

**SOLVED  
PAPER**

**NEET (UG)  
07<sup>th</sup> May 2023**

**Code  
F3**

**Important Instructions**

- 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:
  - 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.
  - 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.

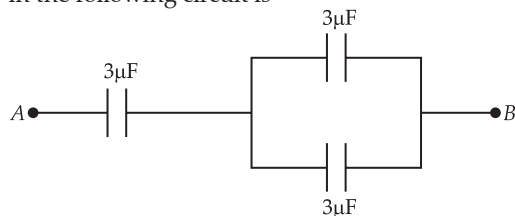
Candidates are advised to read all 15 questions in each subject of Section B before they start attempting the question paper. In the event of a candidate attempting more than ten questions, the first ten questions answered by the candidate shall be evaluated.
- Each question carries **4** marks. For 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.**
- Use **Blue/Black Ball Point Pen only** for writing particulars on this page/markings responses on Answer Sheet.
- Use of Electronic/Manual Calculator is prohibited.
- No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.**
- The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.
- 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**

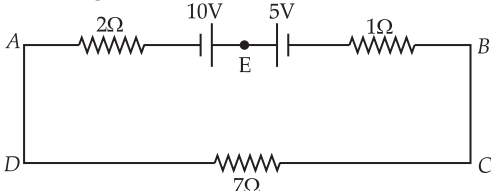
**Section A**

- A football player is moving southward and suddenly turns eastward with the same speed to avoid an opponent. The force that acts on the player while turning is
  - along north-ward
  - along north-east
  - along south-west
  - along east-ward
- An ac source is connected to a capacitor C. Due to decrease in its operating frequency
  - displacement current increases.
  - displacement current decreases.
  - capacitive reactance remains constant
  - capacitive reactance decreases.
- The half life of a radioactive substance is 20 minutes. In how much time, the activity of substance drops to  $\left(\frac{1}{16}\right)^{\text{th}}$  of its initial value? Out of Syllabus

- 40 minutes
  - 60 minutes
  - 80 minutes
  - 20 minutes
- The net magnetic flux through any closed surface is
    - Positive
    - Infinity
    - Negative
    - Zero
  - The equivalent capacitance of the system shown in the following circuit is



- $3\mu\text{F}$
- $6\mu\text{F}$
- $9\mu\text{F}$
- $2\mu\text{F}$

6. The ratio of frequencies of fundamental harmonic produced by an open pipe to that of closed pipe having the same length is  
 (1) 2 : 1 (2) 1 : 3  
 (3) 3 : 1 (4) 1 : 2
7. In hydrogen spectrum, the shortest wavelength in the Balmer series is  $\lambda$ . The shortest wavelength in the Bracket series is  
 (1)  $4\lambda$  (2)  $9\lambda$   
 (3)  $16\lambda$  (4)  $2\lambda$
8. A 12 V, 60 W lamp is connected to the secondary of a step down transformer, whose primary is connected to ac mains of 220 V. Assuming the transformer to be ideal, what is the current in the primary winding?  
 (1) 2.7 A (2) 3.7 A  
 (3) 0.37 A (4) 0.27 A
9. The magnitude and direction of the current in the following circuit is
- 
- (1) 0.5 A from A to B through E  
 (2)  $\frac{5}{9}$  A from A to B through E  
 (3) 1.5 A from B to A through E  
 (4) 0.2 A from B to A through E
10. The magnetic energy stored in an inductor of inductance 4  $\mu\text{H}$  carrying a current of 2 A is  
 (1) 4 mJ (2) 8 mJ  
 (3) 8  $\mu\text{J}$  (4) 4  $\mu\text{J}$
11. The potential energy of a long spring when stretched by 2 cm is U. If the spring is stretched by 8 cm, potential energy stored in it will be  
 (1) 4U (2) 8U  
 (3) 16U (4) 2U
12. The errors in the measurement which arise due to unpredictable fluctuations in temperature and voltage supply are  
 (1) Personal errors  
 (2) Least count errors  
 (3) Random errors  
 (4) Instrumental errors
13. Resistance of a carbon resistor determined from colour codes is  $(22000 \pm 5\%)\Omega$ . The colour of third band must be Out of Syllabus  
 (1) Green (2) Orange  
 (3) Yellow (4) Red
14. A metal wire has mass  $(0.4 \pm 0.002)$  g, radius  $(0.3 \pm 0.001)$  mm and length  $(5 \pm 0.02)$  cm. The maximum possible percentage error in the measurement of density will nearly be  
 (1) 1.3% (2) 1.6%  
 (3) 1.4% (4) 1.2%

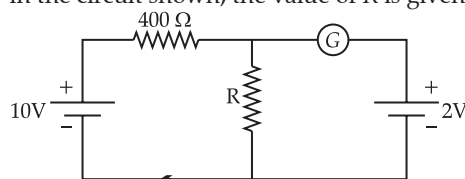
15. Light travels a distance  $x$  in time  $t_1$  in air and  $10x$  in time  $t_2$  in another denser medium. What is the critical angle for this medium?  
 (1)  $\sin^{-1}\left(\frac{10t_2}{t_1}\right)$  (2)  $\sin^{-1}\left(\frac{t_1}{10t_2}\right)$   
 (3)  $\sin^{-1}\left(\frac{10t_1}{t_2}\right)$  (4)  $\sin^{-1}\left(\frac{t_2}{t_1}\right)$
16. In a plane electromagnetic wave travelling in free space, the electric field component oscillates sinusoidally at a frequency of  $2.0 \times 10^{10}$  Hz and amplitude  $48 \text{ Vm}^{-1}$ . Then the amplitude of oscillating magnetic field is (Speed of light in free space =  $3 \times 10^8 \text{ m s}^{-1}$ )  
 (1)  $1.6 \times 10^{-8} \text{ T}$  (2)  $1.6 \times 10^{-7} \text{ T}$   
 (3)  $1.6 \times 10^{-6} \text{ T}$  (4)  $1.6 \times 10^{-9} \text{ T}$
17. The ratio of radius of gyration of a solid sphere of mass  $M$  and radius  $R$  about its own axis to the radius of gyration of the thin hollow sphere of same mass and radius about its axis is  
 (1) 5 : 3 (2) 2 : 5  
 (3) 5 : 2 (4) 3 : 5
18. The amount of energy required to form a soap bubble of radius 2 cm from a soap solution is nearly (surface tension of soap solution =  $0.03 \text{ N m}^{-1}$ )  
 (1)  $5.06 \times 10^{-4} \text{ J}$  (2)  $3.01 \times 10^{-4} \text{ J}$   
 (3)  $50.1 \times 10^{-4} \text{ J}$  (4)  $30.16 \times 10^{-4} \text{ J}$
19. In a series LCR circuit, the inductance  $L$  is 10 mH, capacitance  $C$  is 1  $\mu\text{F}$  and resistance  $R$  is  $100\Omega$ . The frequency at which resonance occurs is  
 (1) 15.9 kHz (2) 1.59 rad/s  
 (3) 1.59 kHz (4) 15.9 rad/s
20. If  $\oint_s \vec{E} \cdot d\vec{S} = 0$  over a surface, then  
 (1) the magnitude of electric field on the surface is constant.  
 (2) all the charges must necessarily be inside the surface.  
 (3) the electric field inside the surface is necessarily uniform.  
 (4) the number of flux lines entering the surface must be equal to the number of flux lines leaving it.
21. The venturi-meter works on  
 (1) Bernoulli's principle  
 (2) The principle of parallel axes  
 (3) The principle of perpendicular axes  
 (4) Huygen's principle
22. Two bodies of mass  $m$  and  $9m$  are placed at a distance  $R$ . The gravitational potential on the line joining the bodies where the gravitational field equals zero, will be ( $G$  = gravitational constant)  
 (1)  $-\frac{12Gm}{R}$  (2)  $-\frac{16Gm}{R}$   
 (3)  $-\frac{20Gm}{R}$  (4)  $-\frac{8Gm}{R}$

23. The temperature of a gas is  $-50^\circ\text{C}$ . To what temperature the gas should be heated so that the rms speed is increased by 3 times?
- (1)  $3295^\circ\text{C}$  (2)  $3097\text{K}$   
 (3)  $223\text{K}$  (4)  $669^\circ\text{C}$
24. The minimum wavelength of X-rays produced by an electron accelerated through a potential difference of  $V$  volts is proportional to
- (1)  $\frac{1}{V}$  (2)  $\frac{1}{\sqrt{V}}$   
 (3)  $V^2$  (4)  $\sqrt{V}$
25. A vehicle travels half the distance with speed  $v$  and the remaining distance with speed  $2v$ . Its average speed is
- (1)  $\frac{2v}{3}$  (2)  $\frac{4v}{3}$   
 (3)  $\frac{3v}{4}$  (4)  $\frac{v}{3}$
26. The angular acceleration of a body, moving along the circumference of a circle, is
- (1) along the radius towards the centre  
 (2) along the tangent to its position  
 (3) along the axis of rotation  
 (4) along the radius, away from centre
27. Let a wire be suspended from the ceiling (rigid support) and stretched by a weight  $W$  attached at its free end. The longitudinal stress at any point of cross-sectional area  $A$  of the wire is
- (1)  $\frac{W}{A}$  (2)  $\frac{W}{2A}$   
 (3) Zero (4)  $\frac{2W}{A}$
28. A full wave rectifier circuit consists of two p-n junction diodes, a centre-tapped transformer, capacitor and a load resistance. Which of these components remove the ac ripple from the rectified output?
- (1) p-n junction diodes  
 (2) Capacitor  
 (3) Load resistance  
 (4) A centre-tapped transformer
29. An electric dipole is placed at an angle of  $30^\circ$  with an electric field of intensity  $2 \times 10^5\text{NC}^{-1}$ . It experiences a torque equal to  $4\text{Nm}$ . Calculate the magnitude of charge on the dipole, if the dipole length is  $2\text{cm}$ .
- (1)  $6\text{mC}$  (2)  $4\text{mC}$   
 (3)  $2\text{mC}$  (4)  $8\text{mC}$
30. A Carnot engine has an efficiency of 50% when its source is at a temperature  $327^\circ\text{C}$ . The temperature of the sink is
- Out of Syllabus
- (1)  $15^\circ\text{C}$  (2)  $100^\circ\text{C}$   
 (3)  $200^\circ\text{C}$  (4)  $27^\circ\text{C}$
31. For Young's double slit experiment, two statements are given below:
- Statement I:** If screen is moved away from the plane of slits, angular separation of the fringes remains constant.

**Statement II:** If the monochromatic source is replaced by another monochromatic source of larger wavelength, the angular separation of fringes decreases.

