (d)	78 (a) (b) (c) (d)	83 (a) (b) (c) (d)	88 (a) (b) (c) (d)
64 (a) (b) (c) (d)	69 (a) (b) (c) (d)	74 (a) (b) (c) (d)	79 (a) (b) (c) (d)	84 (a) (b) (c) (d)	89 (a) (b) (c) (d)
65 (a) (b) (c) (d)	70 (a) (b) (c) (d)	75 (a) (b) (c) (d)	80 (a) (b) (c) (d)	85 (a) (b) (c) (d)	90 (a) (b) (c) (d)
91 (a) (b) (c) (d)	96 (a) (b) (c) (d)	101 (a) (b) (c) (d)	106 (a) (b) (c) (d)	111 (a) (b) (c) (d)	116 (a) (b) (c) (d)
92 (a) (b) (c) (d)	97 (a) (b) (c) (d)	102 (a) (b) (c) (d)	107 (a) (b) (c) (d)	112 (a) (b) (c) (d)	117 (a) (b) (c) (d)
93 (a) (b) (c) (d)	98 (a) (b) (c) (d)	103 (a) (b) (c) (d)	108 (a) (b) (c) (d)	113 (a) (b) (c) (d)	118 (a) (b) (c) (d)
94 (a) (b) (c) (d)	99 (a) (b) (c) (d)	104 (a) (b) (c) (d)	109 (a) (b) (c) (d)	114 (a) (b) (c) (d)	119 (a) (b) (c) (d)
95 (a) (b) (c) (d)	100 (a) (b) (c) (d)	105 (a) (b) (c) (d)	110 (a) (b) (c) (d)	115 (a) (b) (c) (d)	120 (a) (b) (c) (d)
121 (a) (b) (c) (d)	126 (a) (b) (c) (d)	131 (a) (b) (c) (d)	136 (a) (b) (c) (d)	141 (a) (b) (c) (d)	146 (a) (b) (c) (d)
122 (a) (b) (c) (d)	127 (a) (b) (c) (d)	132 (a) (b) (c) (d)	137 (a) (b) (c) (d)	142 (a) (b) (c) (d)	147 (a) (b) (c) (d)
123 (a) (b) (c) (d)	128 (a) (b) (c) (d)	133 (a) (b) (c) (d)	138 (a) (b) (c) (d)	143 (a) (b) (c) (d)	148 (a) (b) (c) (d)
124 (a) (b) (c) (d)	129 (a) (b) (c) (d)	134 (a) (b) (c) (d)	139 (a) (b) (c) (d)	144 (a) (b) (c) (d)	149 (a) (b) (c) (d)
125 (a) (b) (c) (d)	130 (a) (b) (c) (d)	135 (a) (b) (c) (d)	140 (a) (b) (c) (d)	145 (a) (b) (c) (d)	150 (a) (b) (c) (d)
151 (a) (b) (c) (d)	156 (a) (b) (c) (d)	161 (a) (b) (c) (d)	166 (a) (b) (c) (d)	171 (a) (b) (c) (d)	176 (a) (b) (c) (d)
152 (a) (b) (c) (d)	157 (a) (b) (c) (d)	162 (a) (b) (c) (d)	167 (a) (b) (c) (d)	172 (a) (b) (c) (d)	177 (a) (b) (c) (d)
153 (a) (b) (c) (d)	158 (a) (b) (c) (d)	163 (a) (b) (c) (d)	168 (a) (b) (c) (d)	173 (a) (b) (c) (d)	178 (a) (b) (c) (d)
154 (a) (b) (c) (d)	159 (a) (b) (c) (d)	164 (a) (b) (c) (d)	169 (a) (b) (c) (d)	174 (a) (b) (c) (d)	179 (a) (b) (c) (d)
155 (a) (b) (c) (d)	160 (a) (b) (c) (d)	165 (a) (b) (c) (d)	170 (a) (b) (c) (d)	175 (a) (b) (c) (d)	180 (a) (b) (c) (d)
181 (a) (b) (c) (d)	186 (a) (b) (c) (d)	191 (a) (b) (c) (d)	196 (a) (b) (c) (d)		
182 (a) (b) (c) (d)	187 (a) (b) (c) (d)	192 (a) (b) (c) (d)	197 (a) (b) (c) (d)		
183 (a) (b) (c) (d)	188 (a) (b) (c) (d)	193 (a) (b) (c) (d)	198 (a) (b) (c) (d)		
184 (a) (b) (c) (d)	189 (a) (b) (c) (d)	194 (a) (b) (c) (d)	199 (a) (b) (c) (d)		
185 (a) (b) (c) (d)	190 (a) (b) (c) (d)	195 (a) (b) (c) (d)	200 (a) (b) (c) (d)		

Q. No.	Answer Key	Topic's Name	Chapter's Name
		SECTION-A (PHYSICS)	
1	3	Work, Energy and Power	Work, Energy and Power
2	2	Electrostatic Potential and Capacitance	Electrostatics
3	3	Laws of Motion	Laws of Motion
4	3	Electronic Devices	Electronic Devices
5	2	Magnetic Effects of Current	Magnetic Effects of Current and Magnetism
6	3	Waves	Oscillations and Waves
7	2	Motion of System of Particles and Rigid Body	Motion of System of Particles and Rigid Body
8	4	Dual Nature of Matter and Radiation	Dual Nature of Matter and Radiation
9	2	Thermodynamics	Thermodynamics
10	1	Units and Measurement	Physical World and Measurement
11	3	Electrostatic Potential and Capacitance	Electrostatics
12	4	Current Electricity	Current Electricity
13	3	Nuclei	Atoms and Nuclei
14	4	Motion in a Straight Line	Kinematics
15	3	Electronic Devices	Electronic Devices
16	2	Motion of System of Particles and Rigid Body	Motion of System of Particles and Rigid Body
17	1	Dual Nature of Matter and Radiation	Dual Nature of Matter and Radiation
18	3	Units and Measurement	Physical World and Measurement
19	4	Electronic Devices	Electronic Devices
20	1	Work, Energy and Power	Work, Energy and Power
21	4	Wave Optics	Wave Optics
22	3	Alternating Current	Electromagnetic Induction and Alternating Current
23	1	Mechanical Properties of Fluids	Properties of Bulk Matter
24	3	Ray Optics and Optical Instruments	Optics
25	3	Motion in a Straight Line	Kinematics
26	2	Motion of System of Particles and Rigid Body	Motion of System of Particles and Rigid Body
27	2	Mechanical Properties of Fluids	Properties of Bulk Matter
28	4	Atoms	Atoms and Nuclei
29	2	Magnetic Effects of Current	Magnetic Effect of Current and Magnetism
30	2	Current Electricity	Current Electricity
31	3	Magnetic Effects of Current	Magnetic Effects of Current and Magnetism
32	4	Electromagnetic Waves	Electromagnetic Waves
33	3	Ray Optics and Optical Instruments	Optics
34	4	Electromagnetic Waves	Electromagnetic Waves
35	2	Gravitation	Gravitation

		SECTION-B (PHYSICS)	
36	1	Oscillations	Oscillations and Waves
37	3	Electronic Devices	Electronic Devices
38	2	Alternating Current	Electromagnetic Induction and Alternating Current
39	2	Electric Charges and Fields	Electrostatics
40	3	Electrostatic Potential and Capacitance	Electrostatics
41	3	Mechanical Properties of Solids	Properties of Bulk Matter
42	2	Ray Optics and Optical Instruments	Optics
43	4	Behavior of Perfect Gas and Kinetic Theory	Behavior of Perfect Gas and Kinetic Theory
44	3	Nuclei	Atoms and Nuclei
45	4	Units and Measurements	Physical World and Measurement
46	2	Current Electricity	Current Electricity
47	2	Concept of Vector and Motion in a Plane	Kinematics
48	2	Gravitation	Gravitation
49	3	Magnetics Effects of Current	Magnetic Effect of Current and Magnetism
50	3	Electromagnetic Induction	Electromagnetic Induction and Alternating Current
		SECTION-A (CHEMISTRY)	
51	3	Classification of solids	Solid state
52	4	Aromaticity	Organic Chemistry Some Basic Principles and Techniques
53	2	Molality	Some basic concepts of chemistry
54	1	IUPAC name of elements of periodic table	Classification of elements and periodicity in properties
55	1	Chlorination	Organic Chemistry Some Basic Principles and Techniques
56	3	Amines	Organic Compounds Containing Nitrogen
57	2	Properties of *f*-Block elements	*d*- and *f*-Block elements
58	4	Shapes of molecular orbitals	Structure of atom
59	3	Acidic strength of substituted phenols	Alcohols, Phenols and Ethers
60	4	Reactivity series	Electrochemistry
61	3	Hardy - Schulze rule	Surface Chemistry
62	4	Polymers	Polymers
63	4	Chemical reactions of carbonyl group	Aldehydes, ketones and carboxylic acids
64	2	Defects in solids	Solid state
65	3	Dalton's law of partial pressure	States of Matter : Gases and Liquids
66	1	Physical properties of aldehydes and ketones	Aldehydes, ketones and carboxylic acids
67	1	Preparation of carboxylic acids	Aldehydes, ketones and carboxylic acids
68	3	Enzymes	Surface Chemistry
69	2	Properties of *p*-block elements	*p*-Block elements
70	1	*p*-block elements	*p*-Block elements
71	2	Types of drugs	Chemistry in everyday life
72	3	Order of a chemical reaction	Chemical Kinetics