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

- (1) Both **Statement I** and **Statement II** are false.  
 (2) **Statement I** is true but **Statement II** is false.  
 (3) **Statement I** is false but **Statement II** is true.  
 (4) Both **Statement I** and **Statement II** are true.
32. The work functions of Caesium (Cs), Potassium (K) and Sodium (Na) are  $2.14\text{eV}$ ,  $2.30\text{eV}$  and  $2.75\text{eV}$  respectively. If incident electromagnetic radiation has an incident energy of  $2.20\text{eV}$ , which of these photosensitive surfaces may emit photoelectrons?
- (1) Both Na and K (2) K only  
 (3) Na only (4) Cs only
33. Given below are two statements:
- Statement I:** Photovoltaic devices can convert optical radiation into electricity.  
**Statement II:** Zener diode is designed to operate under reverse bias in breakdown region.
- 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) **Statement I** is correct but **Statement II** is incorrect.  
 (3) **Statement I** is incorrect but **Statement II** is correct.  
 (4) Both **Statement I** and **Statement II** are correct.
34. If the galvanometer  $G$  does not show any deflection in the circuit shown, the value of  $R$  is given by

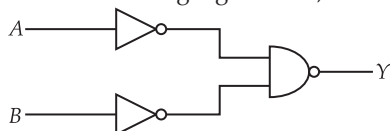


- (1)  $50\ \Omega$  (2)  $100\ \Omega$   
 (3)  $400\ \Omega$  (4)  $200\ \Omega$
35. A bullet is fired from a gun at the speed of  $280\text{m s}^{-1}$  in the direction  $30^\circ$  above the horizontal. The maximum height attained by the bullet is ( $g=9.8\text{m s}^{-2}$ ,  $\sin 30^\circ = 0.5$ )
- (1)  $2000\text{m}$  (2)  $1000\text{m}$   
 (3)  $3000\text{m}$  (4)  $2800\text{m}$

### Section B

36. A satellite is orbiting just above the surface of the earth with period  $T$ . If  $d$  is the density of the earth and  $G$  is the universal constant of gravitation, the quantity  $\frac{3\pi}{Gd}$  represents
- (1)  $T^2$  (2)  $T^3$   
 (3)  $\sqrt{T}$  (4)  $T$

37. For the following logic circuit, the truth table is



- (1) 

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1
- (2) 

A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0
- (3) 

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1
- (4) 

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

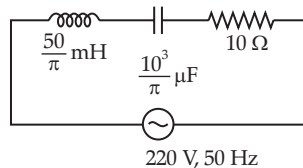
38. The radius of inner most orbit of hydrogen atom is  $5.3 \times 10^{-11}$  m. What is the radius of third allowed orbit of hydrogen atom?

- (1)  $1.06 \text{ \AA}$  (2)  $1.59 \text{ \AA}$   
 (3)  $4.77 \text{ \AA}$  (4)  $0.53 \text{ \AA}$

39. A wire carrying a current  $I$  along the positive  $x$ -axis has length  $L$ . It is kept in a magnetic field  $\vec{B} = (2\hat{i} + 3\hat{j} - 4\hat{k})$  T. The magnitude of the magnetic force acting on the wire is

- (1)  $\sqrt{5} IL$  (2)  $5 IL$   
 (3)  $\sqrt{3} IL$  (4)  $3 IL$

40. The net impedance of circuit (as shown in figure) will be

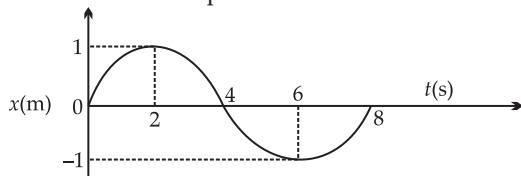


- (1)  $15 \Omega$  (2)  $5\sqrt{5} \Omega$   
 (3)  $25 \Omega$  (4)  $10\sqrt{2} \Omega$

41. 10 resistors, each of resistance  $R$  are connected in series to a battery of emf  $E$  and negligible internal resistance. Then those are connected in parallel to the same battery, the current is increased  $n$  times. The value of  $n$  is

- (1) 100 (2) 1  
 (3) 1000 (4) 10

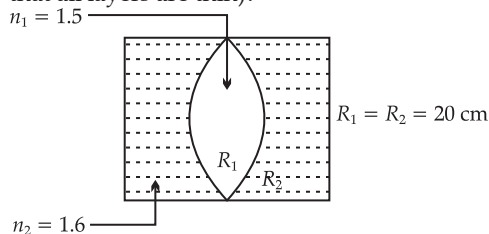
42. The  $x$ - $t$  graph of a particle performing simple harmonic motion is shown in the figure. The acceleration of the particle at  $t = 2$  s is



- (1)  $-\frac{\pi^2}{8} \text{ m s}^{-2}$  (2)  $\frac{\pi^2}{16} \text{ m s}^{-2}$

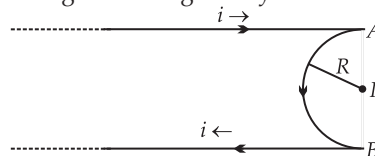
- (3)  $-\frac{\pi^2}{16} \text{ m s}^{-2}$  (4)  $\frac{\pi^2}{8} \text{ m s}^{-2}$

43. In the figure shown here, what is the equivalent focal length of the combination of lenses (Assume that all layers are thin)?



- (1)  $-40 \text{ cm}$  (2)  $-100 \text{ cm}$   
 (3)  $-50 \text{ cm}$  (4)  $40 \text{ cm}$

44. A very long conducting wire is bent in a semi-circular shape from  $A$  to  $B$  as shown in figure. The magnetic field at point  $P$  for steady current configuration is given by



- (1)  $\frac{\mu_0 i}{4R}$  pointed away from the page  
 (2)  $\frac{\mu_0 i}{4R} \left[ 1 - \frac{2}{\pi} \right]$  pointed away from page  
 (3)  $\frac{\mu_0 i}{4R} \left[ 1 - \frac{2}{\pi} \right]$  pointed into the page  
 (4)  $\frac{\mu_0 i}{4R}$  pointed into the page

45. Calculate the maximum acceleration of a moving car so that a body lying on the floor of the car remains stationary. The coefficient of static friction between the body and the floor is 0.15 ( $g = 10 \text{ ms}^{-2}$ )

- (1)  $150 \text{ ms}^{-2}$  (2)  $1.5 \text{ ms}^{-2}$   
 (3)  $50 \text{ ms}^{-2}$  (4)  $1.2 \text{ ms}^{-2}$

46. Two thin lenses are of same focal lengths ( $f$ ), but one is convex and the other one is concave. When they are placed in contact with each other, the equivalent focal length of the combination will be

- (1)  $\frac{f}{4}$  (2)  $\frac{f}{2}$   
 (3) Infinite (4) Zero

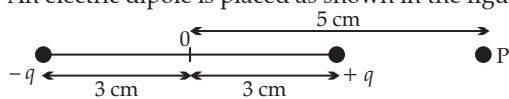
47. A horizontal bridge is built across a river. A student standing on the bridge throws a small ball vertically upwards with a velocity  $4 \text{ m s}^{-1}$ . The ball strikes the water surface after 4 s. The height of bridge above water surface is (Take  $g = 10 \text{ ms}^{-2}$ )

- (1) 60 m (2) 64 m  
 (3) 68 m (4) 56 m

48. The resistance of platinum wire at  $0^\circ\text{C}$  is  $2 \Omega$  and  $6.8 \Omega$  at  $80^\circ\text{C}$ . The temperature coefficient of resistance of the wire is

- (1)  $3 \times 10^{-3} \text{ } ^\circ\text{C}^{-1}$       (2)  $3 \times 10^{-2} \text{ } ^\circ\text{C}^{-1}$   
 (3)  $3 \times 10^{-1} \text{ } ^\circ\text{C}^{-1}$       (4)  $3 \times 10^{-4} \text{ } ^\circ\text{C}^{-1}$

49. An electric dipole is placed as shown in the figure.



The electric potential (in  $10^2 \text{ V}$ ) at point P due to the dipole is ( $\epsilon_0 =$  permittivity of free space and  $\frac{1}{4\pi\epsilon_0} = K$ )

- (1)  $\left(\frac{5}{8}\right) qK$       (2)  $\left(\frac{8}{5}\right) qK$

- (3)  $\left(\frac{8}{3}\right) qK$       (4)  $\left(\frac{3}{8}\right) qK$

50. A bullet from a gun is fired on a rectangular wooden block with velocity  $u$ . When bullet travels 24 cm through the block along its length horizontally, velocity of bullet becomes  $\frac{u}{3}$ . Then it further penetrates into the block in the same direction before coming to rest exactly at the other end of the block. The total length of the block is

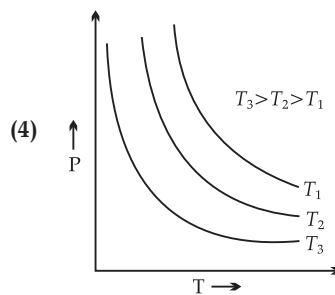
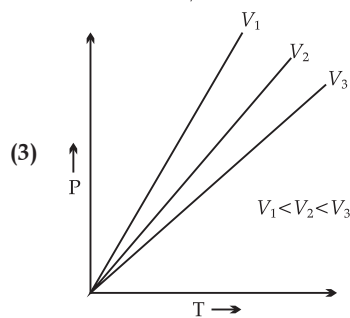
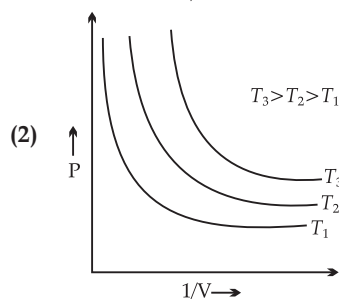
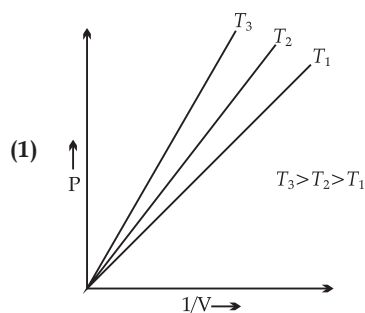
(1) 24 cm      (2) 28 cm  
 (3) 30 cm      (4) 27 cm



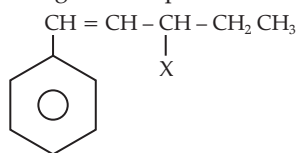
## CHEMISTRY

### Section A

51. The element expected to form largest ion to achieve the nearest noble gas configuration is
- (1) F      (2) N  
 (3) Na      (4) O
52. In Lassaigne's extract of an organic compound, both nitrogen and sulphur are present, which gives blood red colour with  $\text{Fe}^{3+}$  due to the formation of
- (1) NaSCN  
 (2)  $[\text{Fe}(\text{CN})_5 \text{NOS}]^{4-}$   
 (3)  $[\text{Fe}(\text{SCN})]^{2+}$   
 (4)  $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3 \cdot x\text{H}_2\text{O}$
53. The relation between  $n_m$ , ( $n_m =$  the number of permissible values of magnetic quantum number ( $m$ )) for a given value of azimuthal quantum number ( $l$ ), is
- (1)  $l = 2n_m + 1$       (2)  $n_m = 2l^2 + 1$   
 (4)  $n_m = l + 2$       (4)  $l = \frac{n_m - 1}{2}$
54. Which one is an example of heterogenous catalysis?
- Out of Syllabus
- (1) Hydrolysis of sugar catalysed by  $\text{H}^+$  ions.  
 (2) Decomposition of ozone in presence of nitrogen monoxide.  
 (3) Combination between dinitrogen and dihydrogen to form ammonia in the presence of finely divided iron.  
 (4) Oxidation of sulphur dioxide into sulphur trioxide in the presence of oxides of nitrogen.
55. Which amongst the following options is **correct** graphical representation of Boyle's Law?
- Out of Syllabus

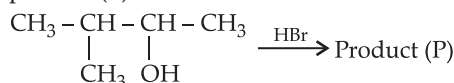


56. The given compound



is an example of \_\_\_\_\_.