73	1	pH	Equilibrium
74	3	Quantitative estimation of nitrogen	Organic Chemistry Some Basic Principles and Techniques
75	4	Chemical bonding	Chemical Bonding and Molecular Structure
76	2	Work	Thermodynamics
77	2	Equilibrium	Equilibrium
78	1	Electrochemistry	Electrochemistry
79	1	Interhalogen compounds	p-block elements
80	4	Magnetic property	Chemical Bonding and Molecular Structure
81	3	Stereochemistry	Haloalkanes and haloarenes
82	2	Properties of *s*-block elements	*s*-Block Elements (Alkali and Alkaline Earth Metals)
83	4	Properties of *p*-block elements	*p*-block elements
84	4	Uses of *s*-block elements	*s*-Block Elements (Alkali and Alkaline Earth Metals)
85	4	IUPAC name of elements of complexes	Coordination compounds
		SECTION-B (CHEMISTRY)	
86	1	Equilibrium	Equilibrium
87	2	Ores of metals	General Principles and Processes of Isolation of Elements
88	3	Lucas test for alcohols	Alcohols, Phenols and Ethers
89	1	Structure of atom	Structure of atom
90	4	Chemical reactions of alcohols	Alcohols, Phenols and Ethers
91	2	Aldol Condensation	Aldehydes, ketones and carboxylic acids
92	1	Ozonolysis	Organic Chemistry Some Basic Principles and Techniques
93	1	Chemical reactions of $KMnO_4$	*d*- and *f*-Block elements
94	4	Ideal gas equation	States of Matter : Gases and Liquids
95	2	First order reaction	Chemical Kinetics
96	1	IUPAC name of organic compounds	Organic Chemistry Some Basic Principles and Techniques
97	No correct Option	Nernst equation	Electrochemistry
98	3	Properties of complexes	Coordination compounds
99	1	Density of solids	Solid state
100	2	Pollutants	Environmental Chemistry
		SECTION-A (BOTANY)	
101	3	Population and its Attributes	Organisms and populations
102	3	Ecosystem - Structure and Function, Productivity and Decomposition	Ecosystem
103	4	Anatomy of Dicotyledonous and Monocotyledonous plants	Anatomy of Flowering Plants
104	3	Long Distance Transport of Water and Transpiration	Transport in Plants
105	3	Phylum Annelida, Arthropoda, Mollusca, Echinodermata Mollusca, Echinodermata and Hemichordata	Animal Kingdom

106	2	The DNA, Search For Genetic Material RNA World	Molecular Basis of Inheritance
107	1	Secondary Growth	Anatomy of Flowering Plants
108	2	The Inflorescence and The Flower	Morphology of Flowering Plants
109	3	Principles of Biotechnology and Tools of Recombinant DNA Technology	Biotechnology : Principles & Processes
110	4	Differentiation, Dedifferentiation and Redifferentiation, Development and Plant Growth Regulators	Plant Growth and Development
111	2	Types of Classification and Algae	Plant Kingdom
112	4	Flower, Pre-Fertilisation : Structure and Events	Sexual Reproduction in Flowering Plants
113	4	Do Plants Breathe? Glycolysis	Respiration in Plants
114	3	Biodiversity Conservation	Biodiversity And Conservation
115	2	Use of ATP and NADPH	Photosynthesis in Higher Plants
116	3	Cell Cycle And Mitosis	Cell Cycle And Cell Division
117	3	Meiosis	Cell Cycle And Cell Division
118	3	Sex determination and Genetic Disorders	Principle of Inheritance and Variation
119	3	Differentiation, Dedifferentiation and Redifferentiation, Development and Plant Growth Regulators	Plant Growth and Development
120	1	Mendel's Laws of Inheritance and Chromosomal theory	Principle of Inheritance and Variation
121	4	Do Plants Breathe? Glycolysis	Respiration in Plants
122	3	Root, Stem and Leaf	Morphology of Flowering Plants
123	3	Types of Classification and Algae	Plant Kingdom
124	3	Pollution and its Types	Environmental Issues
125	1	Flower, Pre-Fertilisation : Structure and Events	Sexual Reproduction in Flowering Plants
126	2	Means of Transport and Plant-Water Relations	Transport in Plants
127	2	The Inflorescence and The Flower	Morphology of Flowering Plants
128	2	Process of Recombinant DNA Technology	Biotechnology : Principles & Processes
129	2	Plant Growth Regulators	Plant Growth and Development
130	3	Genetic Code, Translation Gene Expression And DNA Fingerprinting	Molecular Basis of Inheritance
131	1	Pigments involved in Photosynthesis, Light Reaction and The Electron Transport	Photosynthesis in Higher Plants
132	2	Mechanism of Absorption of Elements, Translocation of Solutes and Soil as Reservoir of Essential Elements	Mineral Nutrition
133	2	Biodiversity Conservation	Biodiversity And Conservation
134	1	Genetic Code, Translation Gene Expression And DNA Fingerprinting	Molecular Basis of Inheritance
135	2	Plant Growth Regulators	Plant Growth and Development
		SECTION-B (BOTANY)	
136	2	Pollution and its Types	Environmental Issues
137	3	Mendel's Laws of Inheritance and Chromosomal theory	Principle of Inheritance and Variation
138	3	The Fruit, The Seed and The Families	Morphology of Flowering Plants
139	1	Genetic Code, Translation Gene Expression And DNA Fingerprinting	Molecular Basis of Inheritance

140	2	Sex determination and Genetic Disorders	Principle of Inheritance and Variation
141	1	Population and its Attributes	Organisms and populations
142	2	Pigments involved in Photosynthesis, Light Reaction and The Electron Transport	Photosynthesis in Higher Plants
143	2	Gymnosperms, Angiosperms and Plant Life Cycles	Plant Kingdom
144	3	Proteins, Polysaccharides, Nucleic Acids	Biomolecules
145	2	The DNA, Search For Genetic Material RNA World	Molecular Basis of Inheritance
146	1	Cell Cycle	Cell Cycle And Cell Division
147	2	Principles of Biotechnology and Tools of Recombinant DNA Technology	Biotechnology : Principles & Processes
148	2	Anatomy of Dicotyledonous and Monocotyledonous plants	Anatomy of Flowering Plants
149	3	Ecological Succession and Nutrient Cycling	Ecosystem
150	2	Means of Transport and Plant-Water Relations	Transport in Plants
		SECTION-A (ZOOLOGY)	
151	3	Plant Breeding for Improved Food Quality	Strategies for enhancement in food production
152	2	Meiosis	Cell cycle and cell division
153	1	Absorption of Digested Products	Digestion and absorption
154	2	Oogenesis	Human reproduction
155	2	Decomposition	Ecosystem
156	1	Populations	Organisms and populations
157	4	Anatomy	Structural organisation in animals
158	3	The Endoplasmic Reticulum (ER)	Cell: the unit of life
159	2	Anatomy	Structural organisation in animals
160	4	Human Respiratory System	Breathing and exchange of gases
161	2	Transport of Oxygen	Breathing and exchange of gases
162	2	Metaphase	Cell cycle and cell division
163	2	Joints	Locomotion and movement
164	1	The DNA	Molecular basis of inheritance
165	1	How do we conserve Biodiversity?	Biodiversity and conservation
166	4	Oogenesis	Human reproduction
167	1	Phylum – Chordata	Animal kingdom
168	3	Eubacteria	Biological classification
169	3	Auto Immunity	Human health and disease
170	4	Gene Therapy	Biotechnology and its applications
171	1	Disorders Of Muscular And Skeletal System	Locomotion And Movement
172	3	The Male Reproductive System	Human Reproduction
173	4	Introduction To Excretion	Excretory Products And Their Elimination
174	1	Chemicals, Enzymes And Other Bioactive Molecules	Microbes In Human Welfare
175	3	Population Stabilisation And Birth Control	Reproductive Health
176	3	Nature Of Bond Linking Monomers In A Polymer	Biomolecules
177	4	Connective Tissue	Structural Organisation In Animals

178	4	Digestive Glands	Digestion And Absorption
179	1	Restriction Enzymes	Biotechnology : Principles And Processes
180	2	Hardy-Weinberg Principle	Evolution
181	3	Disorders Of Muscular And Skeletal System	Locomotion And Movement
182	1	Taxonomic Categories	The Living World
183	3	Lac Operon Model	Molecular Basis Of Inheritance
184	2	Asexual Reproduction	Reproduction In Organisms
185	4	Coagulation Of Blood	Body Fluids And Circulation
		SECTION-B (ZOOLOGY)	
186	4	Biological Functions Of Biomolecules	Biomolecules
187	1	Animal Tissues	Structural Organisation In Animals
188	3	Human Circulatory System	Body Fluids And Circulation
189	2	Parathyroid Gland	Chemical Coordination And Integration
190	1	Kingdom Monera	Biological Classification
191	4	Acquired Immunity	Human Health And Disease
192	2	Population Stabilisation And Birth Control	Reproductive Health
193	2	Genetically Engineered Insulin	Biotechnology And Its Applications
194	4	Linkage And Recombination	Principles Of Inheritance And Variation
195	3	The Experimental Proof	Molecular Basis Of Inheritance
196	4	Cloning Vectors	Biotechnology : Principles And Processes
197	4	Transmission Of Impulses	Neural Control And Coordination
198	4	What Are The Evidences For Evolution?	Evolution
199	4	Mendelian Disorders	Principles Of Inheritance And Variation
200	2	Air Pollution And Its Control	Environmental Issues

NEET (UG)
17th July 2022 Paper

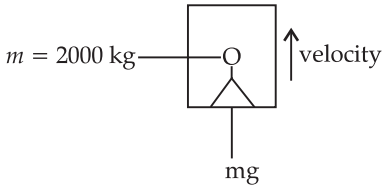
ANSWERS WITH EXPLANATIONS

PHYSICS

Section—A

1. Option (3) is correct.

Explanation:



$$T = W + f$$
$$= mg + f$$
$$= (2000)\,(10) + 3000$$
$$= 23000 \text{ N}$$
$$\text{Power} = \text{Force} \times \text{velocity}$$
$$= 23000 \times 1.5$$
$$= 34500 \text{ W}$$

2. Option (2) is correct.

Explanation: As,

$$V = \frac{1}{4\pi\varepsilon_0}\frac{Q}{r},$$

or,
$$V \propto \frac{1}{r}$$

Hence, lesser the radius/distance, more will be the potential.

3. Option (3) is correct.

Explanation: By law of conservation of momentum,

$$m \times 0 = \frac{2m}{5}(-v\hat{i}) + \frac{2}{5}m(v\hat{j}) + \frac{m}{5}(v')$$

$$\Rightarrow \quad m(0) = (-2mv\hat{i}) + (2mv\hat{j}) + (mv')$$

$$\Rightarrow \quad v' = \sqrt{(2v)^2 + (2v)^2}$$

$$\Rightarrow \quad v' = \sqrt{8v^2}$$

$$\Rightarrow \quad v' = 2\sqrt{2}\,v$$

4. Option (3) is correct.

Explanation: As temperature increases, the electrical resistance decreases for semi-conductors and insulators while increases for conductors.