- (1) aryl halide (2) allylic halide  
 (3) vinylic halide (4) benzylic halide
57. Consider the following reaction and identify the product (P).



3 - Methylbutan - 2 - ol

- (1)  $\text{CH}_3\text{CH} = \text{CH} - \text{CH}_3$   
 (2)  $\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH} - \text{CH}_3 \\ | \quad | \\ \text{CH}_3 \quad \text{Br} \end{array}$   
 (3)  $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3 - \text{C} - \text{CH}_2 - \text{Br} \\ | \\ \text{CH}_3 \end{array}$   
 (4)  $\begin{array}{c} \text{Br} \\ | \\ \text{CH}_3 - \text{C} - \text{CH}_2 - \text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$
58. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**:  
**Assertion A**: Helium is used to dilute oxygen in diving apparatus.  
**Reasons R**: Helium has high solubility in  $\text{O}_2$ .  
 In the light of the above statements, choose the **correct** answer from the options given below:
- (1) Both **A** and **R** are true and **R** is **NOT** the correct explanation of **A**.  
 (2) **A** is true but **R** is false.  
 (3) **A** is false but **R** is true.  
 (4) Both **A** and **R** are true and **R** is the correct explanation of **A**.
59. The conductivity of centimolar solution of  $\text{KCl}$  at  $25^\circ\text{C}$  is  $0.0210 \text{ ohm}^{-1} \text{ cm}^{-1}$  and the resistance of the cell containing the solution at  $25^\circ\text{C}$  is 60 ohm. The value of cell constant is
- (1)  $3.28 \text{ cm}^{-1}$  (2)  $1.26 \text{ cm}^{-1}$   
 (3)  $3.34 \text{ cm}^{-1}$  (4)  $1.34 \text{ cm}^{-1}$
60. The number of  $\sigma$  bonds,  $\pi$  bonds and lone pair of electrons in pyridine, respectively are
- (1) 12, 3, 0 (2) 11, 3, 1  
 (3) 12, 2, 1 (4) 11, 2, 0
61. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**:  
**Assertion A**: Metallic sodium dissolves in liquid ammonia giving a deep blue solution, which is paramagnetic.  
**Reasons R**: The deep blue solution is due to the formation of amide.

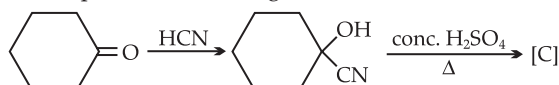
In the light of the above statements, choose the **correct** answer from the options given below:

- (1) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**.  
 (2) **A** is true but **R** is false.  
 (3) **A** is false but **R** is true.  
 (4) Both **A** and **R** are true and **R** is the correct explanation of **A**.
62. The **right** option for the mass of  $\text{CO}_2$  produced by heating 20 g of 20% pure limestone is (Atomic mass of  $\text{Ca} = 40$ )
- $$\left[ \text{CaCO}_3 \xrightarrow{1200 \text{ K}} \text{CaO} + \text{CO}_2 \right]$$
- (1) 1.76 g (2) 2.64 g  
 (3) 1.32 g (4) 1.12 g
63. Intermolecular forces are forces of attraction and repulsion between interacting particles that will include
- A. dipole-dipole forces.  
 B. dipole-induced dipole forces.  
 C. hydrogen bonding.  
 D. covalent bonding.  
 E. dispersion forces.
- Choose the **most appropriate** answer from the options given below :
- (1) A, B, C, D are correct.  
 (2) A, B, C, E are correct.  
 (3) A, C, D, E are correct.  
 (4) B, C, D, E are correct.
64. For a certain reaction, the rate =  $k [\text{A}]^2 [\text{B}]$ , when the initial concentration of **A** is tripled keeping concentration of **B** constant, the initial rate would
- (1) increase by a factor of six.  
 (2) increase by a factor of nine.  
 (3) increase by a factor of three.  
 (4) decrease by a factor of nine.
65. Taking stability as the factor, which one of the following represents **correct** relationship?
- (1)  $\text{InI}_3 > \text{InI}$   
 (2)  $\text{AlCl} > \text{AlCl}_3$   
 (3)  $\text{TlI} > \text{TlI}_3$   
 (4)  $\text{TlCl}_3 > \text{TlCl}$
66. Which of the following statements are **NOT** correct? Out of Syllabus
- A. Hydrogen is used to reduce heavy metal oxides to metals.  
 B. Heavy water is used to study reaction mechanism.  
 C. Hydrogen is used to make saturated fats from oils.  
 D. The H-H bond dissociation enthalpy is lowest as compared to a single bond between two atoms of any element.  
 E. Hydrogen reduces oxides of metals that are more active than iron.



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

- (1) B, D only  
 (2) D, E only  
 (3) A, B, C only  
 (4) B, C, D, E only
67. Weight (g) of two moles of the organic compound, which is obtained by heating sodium ethanoate with sodium hydroxide in presence of calcium oxide is
- (1) 32 (2) 30  
 (3) 18 (4) 16
68. Complete the following reaction:



[A] [B] [C] is \_\_\_\_\_.

- (1) (2)   
 (3) (4)

69. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**:  
**Assertion A**: In equation  $\Delta_r G = -nFE_{\text{cell}}$ , value of  $\Delta_r G$  depends on  $n$ .

**Reason R**:  $E_{\text{cell}}$  is an intensive property and  $\Delta_r G$  is an extensive property.

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

- (1) Both **A** and **R** are true and **R** is **NOT** the correct explanation of **A**.  
 (2) **A** is true but **R** is false.  
 (3) **A** is false but **R** is true.  
 (4) Both **A** and **R** are true and **R** is the correct explanation of **A**.
70. Amongst the following, the total number of species NOT having eight electrons around central atom in its outer most shell, is  
 $\text{NH}_3$ ,  $\text{AlCl}_3$ ,  $\text{BeCl}_2$ ,  $\text{CCl}_4$ ,  $\text{PCl}_5$  :
- (1) 2 (2) 4  
 (3) 1 (4) 3

71. The **correct** order of energies of molecular orbitals of  $\text{N}_2$  molecule, is:

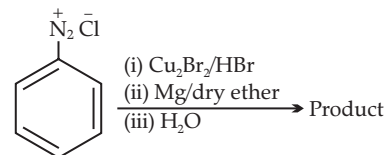
- (1)  $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < \sigma 2p_z < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y) < \sigma^* 2p_z$   
 (2)  $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < \sigma 2p_z < \sigma^* 2p_z < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y)$   
 (3)  $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y) < \sigma 2p_z < \sigma^* 2p_z$   
 (4)  $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < (\pi 2p_x = \pi 2p_y) < \sigma 2p_z < (\pi^* 2p_x = \pi^* 2p_y) < \sigma^* 2p_z$

72. A compound is formed by two elements A and B. The element B forms cubic close packed structure and atoms of A occupy 1/3 of tetrahedral voids.

If the formula of the compound is  $\text{A}_x\text{B}_y$ , then the value of  $x + y$  is in option

Out of Syllabus

- (1) 4 (2) 3  
 (3) 2 (4) 5
73. The stability of  $\text{Cu}^{2+}$  is more than  $\text{Cu}^+$  salts in aqueous solution due to
- (1) enthalpy of atomization.  
 (2) hydration energy.  
 (3) second ionisation enthalpy.  
 (4) first ionisation enthalpy.
74. Identify the product in the following reaction



- (1) (2)   
 (3) (4)

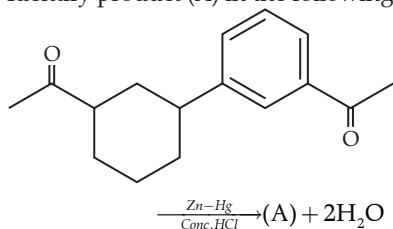
75. Given below are two statements:  
**Statement I**: A unit formed by the attachment of a base to 1' position of sugar is known as nucleoside  
**Statement II**: When nucleoside is linked to phosphorous acid at 5'-position of sugar moiety, we get nucleotide.
- In the light of the above statements, choose the **correct** answer from the options given below:
- (1) Both **Statement I** and **Statement II** are false.  
 (2) **Statement I** is true but **Statement II** is false.  
 (3) **Statement I** is false but **Statement II** is true.  
 (4) Both **Statement I** and **Statement II** are true.

76. Which one of the following statements is **correct**?

Out of Syllabus

- (1) All enzymes that utilise ATP in phosphate transfer require Ca as the cofactor.  
 (2) The bone in human body is an inert and unchanging substance.  
 (3) Mg plays roles in neuromuscular function and interneuronal transmission.  
 (4) The daily requirement of Mg and Ca in the human body is estimated to be 0.2 - 0.3 g.
77. Which of the following reactions will NOT give primary amine as the product?
- (1)  $\text{CH}_3\text{CN} \xrightarrow[\text{(ii) H}_3\text{O}^+]{\text{(i) LiAlH}_4} \text{Product}$   
 (2)  $\text{CH}_3\text{NC} \xrightarrow[\text{(ii) H}_3\text{O}^+]{\text{(i) LiAlH}_4} \text{Product}$   
 (3)  $\text{CH}_3\text{CONH}_2 \xrightarrow[\text{(ii) H}_3\text{O}^+]{\text{(i) LiAlH}_4} \text{Product}$   
 (4)  $\text{CH}_3\text{CONH}_2 \xrightarrow{\text{Br}_2 / \text{KOH}} \text{Product}$

78. Identify product (A) in the following reaction:



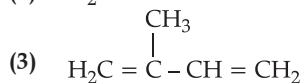
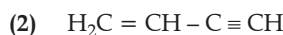
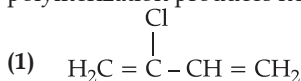
- (1)
- (2)
- (3)
- (4)

79. Match List - I with List - II:

List - I	List-II
A. Coke	I. Carbon atoms are $sp^3$ hybridised.
B. Diamond	II. Used as a dry lubricant
C. Fullerene	III. Used as a reducing agent
D. Graphite	IV. Cage like molecules

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

- (1) A-IV, B-I, C-II, D-III  
 (2) A-III, B-I, C-IV, D-II  
 (3) A-III, B-IV, C-I, D-II  
 (4) A-II, B-IV, C-I, D-III
80. Amongst the given options which of the following molecules/ion acts as a Lewis acid?
- (1)  $\text{H}_2\text{O}$  (2)  $\text{BF}_3$   
 (3)  $\text{OH}^-$  (4)  $\text{NH}_3$
81. Which amongst the following molecules on polymerization produces neoprene?



82. Some tranquilizers are listed below. Which one from the following belongs to barbiturates?

Out of Syllabus

- (1) Meprobamate  
 (2) Valium  
 (3) Veronal  
 (4) Chlordiazepoxide
83. Homoleptic complex from the following complexes is
- (1) Diamminechloridonitrito - N- platinum (II)  
 (2) Pentaamminecarbonatocobalt (III) chloride  
 (3) Triamminetriaquachromium (III) chloride  
 (4) Potassiumtrioxalatoaluminate (III)
84. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**:  
**Assertion A**: A reaction can have zero activation energy.  
**Reasons R**: The minimum extra amount of energy absorbed by reactant molecules so that their energy becomes equal to threshold value, is called activation energy.  
 In the light of the above statements, choose the **correct** answer from the options given below:
- (1) Both **A** and **R** are true and **R** is **NOT** the correct explanation of **A**.  
 (2) **A** is true but **R** is false.  
 (3) **A** is false but **R** is true.  
 (4) Both **A** and **R** are true and **R** is the correct explanation of **A**.
85. Select the **correct** statements from the following:
- A. Atoms of all elements are composed of two fundamental particles.  
 B. The mass of the electron is  $9.10939 \times 10^{-31}$  kg.  
 C. All the isotopes of a given element show same chemical properties.  
 D. Protons and electrons are collectively known as nucleons.  
 E. Dalton's atomic theory, regarded the atom as an ultimate particle of matter.
- Choose the **correct** answer from the options given below:
- (1) C, D and E only  
 (2) A and E only  
 (3) B, C and E only  
 (4) A, B and C only

## Section B

86. Match List-I with List - II:

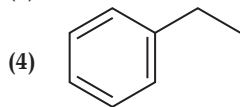
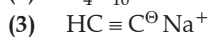
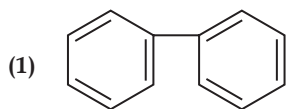
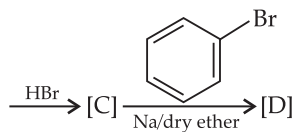
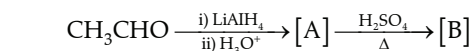
List-I (Oxoacids of Sulphur)	List-II (Bonds)
A. Peroxodisulphuric acid	I. Two S-OH, Four S=O, One S-O-S



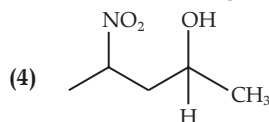
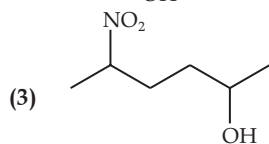
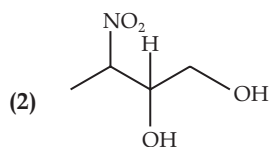
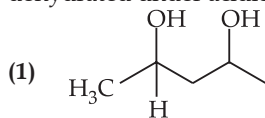
B.	Sulphuric acid	II.	Two S-OH, One S=O
C.	Pyrosulphuric acid	III.	Two S-OH, Four S=O, One S-O-O-S
D.	Sulphurous acid	IV.	Two S-OH, Two S=O

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

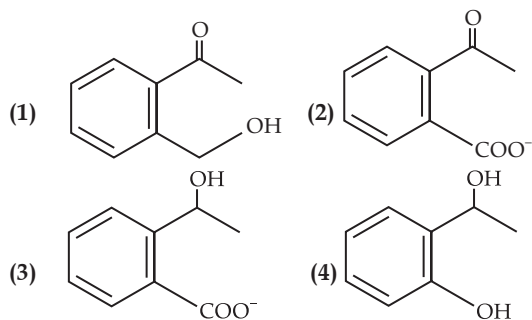
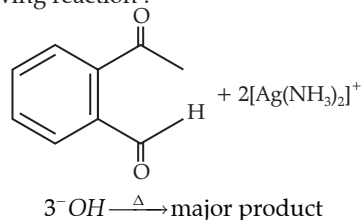
- (1) A-III, B-IV, C-I, D-II  
 (2) A-I, B-III, C-IV, D-II  
 (3) A-III, B-IV, C-II, D-I  
 (4) A-1, B-III, C-II, D-IV
87. On balancing the given redox reaction,  
 $a \text{Cr}_2\text{O}_7^{2-} + b \text{SO}_3^{2-} (\text{aq}) + c \text{H}^+ (\text{aq}) \rightarrow$   
 $2a \text{Cr}^{3+} (\text{aq}) + b \text{SO}_4^{2-} (\text{aq}) + \frac{c}{2} \text{H}_2\text{O} (\text{l})$   
 the coefficients a, b and c are found to be, respectively  
 (1) 3, 8, 1 (2) 1, 8, 3  
 (3) 8, 1, 3 (4) 1, 3, 8
88. What fraction of one edge centred octahedral void lies in one unit cell of fcc? Out of Syllabus  
 (1)  $\frac{1}{3}$  (2)  $\frac{1}{4}$   
 (3)  $\frac{1}{12}$  (4)  $\frac{1}{2}$
89. Identify the final product [D] obtained in the following sequence of reactions.



90. Which complex compound is most stable?  
 (1)  $[\text{Co}(\text{NH}_3)_3(\text{NO}_3)_3]$   
 (2)  $[\text{CoCl}_2(\text{en})_2] \text{NO}_3$   
 (3)  $[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_4)_3$   
 (4)  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Br}](\text{NO}_3)_2$
91. Which amongst the following will be most readily dehydrated under acidic conditions?



92. Given below are two statements: Out of Syllabus  
**Statement I:** The nutrient deficient water bodies lead to eutrophication.  
**Statement II:** Eutrophication leads to decrease in the level of oxygen in the water bodies.  
 In the light of the above statements, choose the **correct** answer from the options given below:  
 (1) Both **Statement I** and **Statement II** are false.  
 (2) **Statement I** is correct but **Statement II** is false.  
 (3) **Statement I** is incorrect but **Statement II** is true.  
 (4) Both **Statement I** and **Statement II** are true.
93. The reaction that does **NOT** take place in a blast furnace between 900 K to 1500 K temperature range during extraction of iron is Out of Syllabus  
 (1)  $\text{FeO} + \text{CO} \rightarrow \text{Fe} + \text{CO}_2$   
 (2)  $\text{C} + \text{CO}_2 \rightarrow 2\text{CO}$   
 (3)  $\text{CaO} + \text{SiO}_2 \rightarrow \text{CaSiO}_3$   
 (4)  $\text{Fe}_2\text{O}_3 + \text{CO} \rightarrow 2\text{FeO} + \text{CO}_2$
94. Identify the major product obtained in the following reaction:

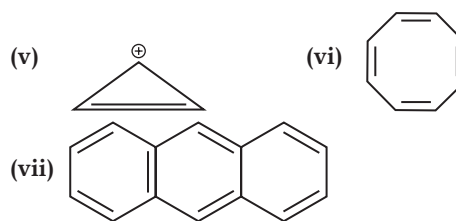
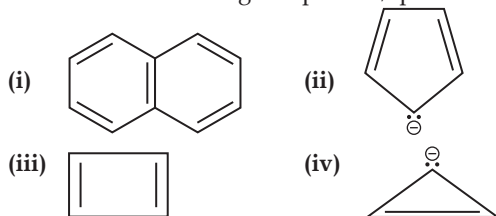


95. Which amongst the following options is the **correct** relation between change in enthalpy and change in internal energy?  
 (1)  $\Delta H = \Delta U + \Delta n_g RT$   
 (2)  $\Delta H - \Delta U = -\Delta n_g RT$

- (3)  $\Delta H + \Delta U = \Delta nR$   
 (4)  $\Delta H = \Delta U - \Delta n_g RT$
96. Which of the following statements are **INCORRECT**?
- A. All the transition metals except scandium form MO oxides which are ionic.  
 B. The highest oxidation number corresponding to the group number in transition metal oxides is attained in  $Sc_2O_3$  to  $Mn_2O_7$ .  
 C. Basic character increases from  $V_2O_3$  to  $V_2O_4$  to  $V_2O_5$ .  
 D.  $V_2O_4$  dissolves in acids to give  $VO_4^{3-}$  salts.  
 E.  $CrO$  is basic but  $Cr_2O_3$  is amphoteric.
- Choose the **correct** answer from the options given below:

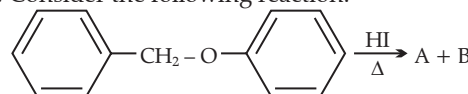
- (1) B and D only  
 (2) C and D only  
 (3) B and C only  
 (4) A and E only
97. The equilibrium concentrations of the species in the reaction  $A + B \rightleftharpoons C + D$  are 2, 3, 10 and 6 mol  $L^{-1}$ , respectively at 300 K.  $\Delta G^\circ$  for the reaction is ( $R = 2 \text{ cal/mol K}$ )
- (1)  $-137.26 \text{ cal}$   
 (2)  $-1381.80 \text{ cal}$   
 (3)  $-13.73 \text{ cal}$   
 (4)  $1372.60 \text{ cal}$

98. Consider the following compounds/species:

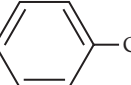
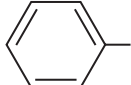
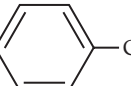
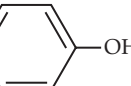
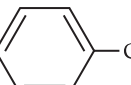
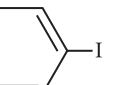
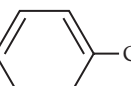
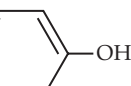


The number of compounds/species which obey Huckel's rule is \_\_\_\_\_.

- (1) 6 (2) 2  
 (3) 5 (4) 4
99. Pumice stone is an example of Out of Syllabus
- (1) gel (2) solid sol  
 (3) foam (4) sol
100. Consider the following reaction:



Identify products A and B.