5. Option (2) is correct.

Explanation:
$$B = \mu_0 nI = \frac{\mu_0 N}{l} I$$

$$\therefore \quad B = 4\pi \times 10^{-7} \times \frac{100}{1 \times 10^{-3}} \times 1$$
$$= 12.56 \times 10^{-2} \text{ T}$$

6. Option (3) is correct.

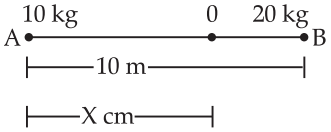
Explanation:
$$v \propto \sqrt{T}$$
$$\frac{v_i}{v_f} = \sqrt{\frac{T_1}{T_2}}$$

$$\Rightarrow \quad \frac{v_i}{v_f} = \sqrt{\frac{T}{2T}}$$

$$v_i : v_f = 1 : \sqrt{2}$$

7. Option (2) is correct.

Explanation:



$$X_{cm} = \frac{M_1 \times M_2}{M_1 + M_2}$$
$$= \frac{10 \times 20}{10 + 20}$$
$$= \frac{200}{30} = \frac{20}{3} \text{m}$$

8. Option (4) is correct.

Explanation:

$$\text{As, } \lambda = \frac{h}{p}$$

i.e.,
$$\lambda \propto \frac{1}{p}$$

Hence, the graph will be hyperbolic.

9. Option (2) is correct.

Explanation: The given processes are;

1 → Isochoric
2 → Adiabatic
3 → Isothermal
4 → Isobaric

10. Option (1) is correct.

Explanation: Plane angle and solid angle are dimensionless, while having units.

11. Option (3) is correct.

Explanation: Electric field lines are always perpendicular to the equipotential surface.

12. Option (4) is correct.

Explanation: Given: $l = 10$ m, $r = \frac{10^{-2}}{\pi} m$,

$R = 10\ \Omega$, $E = 10$ V/m

As, $J = \sigma E$

or, $J = \frac{E}{\rho} = \frac{El}{RA}$

$= \frac{10 \times 10}{10 \times \pi r^2}$

$= \frac{10 \times 10}{10 \times 3.14 \times \left(\frac{10^{-2}}{\pi}\right)^2}$

$= \frac{10 \times 10 \times (3.14)^2}{10 \times 3.14 \times 10^{-4}}$

$= 3.14 \times 10^5\ \text{A/m}^2$

13. Out of Syllabus

14. Option (4) is correct.

Explanation: Slope of displacement-time graph gives velocity.

$$\text{Slope} = v = \frac{dx}{dt} = \tan\theta$$

Hence, $\frac{v_1}{v_2} = \frac{\tan\theta_1}{\tan\theta_2} = \frac{\tan 30^\circ}{\tan 45^\circ}$

$\frac{v_1}{v_2} = \frac{1}{\sqrt{3}}$

15. Option (3) is correct.

Explanation: In half-wave rectification,

input frequency = output frequency

16. Option (2) is correct.

Explanation: $I_1 = \frac{Mr^2}{2}$ (about at centre)

$I_2 = \frac{Mr^2}{4}$ (about at diameter)

As, $I = MK^2$

Hence, $K = \sqrt{\frac{I}{M}}$

$\frac{K_1}{K_2} = \sqrt{\frac{I_1}{I_2}}$

$= \sqrt{\frac{\frac{Mr^2}{2}}{\frac{Mr^2}{4}}}$

$= \sqrt{2} : 1$

17. Option (1) is correct.

Explanation: Apply Einstein's photoelectric equation

$$eV_s = h\nu - h\nu_0$$

or, $\nu_0 = \frac{h\nu - eV_s}{h}$ …(i)

From first condition,

$\nu \to \nu$ and $V_s \to \frac{V_s}{2}$

From equation (i)

$$\nu_0 = \left(h\nu - e\frac{V_s}{2}\right)\Big/h$$

$$\nu_0 = \frac{2h\nu - eV_s}{2h} \quad \text{…(ii)}$$

Again apply second condition,

$\nu \to \frac{\nu}{2}$ and $V_s \to V_s$

From equation (i),

$$\nu_0 = \frac{h\nu - 2eV_s}{2h} \quad \text{…(iii)}$$

Now, from equation (ii) and (iii)

$$2h\nu - eV_s = h\nu - 2eV_s$$

or, $h\nu = -eV_s$ …(iv)

Now from equation (i) and (iv)

$$\nu_0 h = h\nu + h\nu$$

$$\nu_0 = 2\nu$$

18. Option (3) is correct.

Explanation: Dimensions of given options are as follows;

(1) Magnetic flux — $[ML^2T^{-2}A^{-1}]$

(2) Self inductance — $[ML^2T^{-2}A^{-2}]$

(3) Magnetic permeability — $[ML^2T^{-2}A^{-2}]$

(4) Electric permittivity — $[M^{-1}L^{-3}T^4A^2]$

Hence, the option (3) is correct.

19. Option (4) is correct.

Explanation: The potential drop will be equal in both circuits (a) and (c), as both the junctions are in forward biasing, and hence offers equal resistance.

20. Option (1) is correct.

Explanation: As, energy = power × time

Hence, $E = 100 \times 10^3 \times 1 \times 60 \times 60$

$= 360000 \times 10^3$

$= 36 \times 10^7$ J

21. Option (4) is correct.

Explanation: In YDSE,

$$x = (n\lambda)\left(\frac{D}{d}\right)$$

According to question,

$$(n_1\lambda_1)\left(\frac{D}{d}\right) = (n_2\lambda_2)\left(\frac{D}{d}\right)$$

$= 8 \times 600 \times 10^{-9} = n_2 \times 400 \times 10^{-9}$

$= n_2 = \dfrac{8 \times 600 \times 10^{-9}}{400 \times 10^{-9}} = 12$

22. Option (3) is correct.

Explanation: Peak voltage is always $\sqrt{2}$ times of rms voltages in a.c.

$$V_0 = \sqrt{2}\, V_{rms}$$

23. Option (1) is correct.

Explanation: For soap bubble, $P - P_0 = \dfrac{4T}{R}$

As pressure is inverse in relation with radius, hence the pressure decreases as the soap bubble expands or radius increases.

24. Option (3) is correct.

Explanation: Given: $R_1 = R_2 = 20$ cm $= 0.2$m, $\mu = 1.5$

Power, $$P = \frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$P = (1.5 - 1)\left\{\frac{1}{0.2} - \left(\frac{1}{-0.2}\right)\right\}$$

$$\begin{bmatrix} \text{for biconvex lens,} \\ R_1 = +ve \\ R_2 = -ve \end{bmatrix}$$

$$P = 0.5\left(\frac{1}{0.2} + \frac{1}{0.2}\right)$$

$$P = 0.5 \times \frac{2}{0.2} = 5\text{D}$$

25. Option (3) is correct.

Explanation: As,

$$S_{nth} = u + \frac{a}{2}(2n - 1)$$

Hence, $$S_{1st} = \frac{a}{2}\{2(1) - 1\} = \frac{a}{2}(1)$$

$$S_{2nd} = \frac{a}{2}\{2(2) - 1\} = \frac{a}{2}(3)$$

$$S_{3rd} = \frac{a}{2}\{2(3) - 1\} = \frac{a}{2}(5)$$

$$S_{4th} = \frac{a}{2}\{2(4) - 1\} = \frac{a}{2}(7)$$

As the body is freely falling, the initial velocity is zero and $a = g$ in above each case.

Now, $S_{1st} : S_{2nd} : S_{3rd} : S_{4th} = 1 : 3 : 5 : 7$

26. Option (2) is correct.

Explanation: Given:

$\omega_0 = 1200$ rpm

$\omega = 3120$ rpm

$t = 16$ seconds

$$\alpha = \frac{\omega - \omega_0}{t}$$

$$= \frac{3120 - 1200}{16}$$

$$= \frac{1920}{16} \text{ rpm}$$

$$= \frac{1920}{16} \times \frac{2\pi}{60} \text{ rad/s}^2$$

$= 4\pi$ rad/s^2

27. Option (2) is correct.

Explanation: Initially the velocity of the body falling in a viscous fluid increases but after some time it acquires a constant velocity known as terminal velocity. This is shown by point B.

28. Option (4) is correct.

Explanation: For first excited state, $n_1 = 2$

And for second excited state, $n_2 = 3$

As, $$T = -13.6\frac{z^2}{n^2}$$

$$T_1 = -13.6 \times \frac{(1)^2}{(2)^2}$$

$$T_2 = -13.6 \times \frac{(1)^2}{(3)^2}$$

$$T_1 : T_2 = \frac{1}{4} : \frac{1}{9} = 9 : 4$$

29. Option (2) is correct.

Explanation: Given:

$a = 1$m

$R = 1\Omega$

$B = 0.5$T

Area of square $= (\text{side})^2 = a^2 = 1$ m^2

$\phi = BA\cos\theta$

$= 0.5 \times 1 \times \cos 0°$

$= 0.5 \times 1 \times 1$

$= 0.5$ Weber

30. Option (2) is correct.

Explanation: In parallel combination, the potential remains same or constant.

As, $$P = \frac{V^2}{R}$$

$$P \propto \frac{1}{R}$$

$$\therefore \quad \frac{P_1}{P_2} = \frac{R_2}{R_1} = \frac{200}{100}$$

$$P_1 : P_2 = 2 : 1$$

And, $$P = \frac{\text{Work done/Energy}}{\text{time taken}}$$

$$P \propto E \quad \text{(at same duration)}$$

$$\therefore \quad E_1 : E_2 = 2 : 1$$

31. Option (3) is correct.

Explanation: As, $d\vec{B} = \frac{\mu_0}{4\pi}\frac{I\vec{dl}\sin\theta}{r^2}$, so the Statement I is correct.

Statement-II is wrong as Biot Savart's law depends on current carrying element, which is also a vector quantity.