- (1) A =  and B =   
 (2) A =  and B =   
 (3) A =  and B =   
 (4) A =  and B = 

## BOTANY

### Section A

101. The phenomenon of pleiotropism refers to
- (1) presence of two alleles, each of the two genes controlling a single trait.  
 (2) a single gene affecting multiple phenotypic expression.  
 (3) more than two genes affecting a single character.  
 (4) presence of several alleles of a single gene controlling a single crossover.
102. In tissue culture experiments, leaf mesophyll cells are put in a culture medium to form callus. This phenomenon may be called as :
- (1) Dedifferentiation  
 (2) Development  
 (3) Senescence  
 (4) Differentiation
103. Movement and accumulation of ions across a membrane against their concentration gradient can be explained by
- (1) Facilitated Diffusion  
 (2) Passive Transport  
 (3) Active Transport  
 (4) Osmosis
104. Among The Evil Quartet', which one is considered the most important cause driving extinction of species?
- (1) Over exploitation for economic gain  
 (2) Alien species invasions  
 (3) Co-extinctions  
 (4) Habitat loss and fragmentation
105. Upon exposure to UV radiation, DNA stained with ethidium bromide will show
- (1) Bright blue colour  
 (2) Bright yellow colour  
 (3) Bright orange colour  
 (4) Bright red colour

106. Given below are two statements: One is labelled as **Assertion A** and the other is labelled as **Reason R**:  
**Assertion A**: The first stage of gametophyte in the life cycle of moss is protonema stage.  
**Reason R**: Protonema develops directly from spores produced in capsule.  
 In the light of the above statements, choose the **most appropriate** answer from the options given below:
- (1) Both **A** and **R** are correct but **R** is NOT the correct explanation of **A**.
  - (2) **A** is correct but **R** is not correct.
  - (3) **A** is not correct but **R** is correct.
  - (4) Both **A** and **R** are correct and **R** is the correct explanation of **A**.
107. What is the role of RNA polymerase III in the process of transcription in eukaryotes?
- (1) Transcription of tRNA, 5 srRNA and snRNA
  - (2) Transcription of precursor of mRNA
  - (3) Transcription of only snRNAs
  - (4) Transcription of rRNAs (28S, 18S, and 5.8S)
108. The historic convention on Biological Diversity, 'The Earth Summit' was held in Rio de Janeiro in the year :
- |          |          |
|----------|----------|
| (1) 1992 | (2) 1986 |
| (3) 2002 | (4) 1985 |
109. Given below are two statements: One is labelled as **Assertion A** and the other is labelled as **Reason R** :  
**Assertion A**: ATP is used at two steps in glycolysis,  
**Reason R**: First ATP is used in converting glucose into glucose-6-phosphate and second ATP is used in conversion of fructose-6- phosphate into fructose-1-6-diphosphate.  
 In the light of the above statements, choose the correct answer from the options given below:
- (1) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.
  - (2) **A** is true but **R** is false.
  - (3) **A** is false but **R** is true.
  - (4) Both **A** and **R** are true and **R** is the correct explanation of **A**.
110. The thickness of ozone in a column of air in the atmosphere is measured in terms of: Out of Syllabus
- |              |                  |
|--------------|------------------|
| (1) Decibels | (2) Decameter    |
| (3) Kilobase | (4) Dobson units |
111. Given below are two statements: Out of Syllabus  
**Statement I**: Endarch and exarch are the terms often used for describing the position of secondary xylem in the plant body.  
**Statement II**: Exarch condition is the most common feature of the root system.  
 In the light of the above statements, choose the **correct** answer from the options given below:
- (1) Both **Statement I** and **Statement II** are false.
  - (2) **Statement I** is correct but **Statement II** false.
  - (3) **Statement I** is incorrect but **Statement II** is true.
  - (4) Both **Statement I** and **Statement II** are true.
112. Identify the pair of heterosporous pteridophytes among the following:
- (1) *Selaginella* and *Salvinia*
  - (2) *Pilotum* and *Salvinia*
  - (3) *Equisetum* and *Salvinia*
  - (4) *Lycopodium* and *Selaginella*
113. Identify the **correct** statements :
- A. Detrivores perform fragmentation.
  - B. The humus is further degraded by some microbes during mineralization.
  - C. Water soluble inorganic nutrients go down into the soil and get precipitated by a process called leaching.
  - D. The detritus food chain begins with living organisms.
  - E. Earthworms break down detritus into smaller particles by a process called catabolism.
- Choose the **correct** answer from the options given below:
- |                  |                  |
|------------------|------------------|
| (1) B, C, D only | (2) C, D, E only |
| (3) D, E, A only | (4) A, B, C only |
114. Axile placentation is observed in
- (1) China rose, Beans and Lupin
  - (2) Tomato, *Dianthus* and Pea
  - (3) China rose, *Petunia* and Lemon
  - (4) Mustard, Cucumber and Primrose
115. Family Fabaceae differs from Solanaceae and Liliaceae. With respect to the stamens, pick out the characteristics specific to family Fabaceae but not found in Solanaceae or Liliaceae. Out of Syllabus
- (1) Polyadelphous and epipetalous stamen
  - (2) Monoadelphous and Monotheccou anthers
  - (3) Epiphylous and Dithecous anthers
  - (4) Diadelphous and Dithecous anthers
116. The reaction centre in PS II has an absorption maxima at
- |            |            |
|------------|------------|
| (1) 700 nm | (2) 660 nm |
| (3) 780 nm | (4) 680 nm |
117. During the purification process for recombinant DNA technology, addition of chilled ethanol precipitates out
- |                     |              |
|---------------------|--------------|
| (1) DNA             | (2) Histones |
| (3) Polysaccharides | (4) RNA      |
118. Among eukaryotes, replication of DNA takes place in
- |                          |                          |
|--------------------------|--------------------------|
| (1) S phase              | (2) G <sub>1</sub> phase |
| (3) G <sub>1</sub> phase | (4) M phase              |
119. The process of appearance of recombination nodules occurs at which sub stage of prophase I in meiosis?
- |                |               |
|----------------|---------------|
| (1) Pachytene  | (2) Diplotene |
| (3) Diakinesis | (4) Zygotene  |

120. How many ATP and NADPH<sub>2</sub> are required for the synthesis of one molecule of glucose during calvin cycle?
- 18 ATP and 12 NADPH<sub>2</sub>
  - 12 ATP and 16 NADPH<sub>2</sub>
  - 18 ATP and 16 NADPH<sub>2</sub>
  - 12 ATP and 12 NADPH<sub>2</sub>
121. In the equation
- GPP - R = NPP
- GPP is Gross Primary Productivity  
NPP is Net Primary Productivity  
R here is \_\_\_\_\_.
- Respiratory quotient
  - Respiratory loss
  - Reproductive allocation
  - Photosynthetically active radiation
122. Large, colourful, fragrant flowers with nectar are seen in:
- bird pollinated plants
  - bat pollinated plants
  - wind pollinated plants
  - insect pollinated plants
123. Spraying of which of the following phytohormone on juvenile conifers helps in hastening the maturity period, that leads to early seed production?
- Gibberellic Acid
  - Zeatin
  - Absciscic Acid
  - Indole-3-butyric Acid
124. Which micronutrient is required for splitting of water molecule during photosynthesis?
- molybdenum
  - magnesium
  - copper
  - manganese
125. Expressed Sequence Tags (ESTs) refers to
- All genes that are expressed as proteins.
  - All genes whether expressed or unexpressed.
  - Certain important expressed genes.
  - All genes that are expressed as RNA.
126. Frequency of recombination between gene pairs on same chromosome as a measure of the distance between genes to map their position on chromosome, was used for the first time by
- Sutton and Boveri
  - Alfred Sturtevant
  - Henking
  - Thomas Hunt Morgan
127. Given below are two statements: Out of Syllabus
- Statement I:** The forces generated by transpiration can lift a xylem-sized column of water over 130 meters height.
- Statement II:** Transpiration cools leaf surfaces sometimes 10 to 15 degrees, by evaporative cooling. In the light of the above statements, choose the **most appropriate** answer from the options given below:
- Both **Statement I** and **Statement II** are incorrect.
  - Statement I** is correct but **Statement II** is incorrect.
  - Statement I** is incorrect but **Statement II** is correct.
  - Both **Statement I** and **Statement II** are correct.
128. The gene gun method used to introduce alien DNA into host cells, microparticles of \_\_\_\_\_ metal are used.
- Zinc
  - Tungsten or gold
  - Silver
  - Copper
129. Given below are two statements: One is labelled as **Assertion A** and the other is labelled as **Reason R**:  
**Assertion A:** Late wood has fewer xylary elements with narrow vessels. Out of Syllabus  
**Reason R:** Cambium is less active in winters. In the light of the above statements, choose the **correct** answer from the options given below:
- Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.
  - A** is true but **R** is false.
  - A** is false but **R** is true.
  - Both **A** and **R** are true and **R** is the correct explanation of **A**.
130. What is the function of tassels in the corn cob?
- To trap pollen grains
  - To disperse pollen grains
  - To protect seeds
  - To attract insects
131. In angiosperm, the haploid, diploid and triploid structures of a fertilized embryo sac sequentially are:
- Antipodals, synergids, and primary endosperm nucleus
  - Synergids, zygote and primary endosperm nucleus
  - Synergids, antipodals and polar nuclei
  - Synergids, primary endosperm nucleus and zygote
132. Which hormone promotes internode/petiole elongation in deep water rice?
- Kinetin
  - Ethylene
  - 2, 4-D
  - GA<sub>3</sub>
133. Which of the following stages of meiosis involves division of centromere?
- Metaphase II
  - Anaphase II
  - Telophase
  - Metaphase I
134. Unequivocal proof that DNA is the genetic material was first proposed by
- Alfred Hershey and Martha Chase
  - Avery, Macleoid and McCarthy
  - Wilkins and Franklin
  - Frederick Griffith
135. Cellulose does not form blue colour with Iodine because
- It is a helical molecule.
  - It does not contain complex helices and hence cannot hold iodine molecules.
  - It breaks down when iodine reacts with it.
  - It is a disaccharide.

## Section B

136. Match List I with List II:

List I		List II	
A.	Oxidative decarboxylation	I.	Citrate synthase
B.	Glycolysis	II.	Pyruvate dehydrogenase
C.	Oxidative phosphorylation	III.	Electron transport system
D.	Tricarboxylic acid cycle	IV.	EMP pathway

Choose the correct answer from the option given below:

- (1) A-II, B-IV, C-I, D-III
- (2) A-III, B-I, C-II, D-IV
- (3) A-II, B-IV, C-III, D-I
- (4) A-III, B-IV, C-II, D-I

137. Which of the following combinations required for chemiosmosis?

- (1) Membrane, proton pump, proton gradient, NADP synthase
- (2) Proton pump, electron gradient, ATP synthase
- (3) Proton pump, electron gradient, NADP synthase
- (4) Membrane, proton pump, proton gradient, ATP synthase

138. Melonate inhibits the growth of pathogenic bacteria by inhibiting the activity of

- (1) Amylase
- (2) Lipase
- (3) Dinitrogenase
- (4) Succinic dehydrogenase

139. Given below are two statements : One labelled as **Assertion A** and the other labelled as **Reason R**:

**Assertion A:** In gymnosperms the pollen grains are released from the microsporangium and carried by air currents.

**Reason R:** Air currents carry the pollen grains to the mouth of the archegonia where the male gametes are discharged and pollen tube is not formed.

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

- (1) Both A and R are true but R is NOT the correct explanation of A.
- (2) A is true but R is false.
- (3) A is false but R is true.
- (4) Both A and R are true and R is the correct explanation of A.

140. Main steps in the formation of Recombinant DNA are given below. Arrange these steps in a correct sequence.

- A. Insertion of recombinant DNA into the host cell.
- B. Cutting of DNA at specific location by restriction enzyme.
- C. Isolation of desired DNA fragment.
- D. Amplification of gene of interest using PCR.

Choose the correct answer from the options given below:

- (1) C, A, B, D
- (2) C, B, D, A
- (3) B, D, A, C
- (4) B, C, D, A

141. Match List I with List II :

List I		List II	
A.	Cohesion	I.	More attraction in liquid phase
B.	Adhesion	II.	Mutual attraction among water molecules
C.	Surface tension	III.	Water loss in liquid phase
D.	Guttation	IV.	Attraction towards polar surfaces

Choose the correct answer from the options given below:

- (1) A-IV, B-III, C-II, D-I
- (2) A-III, B-I, C-IV, D-II
- (3) A-II, B-I, C-IV, D-III
- (4) A-II, B-IV, C-I, D-III

142. Which one of the following statements is NOT correct?

Out of Syllabus

- (1) Algal blooms caused by excess of organic matter in water improve water quality and promote fisheries.
- (2) Water hyacinth grows abundantly in eutrophic water bodies and leads to an imbalance in the ecosystem dynamics of the water body.
- (3) The amount of some toxic substances of industrial waste water increases in the organisms at successive trophic levels.
- (4) The micro-organisms involved in biodegradation of organic matter in a sewage polluted water body consume a lot of oxygen causing the death of aquatic organisms.

143. How many different proteins does the ribosome consist of?

- (1) 60
- (2) 40
- (3) 20
- (4) 80

144. Match List I with List II:

List I (Interaction)		List II (Species A and B)	
A.	Mutualism	I.	+ (A), O(B)
B.	Commensalism	II.	- (A), O(B)
C.	Amensalism	III.	+ (A), -(B)
D.	Parasitism	IV.	+ (A), +(B)

Choose the correct answer from the options given below:

- (1) A-IV, B-I, C-II, D-III
- (2) A-IV, B-III, C-I, D-II
- (3) A-III, B-I, C-IV, D-II
- (4) A-IV, B-II, C-I, D-III

145. Given below are two statements : One is labelled as **Assertion A** and the other is labeled as **Reason R**:



**Assertion A:** A flower is defined as modified shoot wherein the shoot apical meristem changes to floral meristem.

**Reason R:** Internode of the shoot gets condensed to produce different floral appendages laterally at successive nodes instead of leaves.

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

- (1) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.
- (2) **A** is true but **R** is false.
- (3) **A** is false but **R** is true.
- (4) Both **A** and **R** are true and **R** is the correct explanation of **A**.

146. Identify the **correct** statements: Out of Syllabus

- A. Lenticels are the lens-shaped openings permitting the exchange of gases.
- B. Bark formed early in the season is called hard bark.
- C. Bark is a technical term that refers to all tissues exterior to vascular cambium.
- D. Bark refers to periderm and secondary phloem.
- E. Phellogen is single-layered in thickness.

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

- (1) A and D only
- (2) A, B and D only
- (3) B and C only
- (4) B, C and E only

147. Given below are two statements :

**Statement I:** Gause's 'Competitive Exclusion Principle states that two closely related species competing for the same resources cannot co-exist indefinitely and competitively inferior one will be eliminated eventually.

**Statement II:** In general, carnivores are more adversely affected by competition than herbivores. In the light of the above statements, choose the **correct** answer from the options given below:

- (1) Both **Statement I** and **Statement II** are false.
- (2) **Statement I** is correct but **Statement II** is false.
- (3) **Statement I** is incorrect but **Statement II** is true.
- (4) Both **Statement I** and **Statement II** are true.

148. Which of the following statements are correct about Klinefelter's Syndrome?

- A. This disorder was first described by Langdon Down (1866).
- B. Such an individual has overall masculine development. However, the feminine development is also expressed.
- C. The affected individual is short statured.
- D. Physical, psychomotor and mental development is retarded.
- E. Such individuals are sterile.

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

- (1) C and D only
- (2) B and E only
- (3) A and E only
- (4) A and B only

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

List I		List II	
A.	M Phase	I.	Proteins are synthesized
B.	G <sub>2</sub> Phase	II.	Inactive phase
C.	Quiescent stage	III.	Interval between mitosis and initiation of DNA replication
D.	G <sub>1</sub> Phase	IV.	Equational division

Choose the correct answer from the options given below:

- (1) A-IV, B-II, C-I, D-III
- (2) A-IV, B-I, C-II, D-III
- (3) A-II, B-IV, C-I, D-III
- (4) A-III, B-II, C-IV, D-I

150. Match **List I** with **List II**: Out of Syllabus

List I		List II	
A.	Iron	I.	Synthesis of auxin
B.	Zinc	II.	Component of nitrate reductase
C.	Boron	III.	Activator of catalase
D.	Molybdenum	IV.	Cell elongation and differentiation

Choose the correct answer from the options given below:

- (1) A-II, B-III, C-IV, D-I
- (2) A-III, B-I, C-IV, D-II
- (3) A-II, B-IV, C-I, D-III
- (4) A-III, B-II, C-I, D-IV

## ZOOLOGY

### Section A

151. Given below are two statements:

**Statement I:** In prokaryotes, the positively charged DNA is held with some negatively charged proteins in a region called nucleoid.

**Statement II:** In eukaryotes, the negatively charged DNA is wrapped around the positively charged histone octamer to form nucleosome.

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

- (1) Both the **statements I** and **Statement II** are false.
- (2) **Statement I** is correct but **Statement II** is false.
- (3) **Statement I** incorrect but **Statement II** is true.
- (4) Both **Statement I** and **Statement II** are true.



152. In which blood corpuscles, the HIV undergoes replication and produces progeny viruses?

- (1) B-lymphocytes (2) Basophils  
(3) Eosinophils (4) T<sub>H</sub> cells

153. Which of the following statements is correct?

Out of Syllabus

- (1) Biomagnification refers to increase in concentration of the toxicant at successive trophic levels.  
(2) Presence of large amount of nutrients in water restricts 'Algal Bloom'.  
(3) Algal Bloom decreases fish mortality.  
(4) Eutrophication refers to increase in domestic sewage and waste water in lakes.

154. Match List I with List II.

List I		List II	
A.	P-wave	I.	Beginning of systole
B.	Q-wave	II.	Repolarisation of ventricles
C.	QRS complex	III.	Depolarisation of atria
D.	T-wave	IV.	Depolarisation of ventricles

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

- (1) A-IV, B-III, C-II, D-I  
(2) A-II, B-IV, C-I, D-III  
(3) A-1, B-II, C-III, D-IV  
(4) A-III, B-I, C-IV, D-II

155. Broad palm with single palm crease is visible in a person suffering from-

- (1) Turner's syndrome  
(2) Klinefelter's syndrome  
(3) Thalassemia  
(4) Down's syndrome

156. Given below are two statements:

**Statement I:** RNA mutates at a faster rate.

**Statement II:** Viruses having RNA genome and shorter life span mutate and evolve faster.

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

- (1) Both **Statement I** and **Statement II** are false.  
(2) **Statement I** is true but **Statement II** is false.  
(3) **Statement I** false but **Statement II** is true.  
(4) Both **Statement I** and **Statement II** are true.

157. Given below are statements:

**Statement I:** Ligaments are dense irregular tissue.

**Statement II:** Cartilage is dense regular tissue.

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

- (1) Both **Statement I** and **Statement II** are false.  
(2) **Statement I** is true but **Statement II** is false.  
(3) **Statement I** false but **Statement II** is true.  
(4) Both **Statement I** and **Statement II** are true.

158. Given below are statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**.  
**Assertion A:** Nephrons are of two types: Cortical & Juxta medullary, based on their relative position in cortex and medulla.

**Reason R:** Juxta medullary nephrons have short loop of Henle whereas, cortical nephrons have longer loop of Henle.

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

- (1) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.  
(2) **A** is true but **R** is false.  
(3) **A** is false but **R** is true.  
(4) Both **A** and **R** are true and **R** is the correct explanation of **A**.

159. Which of the following is not a cloning vector?

- (1) YAC (2) pBR322  
(3) Probe (4) BAC

160. Given below are two statements:

**Statement I:** A protein is imagined as a line, the left end represented by first amino acid (C-terminal) and the right end represented by last amino acid (N-terminal).

**Statement II:** Adult human haemoglobin, consist of 4 subunits (two subunits of  $\alpha$  type and two subunits of  $\beta$  type).

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

- (1) Both **Statement I** and **Statement II** are false.  
(2) **Statement I** is true but **Statement II** is false.  
(3) **Statement I** is false but **Statement II** is true.  
(4) Both **Statement I** and **Statement II** are true.

161. Once the undigested and unabsorb substances center the caecum, their back is prevented by-

Out of Syllabus

- (1) ileo-caecal valve  
(2) Gastro-oesophageal sphincter  
(3) Pyloric sphincter  
(4) Sphincter of Oddi

162. Match List I with List II.

List I		List II	
A.	Vasectomy	I.	Oral method
B.	Coitus	II.	Barrier method
C.	Cervical caps	III.	Surgical method
D.	Saheli	IV.	Natural method

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

- (1) A-III, B-IV, C-II, D-I  
(2) A-II, B-III, C-I, D-IV  
(3) A-IV, B-II, C-I, D-III  
(4) A-III, B-I, C-IV, D-II

163. Which of the following functions is carried out by cytoskeleton in a cell?

- (1) Protein synthesis

- (2) Motility  
(3) Transportation  
(4) Nuclear division
164. Which one of the following common sexually transmitted diseases is completely curable when detected early and treated properly?  
(1) Gonorrhoea (2) Hepatitis-B  
(3) HIV Infection (4) Genital herpes
165. Vital capacity of lung is \_\_\_\_\_.  
(1) IRV + ERV + TV + RV  
(2) IRV + ERV + TV - RV  
(3) IRV + ERV + TV  
(4) IRV + ERV
166. Which of the following are NOT considered as the part of endomembrane system?  
A. Mitochondria  
B. Endoplasmic Reticulum  
C. Chloroplasts  
D. Golgi complex
- Choose the **most appropriate** answer from the options below:  
(1) A, C and E only  
(2) A and D only  
(3) A, D and E only  
(4) B and D only
167. Match List I with List II.