32. Option (4) is correct.

Explanation:

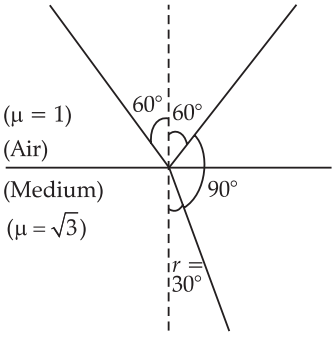
Waves	Wavelength (nearly)
AM Radio waves	10^2 m
Microwaves	10^{-2} m
Infrared Radiations	10^{-4} m
X-rays	10^{-10} m = 1 Å

33. Option (3) is correct.

Explanation: Given:

$$\mu = \sqrt{3}$$

$$i = 60°$$



By using Snell's law, we have;

$$\mu_1 \sin i = \mu_2 \sin r$$

$$1 \times \sin 60° = \sqrt{3} \sin r$$

$$\sin r = \frac{\sqrt{3}/2}{\sqrt{3}} = \frac{1}{2}$$

$$r = 30°$$

Hence, angle between reflected and refracted ray $= 60° + 30° = 90°$

34. Option (4) is correct.

Explanation: As, $\mu = \sqrt{\varepsilon_r \mu_r}$

And, $$\mu = \frac{c}{v}$$

Hence, $$v = \frac{c}{\mu} = \frac{c}{\sqrt{\varepsilon_r \mu_r}}$$

35. Option (2) is correct.

Explanation: Gravitational Field Intensity (I_g)

$$= \frac{\text{Gravitational Force (F)}}{\text{Mass (M)}}$$

$$I_g = \frac{3}{60 \times 10^{-3}}$$

$$I_g = 50 \text{ N/kg}$$

Section—B

36. Option (1) is correct.

Explanation: $(n)(T_l) = (n+1)(T_s)$

As, $$T = 2\pi\sqrt{\frac{l}{g}}$$

Hence, $$(n)\left(2\pi\sqrt{\frac{1.21}{9.8}}\right) = (n+1)\left(2\pi\sqrt{\frac{1}{9.8}}\right)$$

$$\Rightarrow \quad (n)(1.1) = (n+1)(1)$$

$$\Rightarrow \quad 1.1n = n + 1$$

$$\Rightarrow \quad 1.1n - n = 1$$

$$\Rightarrow \quad n(1.1 - 1) = 1$$

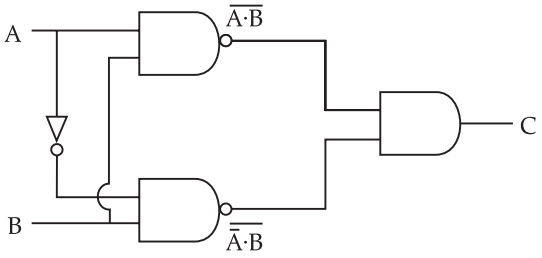
$$\Rightarrow \quad 0.1n = 1$$

$$\Rightarrow \quad n = \frac{1}{0.1} = 10$$

Now, Number of oscillation for shorter pendulum $= (n + 1) = 11$

37. Option (3) is correct.

Explanation:



$$C = \overline{A \cdot B + \bar{A} \cdot B} \text{ (By using de-Morgan Theorem)}$$

$$C = \overline{B(A + \bar{A})} = \bar{B}$$

Hence, option (3) is most accurate one.

38. Option (2) is correct.

Explanation: Given: $L = 10$ H, $C = 10$ μF, $R = 50\ \Omega$

$$V = 200 \sin (100t)$$

Standard equation is $V = V_0 \sin \omega t$

Hence, $$\omega = 100$$

$$n = \frac{\omega}{2\pi} = \frac{100}{2\pi} = \frac{50}{\pi}$$

$$n_0 = \frac{1}{2\pi\sqrt{LC}}$$

$$= \frac{1}{2\pi}\sqrt{\frac{1}{10\times10\times10^{-6}}}$$

$$= \frac{1}{2\pi}\times\sqrt{\frac{1}{10^{-4}}}$$

$$= \frac{1}{2\pi}\times10^2 = \frac{50}{\pi}$$

$$n = n_0 = \frac{50}{\pi}\text{Hz}$$

39. Option (2) is correct.

Explanation: The provided figure is of an electric dipole.

And the electric field intensity for a dipole is always inverse of cube root of distance.

Mathematically, $E = \frac{1}{4\pi\varepsilon_0}\frac{p}{R^3}$

Hence, $E \propto \frac{1}{R^3}$

40. Option (3) is correct.

Explanation: According to the question,

$$C_1V_1 + C_2V_2 = (C_1 + C_2)V$$

$$V = \frac{C_1V_1 + C_2V_2}{C_1 + C_2}$$

$$V = \frac{C\times100 + C\times0}{C + C}$$

$$V = \frac{100C}{2C} = 50V$$

Energy stored, $U = 2 \times \frac{1}{2}CV^2$

[For given system]

$$U = CV^2$$
$$= 900 \times 10^{-12} \times 50 \times 50$$
$$= 2250000 \times 10^{-12}$$
$$= 2.25 \times 10^{-6}\text{ J}$$

41. Option (3) is correct.

Explanation: In stretching a spring, its shape changes and hence the shear modulus. So, assertion (A) is correct.

Reason is incorrect as $Y_{steel} > Y_{Copper}$

42. Option (2) is correct.

Explanation: As, $\mu = \frac{c}{v}$

Hence, $\mu \propto \frac{1}{v}$

Now, Critical angle,

$$\sin i_c = \frac{\mu_2}{\mu_1} = \frac{v_1}{v_2}$$

$$= \frac{1.5\times10^8}{2\times10^8} = \frac{3}{4}$$

$$i_c = \sin^{-1}\left(\frac{3}{4}\right)$$

$$i_c = \sin^{-1}(0.750)$$

43. Option (4) is correct.

Explanation:

Required volume = number of moles × standard volume

$$= \frac{\text{given mass}}{\text{molar mass}}\times22.4\text{ (L)}$$

$$= \frac{4.5\times10^3}{18}\times22.4\times10^{-3}\text{ (m}^3\text{)}$$

$$= \frac{4.5\times22.4}{18}$$

$$= 5.6\text{ m}^3$$

44. Option (3) is correct.

Explanation: As, $R = R_0A^{1/3}$

Hence, $\frac{R_1}{R_2} = \frac{R_0(125)^{1/3}}{R_0(64)^{1/3}}$

$$\frac{R_1}{R_2} = \left(\frac{125}{64}\right)^{1/3}$$

$$\frac{R_1}{R_2} = \frac{5}{4}$$

$$R_1 : R_2 = 5 : 4$$

45. Option (4) is correct.

Explanation: Area = length × breadth

$$= 55.3 \times 25$$
$$= 1382.5\text{ m}^2$$

As least significant figure is two digits, hence resultant should be of two digits.

So, required answer should be

$$1400 = 14 \times 10^2\text{ m}^2$$

46. Option (2) is correct.

Explanation: For precise measurement of unknown resistance, the resistances of arms P and Q should be approximately equal and small, as it maintains balancing.

47. Option (2) is correct.

Explanation: At highest point, only the horizontal component remains in consideration.

Hence, $u_x = u\cos\theta = 10\cos30°$

$$10 \times \frac{\sqrt{3}}{2}$$

$$= 5\sqrt{3}\text{ ms}^{-1}$$

48. Option (2) is correct.

Explanation: The dimensional formula for required parts are as follow:

Gravitational constant — $[M^{-1}L^3T^{-2}]$

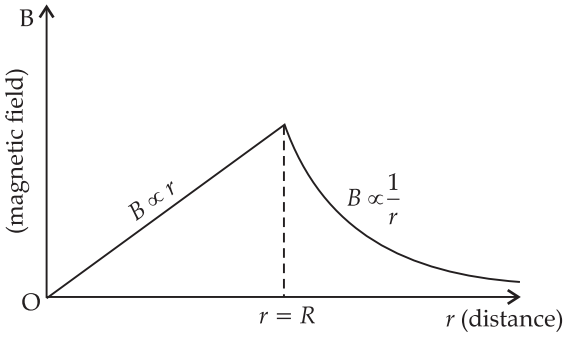
Gravitational potential energy — $[ML^2T^{-2}]$

Gravitational potential — $[L^2T^{-2}]$

Gravitational intensity — $[LT^{-2}]$

49. Option (3) is correct.

Explanation:



The graph clearly representing that given option (3) is correct.

50. Option (3) is correct.

Explanation: Given: $n = 1000$, $r = 10$ m, $B = 2 \times 10^{-5}$ T, $R = 12.56\ \Omega$ and $\omega = 2$ rad/s

$$\text{As,} \quad I_{max} = \frac{E_{max}}{R} = \frac{NBA\omega}{R}$$

$$= \frac{1000 \times 2 \times 10^{-5} \times \pi \times 10 \times 10 \times 2}{12.56}$$

$$= \frac{2 \times 2 \times 3.14}{12.56} \times 10^{\circ} \quad [\because \text{area} = \pi r^2]$$

$$= \frac{12.56}{12.56} \times 1 \quad [\because 10^{\circ} = 1]$$

$$= 1 \text{ A}$$

❑❑❑

CHEMISTRY

Section A

51. Option (3) is correct.

Explanation: In diamond, carbon atoms have tetrahedral arrangement, so hybridization is sp^3. The shape of graphite is trigonal planner and the hybridization possessed by it is sp^2.

52. Option (4) is correct.

Explanation:  does not follows Huckel rule as it has $8\pi e^-$ which violates $(4n+2)\pi e^-$ rule.

53. Option (2) is correct.

Explanation:

$$\text{Molality} = \frac{\text{Moles of solute}}{\text{Weight of solvent (in kg)}}$$

$$\text{Weight} = \frac{\text{Moles of solute}}{\text{Molality}}$$

$$\text{Weight} = \frac{0.5}{1} \text{ kg}$$

$$\text{Weight} = 0.5 \times 1000 \text{ g}$$

$$\text{Weight} = 500 \text{ g}$$

54. Option (1) is correct.

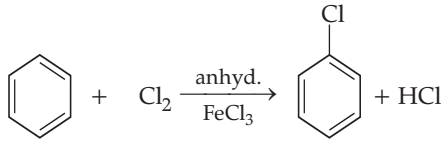
Explanation: As per IUPAC, notation for 1 is '*un*' and g is '*enn*' and the roots are put together in order of digits which make up the atomic number and '*ium*' is added at the end.

So, 119 = un + un + enn + ium

= ununennium

55. Option (1) is correct.

Explanation: Chlorobenzene is obtained by the chlorination of benzene.



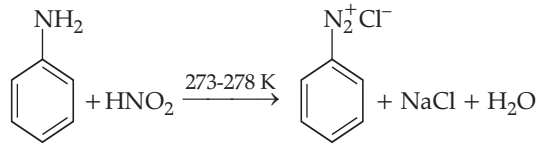
Benzene — Chloro-benzene

56. Option (3) is correct.

Explanation: Primary aliphatic amines reacts with nitrous acid to produce aliphatic diazonium salts which are unstable and liberates nitrogen gas and produces alcohols.

$$R\text{–}NH_2 + HNO_2 \xrightarrow{NaNO_2 + HCl} [R\text{–}N_2^+Cl^-] \xrightarrow{H_2O} ROH + N_2\uparrow + HCl$$

While, primary aromatic amines react with nitrous acid to form diazonium salts which are unstable.



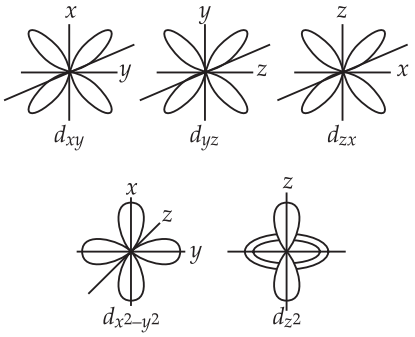
Aniline — Benzene diazonium chloride (unstable)

57. Option (2) is correct.

Explanation: The electronic configuration of Gadolinium (Gd) is [Xe] $4f^7 5d^1 6s^2$. In its Gd^{3+} state it acquires extra stability due to half-filled 4*f* subshell, i.e., [Xe] $4f^7$, and due to the high exchange enthalpy, it has low third ionization enthalpy.

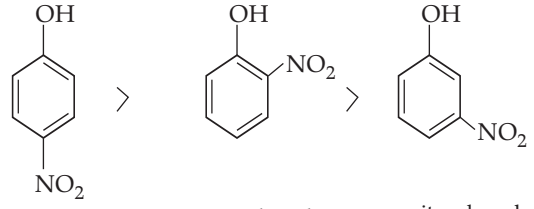
58. Option (4) is correct.

Explanation: The shapes of d_{xy}, d_{yz}, d_{zx} orbitals are similar to each other but the shapes of $d_{x^2-y^2}$ and d_{z^2} are different from each other.



59. Option (3) is correct.

Explanation: The acidic strength of monosubstituted nitrophenol is higher than phenol because of electron withdrawing group. But, *o*-nitrophenol, *m*-nitrophenol and *p*-nitrophenol have different acidic strength because of different distance of —NO_2 group from the —OH group and also at *ortho* and *para* positions, —NO_2 group withdraws electrons of the O—H bond towards itself by the stronger —R effect while the —NO_2 group of *meta* position withdraws electrons of the —OH bond by the weaker —I effect. So, acidic strength of *ortho* and *para*-nitrophenol is greater than that of *meta* nitrophenol.



p-nitrophenol *o*-nitrophenol *m*-nitrophenol

Acidic strength ⟶

60. Option (4) is correct.

Explanation:

$E^0_{Cu^{2+}/Cu} = 0.39$ V, $E^0_{Zn^{2+}/Zn} = -0.76$ V,

$E^0_{Fe^{2+}/Fe} = -0.44$ V, $E^0_{Ag^{2+}/Ag} = 0.80$ V

Considering the E^0 values, Ag cannot displace Cu from the solution.

So, the reaction :

$$2CuSO_4(aq) + 2Ag(s) \rightarrow 2Cu(s) + Ag_2SO_4(aq)$$

cannot occur.

61. Out of Syllabus

62. Out of Syllabus

63. Option (4) is correct.

Explanation: When carbonyl group is reacted with HCN, cyanohydrin is formed as a product.

$$>C=O + HCN \xrightarrow{OH^{\ominus}} >C\begin{matrix}OH\\CN\end{matrix}$$

Cyanonydrin

When carbonyl group is reacted with alcohol, it leads in the formation of an acetal.

$$>C=O + R\text{–}OH \xrightarrow{H^+} R\text{–}\underset{H}{\overset{}{C}}(OR)\text{–}OR$$

Acetal

On reaction with RNH_2, carbonyl compound leads to the formation of Schiff's base.

$$>C=O + R\text{—}NH_2 \xrightarrow{H^+} >C=N\text{—}R$$

Schiff's base

When carbonly compound is treated with hydroxyl amine, oxime is formed.

$$>C=O + NH_2OH \xrightarrow{H^+} >C=N\text{–}OH$$

Oxime

64. Out of Syllabus

65. Out of Syllabus

66. Option (1) is correct.

67. Option (1) is correct.

$$R^{-\delta}Mg^{+\delta}X + O=C=O \rightarrow R\text{–}\overset{O}{\overset{\|}{C}}\text{–}O^-Mg^+X \xrightarrow{H_3O^+} R\text{–}\overset{O}{\overset{\|}{C}}\text{–}OH$$

[Y]

68. Out of Syllabus

69. Option (2) is correct.

Explanation: Because of hydrogen bonding in water molecule, H_2O has highest boiling point. For the hydrides of S, Se and Te, boiling point increases with increase in molar mass.

So, correct order of boiling point is:

$$H_2O > H_2Te > H_2Se > H_2S$$

70. Option (1) is correct.

Explanation: MgH_2 is ionic in nature.

GeH_4 is electron precise as it have $8e^-$ without any lone pair.

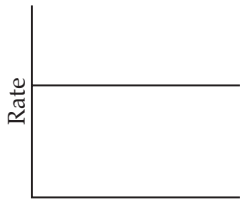
B_2H_6 is an electron deficient compound as it has less then $8e^-$.

HF is electron rich hydride as it has 8 electrons with lone pair.

71. Out of Syllabus

72. Option (3) is correct.

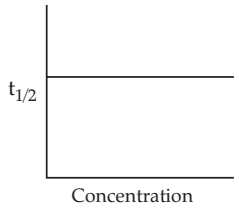
Explanation: Since, rate of a zero order reaction does not depends on concentration, so for zero order reaction, *y* = rate and *x* = concentration.



(for zero order)

While in first order reaction, $t_{1/2} = \frac{0.693}{k}$, so

half life of reaction does not depends on concentration, so graph for first order reaction is:



73. Option (1) is correct.

Explanation: Concentration of salt = 0.10 M

Concentration of acetic acid = 0.01 M

pK_a of acetic acid = 4.57

Since, $\text{pH} = pK_a + \log \frac{[\text{Salt}]}{[\text{Acid}]}$

$$\text{pH} = 4.57 + \log\left(\frac{0.1}{0.01}\right)$$

$$\text{pH} = 4.57 + \log\left(\frac{100}{10}\right)$$

$$\text{pH} = 4.57 + \log 10$$

$$\text{pH} = 4.57 + 1 \quad [\because \log 10 = 1]$$

$$\text{pH} = 5.5$$

74. Option (3) is correct.

Explanation: The Kjeldahl's method for the estimation of nitrogen is not applicable for the compounds having azo group, nitro group or the compounds having nitrogen present in ring, i.e., heterocylic (pyridine) as these compounds does not gets converted into $(NH_4)SO_4$, i.e., ammonium sulphtate. So, only aniline can be used to estimate the amount of nitrogen.

75. Option (4) is correct.

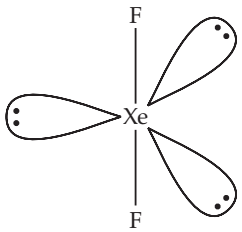
Explanation: In ClF_3, there are 2 lone pairs

In IF_5, there is 1 lone pair.

In SF_4, there is 1 lone pair, and

In XeF_2, there are 3 lone pairs.

So, lone pair-lone pair repulsion is maximum in XeF_2.



76. Option (2) is correct.

Explanation: Since, area under the p-V curve represents the work done and area uner the curve in graph (2) is maximum, so maximum work done is represented by curve (2).

77. Option (2) is correct.

Explanation:

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + 2H_2O(l)$$

Molarity of HCl (M) = 0.5 M

$$\text{Molarity} = \frac{\text{No. of moles}}{\text{Volume}}$$

$$\text{No. of moles} = \text{Molarity} \times \text{Volume}$$

$$= 0.5 \times \frac{50}{1000}$$

Number of moles of $CaCO_3$

$$= \frac{1}{2} \times \text{Numbers of moles of HCl}$$

$$= \frac{1}{2} \times 0.5 \times \frac{50}{1000} = 0.0125$$

So, number of moles of $CaCO_3$ = 0.0125

For $CaCO_3$, number of moles

$$= \frac{\text{Weight}}{\text{Molecular weight}}$$

$$0.0125 = \frac{w}{100}$$

$$w = 0.0125 \times 100 = 1.25 \text{ g}$$

So, weight of pure $CaCO_3$ = 1.25 g

$$\% \text{ Purity} = \frac{\text{Weight of pure } CaCO_3}{\text{Weight of impure } CaCO_3} \times 100$$

Weight of impure $CaCO_3$

$$= \frac{1.25 \times 100}{95}$$

$$= 1.32 \text{ g}$$

78. Option (1) is correct.

Explanation:

$$\overset{+7}{MnO_4^-} + 8H^+ + 5e^- \longrightarrow Mn^{2+} + 4H_2O; \quad E^\circ_{Mn^{2+}/MnO_4^-} = -1.510V \quad ...(1)$$

(Reduction)

$$\frac{1}{2}\overset{0}{O_2} + 2H^+ + 2e^- \longrightarrow \overset{-2}{H_2O}; \quad E^\circ_{O_2/H_2O} = +1.223V \quad ...(2)$$

(Reduction)

Reversing equation (2), we get

$$H_2O \rightarrow \frac{1}{2}O_2 + 2H^+ + 2e^-; \quad E^\circ = -1.223 \text{ V}$$

At cathode:

$$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O] \times 2$$

i.e., $2MnO_4^- + 16H^+ + 10e^- \rightarrow 2Mn^{2+} + 8H_2O$ ...(3)

At anode:

$$H_2O \rightarrow \frac{1}{2}O_2 + 2H^+ + 2e^-] \times 5$$

$$5H_2O \rightarrow \frac{5}{2}O_2 + 10H^+ + 10e^- \quad ...(4)$$

Overall reaction:

$$2MnO_4^- + 6H^+ \rightarrow 2Mn^{2+} + \frac{5}{2}O_2 + 3H_2O$$

$$E^\circ_{cell} = E^\circ_{cathode} - E^\circ_{anode}$$
$$= -1.510 - (-1.223)$$
$$= -1.510 + 1.223$$
$$= 0.287\ V$$

Since $E^\circ_{cell} > 0$, so MnO_4^- will liberate O_2 from water in the presence of an acid.