List I		List II	
A.	CCK	I.	Kidney
B.	GIP	II.	Heart
C.	ANF	III.	Gastric gland
D.	ADH	IV.	Pancrease

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

- (1) A-III, B-II, C-IV, D-I  
(2) A-II, B-IV, C-I, D-III  
(3) A-IV, B-II, C-III, D-I  
(4) A-IV, B-III, C-II, D-I
168. Match List I with List II.

List I		List II	
A.	Gene 'a'	I.	$\beta$ -galactosidase
B.	Gene 'y'	II.	Transacetylase
C.	Gene 'i'	III.	Permease
D.	Gene 'z'	IV.	Repressor protein

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

- (1) A-II, B-III, C-IV, D-I  
(2) A-III, B-IV, C-I, D-II  
(3) A-III, B-I, C-IV, D-II  
(4) A-II, B-I, C-IV, D-III
169. Match List I with List II with respect to human eye. Out of Syllabus

List I		List II	
A.	Fovea	I.	Visible coloured portion of eye that regulates diameter of pupil.

B.	Iris	II.	External layer of eye formed of dense connective tissue.
C.	Blind spot	III.	Point of greatest visual acuity or resolution.
D.	Sclera	IV.	Point where optic nerve leaves the eyeball and photoreceptor cells are absent.

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

- (1) A-IV, B-III, C-II, D-I  
(2) A-I, B-IV, C-III, D-II  
(3) A-II, B-I, C-III, D-IV  
(4) A-III, B-I, C-IV, D-II
170. Select the correct group/set of Australian Marsupials exhibiting adaptive radiation.  
(1) Numbat, Spotted cuscus, Flying phalanger  
(2) Mole, Flying squirrel, Tasmanian tiger cat  
(3) Lemur, Anteater, Wolf  
(4) Tasmanian wolf, Bobcat, Marsupial mole
171. Given below are two statements:

**Statements I:** Vas deferens receives a duct from seminal vesicle and opens into urethra as the ejaculatory duct.

**Statements II:** The cavity of the cervix is called cervical canal which along with vagina forms birth canal.

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

- (1) Both **Statements I** and **Statements II** are false.  
(2) **Statements I** is correct but **Statements II** is false.  
(3) **Statements I** incorrect but **Statement II** is true.  
(4) Both **Statement I** and **Statement II** are true.
172. Match List I with List II.

List I		List II	
A.	Heroin	I.	Effect on cardiovascular system
B.	Morphine	II.	Slow down body function
C.	Cocaine	III.	Painkiller
D.	Morphine	IV.	Interfere with transport of dopamine

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

- (1) A-I, B-II, C-III, D-IV  
(2) A-IV, B-III, C-II, D-I  
(3) A-III, B-IV, C-I, D-II  
(4) A-II, B-I, C-IV, D-III

173. Given below are two statements:

List I		List II	
A.	Ringworm	I.	<i>Haemophilus influenzae</i>
B.	Filariasis	II.	<i>Trichophyton</i>
C.	Malaria	III.	<i>Wuchereria bancrofti</i>
D.	Pneumonia	IV.	<i>Plasmodium vivax</i>

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

- (1) A-II, B-III, C-I, D-IV
- (2) A-III, B-II, C-I, D-IV
- (3) A-III, B-II, C-IV, D-I
- (4) A-II, B-II, C-IV, D-I

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

**Assertion A:** Amniocentesis for sex determination is one of the strategies of Reproductive and Child Health Care Programme.

**Reason R:** Ban on amniocentesis checks increasing menace of female foeticide.

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

- (1) Both **A** and **R** are true and **R** is NOT the correct explanation of **A**.
- (2) **A** is true but **R** is false.
- (3) **A** is false but **R** is true.
- (4) Both **A** and **R** are true and **R** is the correct explanation of **A**.

175. Radial symmetry is not found in adults of phylum\_\_\_\_\_.

- (1) Hemichordate
- (2) Coelenterata
- (3) Echinodermata
- (3) Ctenophora

176. Given below are two statements:

**Statement I:** Low temperature preserves the enzyme in a temporarily inactive state activity because proteins are denatured by whereas high temperature destroys enzymatic activity because proteins are denatured by heat.

**Statement II:** When the inhibitor closely resembles the substrate in its molecular structure and inhibits the activity of the enzyme, it is known as competitive inhibitor.

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

- (1) Both **Statements I** and **Statements II** are false.
- (2) **Statements I** is true but **Statements II** is false.
- (3) **Statements I** is false but **statements II** is true.
- (4) Both **Statements I** and **statements II** are true.

177. Match **List I** and **List II**.

List I		List II	
A.	Taenia	I.	Nephridia
B.	<i>Paramecium</i>	II.	Contractile vacuole
C.	<i>Periplaneta</i>	III.	Flame cells
D.	<i>Pheretima</i>	IV.	Urecose gland

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

- (1) A-I, B-II, C-IV, D-III
- (2) A-III, B-II, C-IV, D-I
- (3) A-II, B-I, C-IV, D-III
- (4) A-I, B-II, C-III, D-IV

178. Which of the following statements are correct regarding female reproductive cycle?

- A. In non-primate mammals cyclical changes during reproduction are called oestrus cycle.
- B. First menstrual cycle begins at puberty and is called menopause.
- C. Lack of menstruation may be indicative of pregnancy.
- D. Cyclic menstruation extends between menarche and menopause.

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

- (1) A and B only
- (2) A, B and C only
- (3) A, C and D only
- (4) A and D only

179. Given below are two statements: Out of Syllabus

**Statements I:** Electrostatic precipitator is most widely used in thermal power plant.

**Statement II:** Electrostatic precipitator in thermal power plant removes ionising radiations

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) **Statement I** is correct but **Statement II** is incorrect.
- (3) **Statement I** incorrect but **Statement II** is correct.
- (4) Both **Statement I** and **Statement II** are correct.

180. Match **List I** and **List II**.

Out of Syllabus

List I (Cells)		List II (Secretion)	
A.	Peptic cells	I.	Mucus
B.	Goblet cells	II.	Bile juice
C.	Oxyntic cells	III.	Proenzyme pepsinogen
D.	Hepatic cells	IV.	HCl and intrinsic factor for absorption of vitamin B <sub>12</sub>

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

- (1) A-II, B-I, C-III, D-IV
- (2) A-III, B-I, C-IV, D-II
- (3) A-II, B-IV, C-I, D-III
- (4) A-IV, B-III, C-II, D-I

181. Given below are two statements: one labelled as **Assertion A** and the other is labelled as **Reason R**.  
**Assertion A:** Endometrium is necessary for implantation of blastocyst.

**Reason R:** In the absence of fertilization, the corpus luteum degenerates that causes disintegration of endometrium.

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

- (1) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.
- (2) **A** is true but **R** is false.
- (3) **A** is false but **R** is true.
- (4) Both **A** and **R** are true and **R** is the correct explanation of **A**.

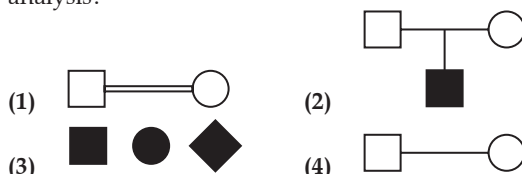
182. Match **List I** with **List II**.

List I (Type of Joint)		List II (Found between)	
A.	Cartilaginous	I.	Between flat skull bones
B.	Ball and Socket Joint	II.	Between adjacent vertebrae in vertebral column
C.	Fibrous Joint	III.	Between carpal and metacarpal of thumb
D.	Saddle Joint	IV.	Between humerus and pectoral girdle

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

- (1) A-II, B-IV, C-I, D-III
- (2) A-I, B-IV, C-III, D-II
- (3) A-II, B-IV, C-III, D-I
- (4) A-III, B-I, C-II, D-IV

183. Which one of the following symbols represents mating between relatives in human pedigree analysis?



184. Which one of the following techniques does not serve the purpose of early diagnosis of a disease for its early treatment?

- (1) Serum and Urine analysis
- (2) Polymerase Chain Reaction (PCR) technique
- (3) Enzyme Linked Immuno-Sorbent Assay (ELISA) technique
- (4) Recombinant DNA Technology

185. Match **List I** with **List II**.

List I (Interacting species)		List II (Name of interaction)	
A.	A leopard and a lion in a forest/grassland	I.	Competition
B.	A cuckoo laying egg in a crow's nest	II.	Brood parasitism

C.	Fungi and root of a higher plant in mycorrhizae	III.	Mutualism
D.	A cattle egret and a cattle in a field	IV.	Commensalism

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

- (1) A-I, B-II, C-IV, D-III
- (2) A-III, B-IV, C-I, D-II
- (3) A-II, B-III, C-I, D-IV
- (4) A-I, B-II, C-III, D-IV

## Section B

186. Given below are two statements:

**Statement I:** During  $G_0$  phase of cell cycle, the cell is metabolically inactive.

**Statement II:** The centrosome undergoes duplication during S phase of interphase.

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) **Statement I** is correct but
- (3) **Statement I** is incorrect but **Statement II** is correct.
- (4) Both **Statement I** and **Statement II** are correct.

187. Match **List I** with **List II**.

List I		List II	
A.	Logistic growth	I.	Unlimited resource availability condition
B.	Exponential	II.	Limited resource availability condition
C.	Expanding age pyramid	III.	The percent individuals of pre reproductive age is largest followed by reproductive and post reproductive age groups
D.	Stable age pyramid	IV.	The percent individuals of pre-reproductives and reproductive age group are same

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

- (1) A-II, B-III, C-I, D-IV
- (2) A-II, B-IV, C-I, D-III
- (3) A-II, B-IV, C-III, D-I
- (4) A-II, B-I, C-III, D-IV

188. In cockroach, excretion is brought about by-

Out of Syllabus

- |                      |                  |
|----------------------|------------------|
| A. Phallic gland     | B. Urecose gland |
| C. Nephrocytes       | D. Fat body      |
| E. Collateral glands |                  |

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

- (1) A, B and E only      (2) B, C and D only  
(3) B and D only      (4) A and E only

189. Select the correct statements.

- A. Tetrad formation is seen during leptotene.  
B. During anaphase, the centromeres split and chromatids separate.  
C. Terminalization takes place during pachytene.  
D. Nucleolus, golgi complex and ER are reformed during telophase.  
E. Crossing over takes place between sister chromatids of homologous chromosome.

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

- (1) B and D only  
(2) A, C and E only  
(3) B and E only  
(4) A and C only

190. Which of the following are NOT under the control of thyroid hormone?

- A. Maintenance of water and electrolyte balance.  
B. Regulation of basal metabolic rate.  
C. Normal rhythm of sleep-wake cycle.  
D. Development of immune system.  
E. Support the process of R.B.Cs formation.