79. Option (1) is correct.

Explanation: ICl is more reactive than I_2 because I-Cl bond is weaker than I-I bond.

Since, in interhalogen compounds, X-X bond is stronger than X-X' bond (X=Cl, Br, I)

80. Option (4) is correct.

Explanation: Molecular orbital electronic configuration of O_2 is

$\sigma 1s^2\sigma^*1s^2, \sigma 2s^2\sigma^*2s^2, \sigma 2p_z^2, \pi 2p_x^2 = \pi 2p_y^2, \sigma 2p_x^1 = \pi^*2p_y^1$

In O_2^+, the electronic configuration is:

$\sigma 1s^2\sigma^*1s^2, \sigma 2s^2\sigma^*2s^2, \sigma 2p_z^2, \pi 2p_x^2 = \pi 2p_y^2, \pi^*2p_x^1 = \pi^*2p_y^1$

Since, there is one unpaired electron in O_2^+, so it is paramagnetic in nature.

81. Option (3) is correct.

Explanation: Enantiomers are non-superimposable mirror images of each other.

82. Option (2) is correct.

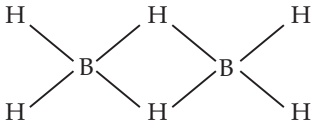
Explanation: Since, O_2^- is superoxide ion, so, its oxidation state is – 1.

So, oxidation number of KO_2 is:

$$x + (-1) = 0$$
$$x = +1$$

83. Option (4) is correct.

Explanation:



In diborane (B_2H_6), hybridization of both the boron atoms is sp^3.

84. Out of Syllabus

85. Option (4) is correct.

Explanation: IUPAC name of $[Ag(H_2O)_2]\ [Ag(CN)_2]$ is:

diaqua silver (I) dicyanidoargentate (I)

Section B

86. Option (1) is correct.

Explanation:

$$3O_2(g) \rightarrow 2O_3(g)$$

$$K_c = \frac{[O_3]^2}{[O_2]^3}$$

$$3 \times 10^{-59} = \frac{[O_3]^2}{(0.040)^3}$$

$$3 \times 10^{-59} = \frac{[O_3]^2}{(4 \times 10^{-2})^3}$$

$$[O_3]^2 = 3 \times 10^{-59} \times 64 \times 10^{-6}$$
$$[O_3]^2 = 192 \times 10^{-65}$$
$$[O_3]^2 = 19.2 \times 10^{-64}$$
$$[O_3] = \sqrt{19.2 \times 10^{-64}}$$
$$[O_3] = 4.38 \times 10^{-32}\ M$$

87. Option (2) is correct.

Explanation: Haematite - Fe_2O_3

Magnetite - Fe_3O_4

Calamine - $ZnCO_3$

Kaolinite - $[Al_2(OH)_4Si_2O_5]$

88. Option (3) is correct.

Explanation: Tertiary alcohols are most reactive and immediately produce turbidity at room temperature on reaction with Lucas reagent.

89. Option (1) is correct.

Explanation:

Since, $r \propto \frac{n^2}{Z}$ (From Bohr's atomic model)

For third Bohr orbit of Li^{2+}, $n_{Li^{3+}} = 3$, $Z_{Li} = 3$

For second Bohr orbit of He^+, $n_{He^+} = 2$, $Z_{He} = 2$

$$(r_3)_{Li^{3+}} = \frac{(3)^2}{3}, (r_2)_{He^+} = \frac{(2)^2}{2}$$

$$\frac{(r_3)_{Li^{3+}}}{(r_2)_{He^+}} = \frac{(3)^2 \times 2}{3 \times (2)^2} = \frac{3}{2}$$

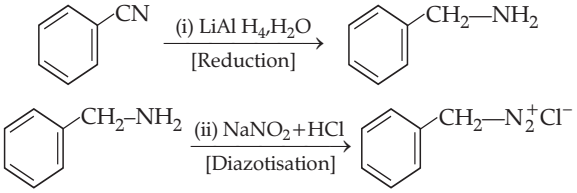
$$\frac{(r_3)_{Li^{3+}}}{105.8} = \frac{3}{2}$$

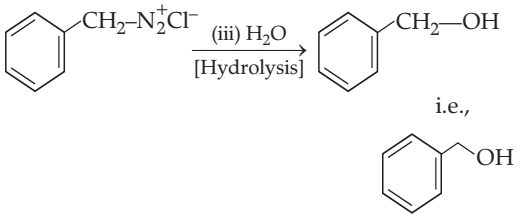
$$(r_3)_{Li^{3+}} = \frac{3}{2} \times 105.8$$

$$(r_3)_{Li^{3+}} = 158.7\ pm$$

90. Option (4) is correct.

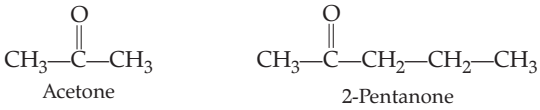
Explanation:



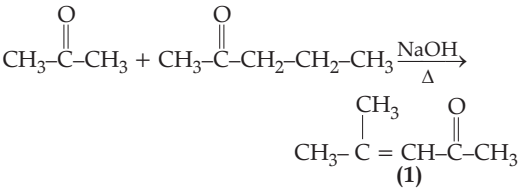


91. Option (2) is correct.

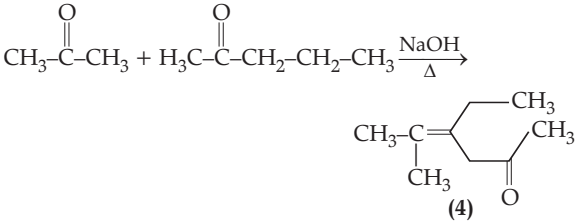
Explanation:



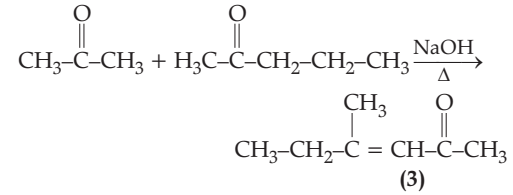
(a)



(b)



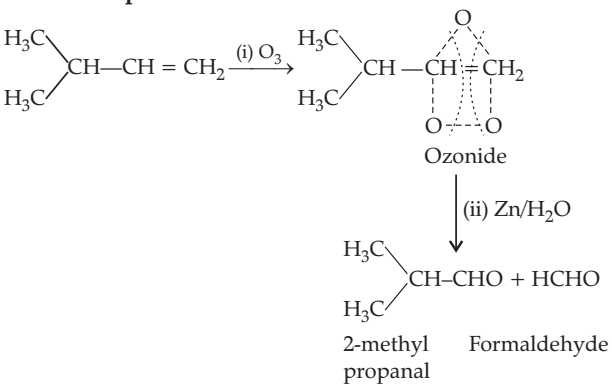
(c)



So, product (2) is not formed.

92. Option (1) is correct.

Explanation:



93. Option (1) is correct.

Explanation: Reaction of $KMnO_4$ with iodide ion in neutral or faintly alkaline medium:

$$\overset{+7}{KMnO_4} + I^- \xrightarrow[\text{faintly alkaline medium}]{\text{Neutral or}} \overset{+7}{MnO_2} + IO_3^-$$

So, the oxidation state of Mn changes from +7 to +4.

94. Out of Syllabus

95. Option (2) is correct.

Explanation: $A \rightarrow$ Products (given)

$[A]_\circ = 0.1$ M

$[A] = 0.001$ M

$t = 5$ min

For first order reaction,

$$k = \frac{2.303}{t}\log\frac{[A_\circ]}{[A]}$$

$$k = \frac{2.303}{5}\log\left(\frac{0.1}{0.001}\right)$$

$$k = \frac{2.303}{5}\log(100)$$

$$k = \frac{2.303}{5}\log 10^2$$

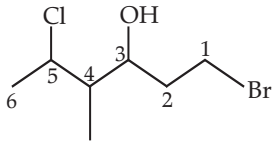
$$k = \frac{2.303}{5} \times 2\log 10$$

$$k = \frac{2.303}{5} \times 2 = \frac{4.606}{5}$$

$k = 0.9212\ \text{min}^{-1}$

96. Option (1) is correct.

Explanation:



IUPAC name : 1-bromo-5-chloro-4 methyl hexan-3-ol

97. None of the option is correct.

Explanation:

$Ni(s) + 2Ag^+ (0.001\ M) \rightarrow Ni^{2+} (0.001\ M) + 2Ag(s)$

Oxidation half reaction:

$$Ni \rightarrow Ni^{2+} + 2e^-$$

Reduction half reaction:

$$Ag^+ + e^- \rightarrow Ag] \times 2$$

Nernst equation:

$$E_{cell} = E^\circ_{cell} - \frac{2.303\ RT}{nF}\log\frac{[Ni^{2+}]}{[Ag^+]^2}$$

$$E_{cell} = 10.5 - \frac{0.059}{2}\log\frac{(10^{-3})}{(10^{-3})^2}$$

$$E_{cell} = 10.5 - \frac{0.059}{2}\log 10^3$$

$$E_{cell} = 10.5 - \frac{0.059}{2} \times 3$$

$E_{cell} = 10.5 - 0.0885$

$E_{cell} = 10.4115$ V

This will be the benefits, if attempted.

98. Option (3) is correct.

Explanation: More the strong field ligands present in the compound, greater is the spliting.

Since, en is a strong field ligand.

So, order or energy absorbed is:

$[Ni(en)_3]^{2+} > [Ni(H_2O)_2(en)_2]^{2+} > [Ni(H_2O)_4(en)]^{2+}$

(C) (A) (B)

99. Out of Syllabus

100. Out of Syllabus

❐❐❐

BOTANY

Section A

101. Option (3) is correct.

Explanation: In predation, only a single species is negatively impacted.

102. Option (3) is correct.

Explanation: The process of degradation of detritus into simpler substances by the action of microbes is called decomposition. Decomposition rate is faster if the detritus is rich in nitrogen and water-soluble substances such as sugars, but not lignin and chitin.

103. Out of Syllabus

104. Out of Syllabus

105. Option (3) is correct.

Explanation: All arthropods for e.g., lobsters, crabs, spiders, mites etc., consists a hard exoskeleton which is made up of a protein, chitin. This hard protective layer of arthropods give support for the attachment of arthropod's muscles.

106. Option (2) is correct.

Explanation: Euchromatin is loosely packed and enriched in genes, hence it is responsible for the active transcription. A typical nucleosome contains about 200 base pairs (bp) of the DNA helix. Heterochromatin is highly condensed and is transcriptionally silent.

107. Out of Syllabus

108. Option (2) is correct.

Explanation: The flowers of the plants such as bean, pea, *Cassia* and Gulmohar belonging to the family Fabaceae are zygomorphic i.e., having floral parts unequal in size or form.

109. Option (3) is correct.

Explanation: Gel electrophoresis is a technique of separation of DNA strands according to their size under the effect of an electric field across the gel. Bright orange coloured bands of DNA can be observed in the gel when exposed to UV light.

110. Option (4) is correct.

Explanation: Plasticity is an ability of an organism to change its phenotype in response to environmental condition. It is a characteristic feature in some plants such as cotton, coriander, buttercup, etc., which enables them to adapt to rapid environmental changes.

111. Option (2) is correct.

Explanation: Algae such as *Ulothrix* and *Volvox* belongs to the family chlorophyceae (green algae) and their reserved food material is in the form of starch.

112. Option (4) is correct.

Explanation: Most dominant pollinating agents among the animals, particularly among the insects are the "bees".

113. Option (4) is correct.

Explanation: In the process of glycolysis, four molecules of ATP and two molecules of NADPH are also formed, each produces 3 molecules of ATP which means total 6 ATP molecules are produced. Out of these 10ATP molecules, 2ATP molecules are initially utilised, one during the conversion of glucose to glucose 6-phosphate and the one during the conversion of fructose-6-phosphate to fructose 1, 6 bisphosphate. So, the net gain of ATP is eight molecules.

114. Option (3) is correct.

Explanation: The major causes of biodiversity loss are Habitat loss and Fragmentation, over-exploitation, Alien species invasion and co-extinction as explained in Rivet-popper hypothesis by Paul Ehrlich.

115. Option (2) is correct.

Explanation: The movement of ions across a semipermeable membrane bound structure, down their electrochemical gradient is known as chemiosmosis. ATP is produced through chemiosmosis, which is the main molecule used by the cell as energy. Electron carriers like NADH and FADH donate electrons to the electron transport chain which cause conformational changes in the shapes of the protein molecules.

116. Option (3) is correct.

Explanation: Pairing of homologous chromosomes occurs during the prophase stage of Meiosis.

117. Option (3) is correct.

Explanation: Crossing over occurs during the pachytene stage of meiosis in which exchange of chromosomal material between maternal and paternal homologous chromo-somes occur. Recombination nodules are multicomponent proteinaceous ellipsoids found associated with the synaptonemal complex during prophase-I of meiosis.

118. Option (3) is correct.

Explanation: XO type of sex determination is found in Grasshoppers, and some insects where females are homogametic and produce only single type of chromosome i.e., (XX). Males have only one X-chromosome (XO).

119. Option (3) is correct.

Explanation: Ethylene is a phytohormone responsible for inducing and promoting female flower development in cucumber.

120. Option (1) is correct.

Explanation: Mendel studied seven pairs of contrasting characters which include pea shape, pea colour, pod shape, pod colour, flower colour, plant size and position of flowers.

121. Option (4) is correct.

Explanation: Less than 7% of the energy is released from glucose during lactic acid fermentation. Not all of it is stored as ATP.

122. Option (3) is correct.

Explanation: In citrus and *Bouganvillea*, the thorns are developed from modified stem. Leaves are modified into many structures and the pointed structures are known as spines.

123. Option (3) is correct.

Explanation: Red algae belongs to the class Rhodophyceae in which they contain a red colour pigment - r-phycoerythrin in their body. Hydrocolloid carrageen can be obtained from Rhodophyceae only.

124. Out of Syllabus

125. Option (1) is correct.

Explanation: Cleistogamy is a type of automatic self pollination of certain plants that can be seen especially in peanuts, peas etc. The advantage of such pollination is that, the flower is not dependent on pollinators but there is no chance for cross-pollination.

126. Option (2) is correct.

Explanation: The transportation of food material occurs with the help of plant tissue was identified by plant physiologists in "Girdling experiment". It showed that phloem is responsible for the translocation of food as it is present outside the xylem.

127. Option (2) is correct.

Explanation: Vexillary aestivation is the characteristic of the family Fabaceae. Hence, *Pisum sativum* shows vexillary aestivation. Stamens are said to be diadelphous when united into two bundles. As china rose has monoadelphous stamens, pea plants have diadelphous stamens.

128. Option (2) is correct.

Explanation: Both the statements are correct but they do not show cause and effect.

129. Option (2) is correct.

Explanation: Ethylene is a simple, gaseous plant growth regulator which is responsible for inducing ripening in fruits and ageing tissues. It promote root growth and root hair formation to increase the absorption surface.

130. Option (3) is correct.

Explanation: Polymorphism is the presence of two or more variant forms of a specific DNA sequence occuring in different individuals or populations. It forms the basis of both genetic mapping and DNA fingerprinting.

131. Option (1) is correct.

Explanation: Phosphoenolpyruvate, found in the mesophyll cells is the primary CO_2 acceptor in C_4 plants. In C_4 plants, mesophyll cells lack RuBisCo-enzyme.

132. Option (2) is correct.

Explanation: *Frankia* produces nitrogen fixing nodules on the roots of *Alnus*.

133. Option (2) is correct.

Explanation: *Ex-situ* conservation is the conservation of species outside their natural habitat where they can be given special care and attention. For e.g., Botanical gardens, Zoos, Aquariums, Cryopreservation etc. Natural parks and wildlife sanctuaries are the *in-situ* conservation methods.

134. Option (1) is correct.

Explanation: As soon as the small sub-unit of ribosome encounters mRNA, the process of translation (mRNA to proteins) begins.

135. Out of Syllabus

Section B

136. Out of Syllabus

137. Option (3) is correct.

Explanation: Genes that are located on different chromosomes assort independently. By determining the recombination frequencies, we can determine if the gene is assorting independently or not.

138. Option (3) is correct.

Explanation: In the given figure, i.e., T. S. of apple fruit, the part labelled 'C' is thalamus, which is a false fruit.

139. Option (1) is correct.

Explanation: Sequence annotation is the process of identifying the boundaries between genes and other features in a DNA sequence. This methodology is adopted by the geneticist for sequencing the whole genome of an organism.

140. Option (2) is correct.

Explanation: Myotonic dystrophy is the most common form of muscular dystrophy that begins at adulthood, characterised by progressive muscle weakness. It is caused due to the genetic changes and is inherited in an autosomal dominant manner.

141. Option (1) is correct.

Explanation: The interaction in which one organism consumes the body or parts of another organism is known as predation. For e.g., House cats killing mice, birds and other small insects.

142. Option (2) is correct.

Explanation: The large bundle sheath cells found around the vascular bundles in C_4 plants help to increase the number of chloroplast for the operation of Calvin cycle.

143. Option (2) is correct.

Explanation: (a) ***Spirogyra***—Dominant haploid free-living gametophyte.

(b) Fern—dominant diploid sporophyte alternating with reduced gametophyte called prothallus.

(c) ***Funaria*—**Dominant haploid leafy gametophyte alternating with partially dependent multicellular sporophyte.

(d) ***Cycas*—**Dominant diploid sporophyte vascular plant with highly reduced male or female gametophyte.

144. Option (3) is correct.

Explanation: Lecithin is naturally found in body tissues. It is a phospholipid, a yellowish-brown fatty substance which contains glycerol, two fatty acids, phosphate group and choline. Saturated fatty acids have single bonds only. Unsaturated fatty acids can have one or more double bonds.

145. Option (2) is correct.

Explanation: Transposones can be used during Gene silencing methods. They are a group of mobile genetic elements and can jump into different places of the genome, hence called jumping genes also.

146. Option (1) is correct.

Explanation: (a) Metacentric chromosome— Centromere in the middle forming two equal arms of chromosomes.

(b) Telocentric chromosome—Centromere situated close to the end forming one extremely short and one very long arm.

(c) Sub-metacentric chromosome—Centromere slightly away from the middle forming one shorter arm and one longer arm.

(d) Telocentric chromosome—Centromere at the terminal end.

147. Option (2) is correct.

Explanation: 5' G A A T T C 3'
3' C T T A A G 5'

In this palindromic sequence, EcoRI recognises and cuts at the restriction site and produces sticky ends.

148. Out of Syllabus

149. Out of Syllabus

150. Out of Syllabus

ZOOLOGY

Section A

151. Option (3) is correct.

Explanation: Bio-fortification is a process of breeding, in which nutritional quality of crop is enhanced with higher levels of vitamins and minerals or higher proteins and healthier fats.

152. Option (2) is correct.

Explanation: DNA replication occurs before meiosis I in S-phase of interphase, so, the statement II is incorrect. As DNA replication occurs only once during meiosis.

153. Option (1) is correct.

Explanation: Being insoluble in water, fatty acids and glycerols cannot be absorbed into the blood.

Lacteals are specialised lymphatic capillaries, which carry all dietary lipids or chylomicrons into lymphatic vessels and ultimately into the blood.

154. Option (2) is correct.

Explanation: Millions of gamete mother cells (oogonia) are formed within each fetal ovary and this process of oogenesis occurs during embryonic development stage.

155. Option (2) is correct.

Explanation: The process of breakdown of detritus into smaller particles by detritivores is known as Fragmentation.

156. Option (1) is correct.

Explanation: Death rate is expressed as the number of deaths in a given area during a given time per 1000 individuals. It can be calculated as

death of individuals to that of total number of individual in a population.

So, Death rate of individuals per week

$$= \frac{8}{80} = 0.1.$$

157. Option (4) is correct.

Explanation: Crop and gizzard are additional chambers in digestive tract of birds. *Pavo* (Peacock), *Psittacula* (Parakeets), *Corvus* (Crow), all are birds, and possess crop and gizzard.

158. Option (3) is correct.

Explanation: Prokaryotes lack membrane bound organelles. So, in prokaryotes both RER and SER are absent. They do not have any kind of endoplasmic reticulum.

159. Out of Syllabus

160. Option (4) is correct.

Explanation: Atmospheric air, passes through nose → pharynx → larynx → trachea → bronchi → bronchioles, this system starting from nose to bronchioles, constitute conducting part of respiratory system, it filters, humidify and maintain the temperature of the gases entered the conducting system.

161. Option (2) is correct.

Explanation: Oxygen get bound to haemoglobin in the lung surface and get dissociated at the tissues. Every 100 mL of oxygenated blood can deliver around 5 mL of O_2 to the tissue under normal physiological conditions.

162. Option (2) is correct.

Explanation: During mitosis, spindle fibres attach to kinetochore of chromosome. Kinetochores are the protein, present around the centromere.

163. Option (2) is correct.

Explanation: White fibrous cartilage is present between the adjacent bones of vertebral column, which allows only a limited movement.

164. Option (1) is correct.

Explanation: The total length of double helix DNA = total number of base pairs × distance between two base pairs.

The length between two base pair is = 0.34 nm = 0.34×10^{-9} m

The length of given DNA molecule is = 1.1m.

1.1 = total number of base pairs × 0.34×10^{-9} m

$$\text{Total number of base pairs} = \frac{1{\cdot}1}{0.34 \times 10^{-9}} = 3.23 \times 10^{9}$$

$3.23 \times 10^9 = \sim 3.3 \times 10^9$.

165. Option (1) is correct.

Explanation: *In-situ* means insite conservation, it is the protection and conservation of whole ecosystem in its natural habitat.

166. Option (4) is correct.

Explanation: Oogenesis occur at early embryonic stage, while spermatogenesis occurs at the stage of puberty.

Both spermatogenesis and oogenesis, results in the formation of haploid gametes.

167. Option (1) is correct.

Explanation: During embryonic develop-ment, members of vertebrata posses noto-chord, but the notochord is replaced by a cartilaginous or bony vertebral column in adult. Thus, all vertebrates are chordates but all chordates are not vertebrates.

168. Option (3) is correct.

Explanation: Mycoplasma are microscopic, they can penetrate 0.2 μm filter. They are categorised as bacteria, which lack cell wall.

169. Option (3) is correct.

Explanation: Rheumatoid arthritis is an autoimmune disease. In this disease, body 's defence mechanism recognises its own cells as foreign bodies, and start attacking self cells.

170. Option (4) is correct.

Explanation: Patient suffering from adenosine deaminase deficiency require periodic infusion of genetically engineered lymphocytes because genetically engineered lymphocytes are not immortal.

171. Option (1) is correct.

Explanation:

Tetany—low level of Ca^{2+} causing rapid spasm.

Myasthenia gravis—Autoimmune disorder resulting in weakening and paralysis of skeletal muscle.

Muscular dystrophy—A genetic disorder causing degeneration of skeletal muscle.

172. Option (3) is correct.

Explanation: Spermiation is release of sperms into seminiferous tubules. The process of transformation of spermatids into spermatozoa is called spermiogenesis.

173. Option (4) is correct.

Explanation: Reptiles, birds, lands snails and insects excrete nitrogenous waste as uric acid in the form of pellet or paste with a minimum loss of water. *Pavo* is a bird among the other options, which excretes in the form of pellet or paste.

174. Option (1) is correct.

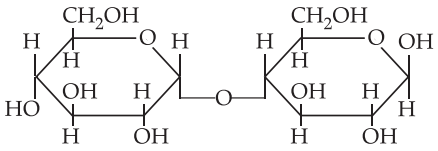
Explanation: *Trichoderma polysporum* is a fungus, which is responsible for the production of an immunosuppressive agent cyclosporin A.

175. Option (3) is correct.

Explanation: IUDs (Intrauterine devices) are method of birth control, inserted by doctors in uterus of females through vagina. Lippe's loop is an example of non-medicated IUD.

176. Option (3) is correct.

Explanation:



Maltose

177. Option (4) is correct.

Explanation: Neuroglia are not a connective tissue, they are neural cells, which provide support to neurons.

178. Option (4) is correct.

Explanation: Secretions of salivary glands lubricate oral cavity, and salivary enzymes performs partial digestion of complex carbohydrates, controls bacterial population in mouth, but do not perform the function of digestion of dissaccharides.

179. Option (1) is correct.

Explanation: Restriction endonucleases recognises a specific palindromic nucleotide sequence in DNA. These endonucleases cut the DNA strand a little away from the centre of palindromic site.

180. Option (2) is correct.

Explanation: Natural selection can lead to stabilisation if more individuals acquire mean character value, and if more individual acquire value other than the mean character value, it leads to directional change.

181. Option (3) is correct.

Explanation: Osteoporosis is an age-related disorder, which is characterised by decrease bone mass and increased chances of fractures. Decreased level of estrogen is the most common cause of osteoporosis.

182. Option (1) is correct.

Explanation: "Kingdom, Phylum, class, order, Family, Genus, species." is correct ascending order of hierarchial arrangement of taxonomic categories.

183. Option (3) is correct.

Explanation: If the *i* gene of *E·coli* strain get mutated and its product can not bind the inducer molecule or lactose, then *i* gene will code for repressor, and due to mutation z, y, a gene will not be translated.

184. Option (2) is correct.

Explanation: Zoospores are asexual reproductive structure in algae. Gemmules are found in sponges.

Buds are asexual reproductive structure in *Hydra*.

185. Option (4) is correct.

Explanation: RBCs after completing their life span, which is of 120 days get destroyed in spleen. The coagulum or clot is formed of network of threads called fibrins.

Section B

186. Option (4) is correct.

Explanation: Glycogen is a storage product in animals. Globulins are proteins that can function as antibody. Many hormones are steroid in nature. Thrombin is an enzyme, that act as biocatalyst.

187. Option (1) is correct.

Explanation: Ciliated epithelium lines nasal cavity, bronchioles, etc.

Mucosal epithelium has goblet cells, which secrete mucus, and are glandular tissue.

Tendons are dense regular connective tissue.

Adipose tissue is a type of loose connective tissue, located mainly beneath the skin.

188. Option (3) is correct.

Explanation:

- Sino-atrial node (SAN) generates an action potential to stimulate atrial contraction.
- If atrial pressure is more than ventricular pressure, then it leads to closure of semilunar valves.

189. Option (2) is correct.

Explanation:

- Parathyroid hormone raises the level of calcium in the blood.
- It also influence calcium absorption from digested food.
- Thyroid hormones control metabolism of carbohydrate.

190. Option (1) is correct.

Explanation: Bacteria can be autotrophic or heterotrophic. Slime moulds are classified under kingdom Protista. Mycoplasma lack cell wall.

191. Option (4) is correct.

Explanation: Acquired immunity is pathogen specific, not present at the time of birth.

192. Option (2) is correct.

Explanation: Diaphragms cover the cervix blocking the entry of sperms.

Contraceptive pills inhibit ovulation and implantation. Intrauterine devices increases phagocytosis of sperm within Uterus. Lactational amenorrhoea is a period of absence of menstrual cycle and ovulation following parturition.

193. Option (2) is correct.

Explanation: Pro-insulin does not contain extra stretch of C-peptide.

Genetically engineered insulin was not extracted from cattles and pigs, but it was artificially manufactured using *E.coli*.

194. Option (4) is correct.

Explanation: Recombination frequency is directly proportional to the distance between genes, So.

Let,

a & d = (X)

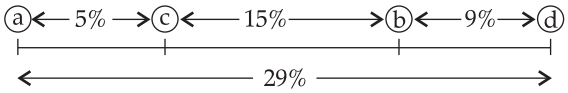
a & c = (Y)

c & b = (Z)

b & d = (A)

(X) = (Y) + (Z) + (A)

29 = 5 + 15 + 9



Hence, a, c, b, d is correct sequence.

195. Option (3) is correct.

Explanation: A new hybrid $^{15}N - ^{14}N$ is formed after 20 minutes. After 40 minutes equal hybrids of high density DNA and low density DNA will be formed.

After 60 minutes, all the DNA strands will be containing ^{14}N nucleotide.

196. Option (4) is correct.

Explanation: Presence of two or more recognition sites, will complicate gene cloning, hence, it is not a desirable feature of cloning vector.

197. Option (4) is correct.

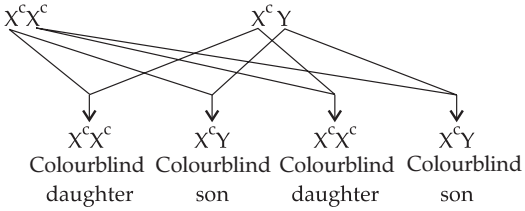
Explanation: Impulse transmission across electrical synapse is always faster than that of chemical synapse.

198. Option (4) is correct.

Explanation: Flippers of penguins and dolphins are a pair of analogous organs, as they perform same function but have different origin.

199. Option (4) is correct.

Explanation: If a colourblind female (X^cX^c) marries a man whose mother was also colour blind. Then, the male will be colourblind (X^cY)



100% Colourblind progeny.

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