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

- (1) B and C only  
(2) C and D only  
(3) D and E only  
(4) A and D only

191. Which of the following is characteristic feature of cockroach regarding sexual dimorphism?

Out of Syllabus

- (1) Presence of anal styles  
(2) Presence of sclerites  
(3) Presence of anal cerci  
(4) Dark brown body colour and anal cerci

192. Which of the following statements are correct?

- A. Basophils are most abundant cells of the total WBCs.  
B. Basophils secrete histamine, serotonin and heparin.  
C. Basophils are involved in inflammatory response.  
D. Basophils have kidney shaped nucleus.  
E. Basophils are agranulocytes.

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

- (1) C and E only      (2) B and C only  
(3) A and B only      (4) D and E only

193. Which of the following statements are correct?

- A. An excessive loss of body fluid from the body switches off osmoreceptors.  
B. ADH facilitates water reabsorption to prevent diuresis.

- C. ANF causes vasodilation.  
D. ADH causes increase in blood pressure.  
E. ADH is responsible for decrease in GFR.

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

- (1) B, C and D only  
(2) A, B and E only  
(3) C, D and E only  
(4) A and B only

194. Match **List I** with **List II**.

List I		List II	
A.	Mast cells	I.	Ciliated epithelium
B.	Inner surface of bronchiole	II.	Areolar
C.	Blood.	III.	Cuboidal epithelium
D.	Tubular parts	IV.	specialised connective tissue

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

- (1) A-II, B-III, C-I, D-IV  
(2) A-II, B-I, C-IV, D-III  
(3) A-III, B-IV, C-II, D-I  
(4) A-I, B-II, C-IV, D-III

195. Select the correct statements with reference to chordates.

- A. Presence of a mid-dorsal, solid and double nerve cord.  
B. Presence of closed circulatory system.  
C. Presence of paired pharyngeal gillslits.  
D. Presence of dorsal heart  
E. Triploblastic pseudocoelomate animals.

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

- (1) B and C only  
(2) B, D and E only  
(3) C, D and E only  
(4) A, C and D only

196. The unique mammalian characteristics are:

- (1) hairs, pinna and mammary glands  
(2) hairs, pinna and indirect development  
(3) pinna, monocondylic skull and mammary glands  
(4) hairs, tympanic membrane and mammary glands

197. The parts of human brain that helps in regulation of sexual behaviour, expression of excitement, pleasure, rage, fear etc. are :

- (1) Corpora quadrigemina & hippocampus  
(2) Brain stem & epithalamus  
(3) Corpus callosum and thalamus  
(4) Limbic system & hypothalamus

198. Which one of the following is the sequence on corresponding coding strand, if the sequence on *mRNA* formed follows  
 5'AUCGAUCGAUCGAUCGAUGG AUCG AUCG 3'?
- (1) 3' UAGCUAGCUAGCUAGCUA  
GCUAGCUAGC 5'
  - (2) 5' ATCGATCGATCGATCGATCG  
ATCGATCG 3'
  - (3) 3' ATCGATCGATCGATCGATG ATCGATCG  
5'
  - (4) 5' UAGCUAGCUAGCUAGCUA GCUAGC  
UAGC 3'
199. Which of the following statements are correct regarding skeletal muscle?
- A. Muscle bundles are held together by collagenous connective tissue layer called fascicle.
  - B. Sarcoplasmic reticulum of muscle fiber is a store house of calcium ions.
  - C. Striated appearance of skeletal muscle fibre is due to distribution pattern actin and myosin proteins.
  - D. M line is considered as functional of contraction called sarcomere.
- Choose the **most appropriate** answer from the options given below:
- (1) B and C only
  - (2) A, C and D only
  - (3) C and D only
  - (4) A, B and C only
200. Which one of the following is NOT an advantage of inbreeding?
- (1) It exposes harmful recessive genes that are eliminated by selection.
  - (2) Elimination of less desirable genes and accumulation of superior genes takes place due to it.
  - (3) It decreases the productivity of inbred population, after continuous inbreeding.
  - (4) It decreases homozygosity.

□□□



<b>Booklet</b>	<b>Batch</b>	<b>RollNumber</b>			<b>Test Center</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
(A) 10+1 (S)		0 0 0 0 0 0 0 0 0	Name <input type="text"/>		0 0
(B) 10-2 (V)		1 1 1 1 1 1 1 1 1	<input type="text"/>		1 1
(C) 10-3 (A)		2 2 2 2 2 2 2 2 2	<input type="text"/>		2 2
(D) Crash (C)		3 3 3 3 3 3 3 3 3	<input type="text"/>		3 3
(E)		4 4 4 4 4 4 4 4 4	Test Date <input type="text"/>	Invigilator's Signature	4 4
(F) Paper		5 5 5 5 5 5 5 5 5	<input type="text"/>		5 5
(G)		6 6 6 6 6 6 6 6 6	Student's Signature		6 6
(H) Paper 1 (1)		7 7 7 7 7 7 7 7 7	<input type="text"/>		7 7
(I) Paper 2 (2)		8 8 8 8 8 8 8 8 8	<input type="text"/>		8 8
(J)		9 9 9 9 9 9 9 9 9			9 9

The OMR Sheet will be computer checked. Fill the circles completely and dark enough for proper detection. Use ballpen (black or blue) for marking.

**Avoid Improper Marking**

Partially Filled

Lightly Filled

Certified that all the entries in this section have been properly filled by the student

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 Name
<b>PHYSICS</b>			
1	2	Acceleration	Kinematics
2	2	Displacement Current	Alternating Current
3	3	Radioactivity	Nucleus
4	4	Gauss Law In Magnetism	Magnetism
5	4	Combination of Capacitors	Capacitors
6	1	Fundamental Mode Of Vibration In Organ Pipe	Waves
7	1	Hydrogen Spectrum	Atoms
8	4	Transformer	Electro Magnetic Induction
9	1	Electrical Circuits	Current Electricity
10	3	Magnetic Energy	Electromagnetic Induction
11	3	Spring Potential Energy	Work Power And Energy
12	3	Errors	Units And Measurement
13	2	Colour Code of Resistance	Current Electricity
14	2	Errors	Units And Measurement
15	3	Total Internal Reflection	Geometrical Optics
16	2	Electromagnetic Wave	Electromagnetic Wave
17	4	Moment of Inertia	Rigid Body Mechanics
18	2	Surface Tension	Fluid Mechanics
19	3	LCR Series Circuit	Alternating Current
20	4	Gauss Law I Electrostatics	Electrostatics
21	1	Venturimeter	Fluid Mechanics
22	2	Gravitational Potential	Gravitation
23	1	Molecular Speeds Of Ideal Gases	Kinetic Theory of Gases
24	1	X-Rays	Dual Nature of Matter And Radiation
25	2	Average Velocity	One Dimensional Motion
26	3	Circular Motion	Circular Motion
27	1	Stress	Mechanics Of Solid
28	2	Rectifier	Semiconductors
29	3	Torque Experienced by an Electric Dipole Placed in External Field	Electrostatics
30	4	Carnot Engine	Thermodynamics
31	2	Youngs Double Slit Experiment	Wave Optics
32	4	Photoelectric Effect	Dual Nature of Matter And Radiation
33	4	Optoelectronic Devices	Semiconductors
34	2	Current Circuits	Current Electricity
35	2	Projectile Motion	Motion in a Plane

Q. No.	Answer Key	Topic's Name	Chapter Name
36	1	Gravitation	Gravitation
37	1	Logic Gate	Semiconductors
38	3	Bohrs Model	Atoms
39	2	Force on a Current Carrying Conductor in A magnetic Field	Magnetism
40	2	LCR Series Circuit	Alternating Current
41	1	Current Circuits	Current Electricity
42	3	SHM	SHM
43	2	Combination of Lens	Geometrical Optics
44	3	Magnetic Field	Magnetic Effects of Current
45	2	Friction	Laws of Motion
46	3	Combination of Lens	Geometrical Optics
47	2	Equations of Kinematics	Kinematics
48	2	Resistance Dependent on Temperature	Current Electricity
49	4	Electrostatic Potential	Electrostatic
50	4	Equation of Kinematics	Kinematics
<b>CHEMISTRY</b>			
51	2	Atomic Size	Classification of Elements and Periodicity in Properties
52	3	Qualitative analysis	Organic Chemistry some Basic Principles and Techniques
53	4	Quantum number	Structure of Atom
54	3	Catalysis	Surface chemistry
55	1	Gas laws	States of matter
56	2	Aryl halide naming	Haloalkanes and Haloarenes
57	4	Addition of HBr	Alcohol phenol ether
58	2	Henry's law	Solution
59	2	Conductance	Electrochemistry
60	2	Sigma pi bond	Chemical Bonding and Molecular structure
61	2	Physical properties of alkali metal	s block
62	1	Mole concept	Some Basic Concepts of Chemistry
63	2	Intermolecular forces	States of Matter : Gases and Liquids
64	2	Rate of reaction	Chemical kinetics
65	3	Inert pair effect	p block
66	2	Properties of hydrogen	Hydrogen
67	1	Decarboxylation	Hydrocarbons
68	3	Nucleophilic addition reaction	Aldehydes, Ketones and Carboxylic Acids
69	1	Free energy	Thermodynamics
70	4	Octet rule	Chemical Bonding and Molecular structure

Q. No.	Answer Key	Topic's Name	Chapter Name
71	4	Molecular Orbital Theory	Chemical Bonding and Molecular structure
72	4	Octahedral Void	Solid State
73	2	Hydration Energy	Chemical Bonding and Molecular structure
74	1	Diazonium Salt	Organic Compounds Containing Nitrogen
75	1	Nucleoside and nucleotide	Biomolecules
76	4	Role of mg and ca	s block element
77	2	Amines	Organic Compounds Containing Nitrogen
78	4	Clemmensen reduction	Aldehyde, ketone and carboxylic acid
79	2	Allotrope of carbon	p block
80	2	Acids and bases	Equilibrium
81	1	Monomer	Polymer
82	3	Tranquillizer	Chemistry in Everyday Life
83	4	Homoleptic complexes	Coordination Compounds
84	1	Activation energy	Chemical kinetics
85	3	Fundamental particle	Atomic structure
86	1	Oxo acids of sulphur	p block
87	4	Balancing of equation	Redox reaction
88	2	Void	Solid state
89	4	Reduction of aldehyde	Aldehyde, ketone and carboxylic acid, Haloalkanes
90	2	Stability of complexes	Coordination compound
91	1	Dehydration of alcohol	Alcohol phenol ether
92	3	Eutrophication	Environmental Chemistry
93	4	Blast furnace	General Principles and Processes of Isolation of Elements
94	2	Tollens reagent	Aldehyde, ketone and carboxylic acid
95	1	Internal energy	Thermodynamics
96	2	Properties of d block element	d block
97	2	Equilibrium constant	Equilibrium
98	4	Huckel rule	Organic Chemistry some Basic Principles and Techniques
99	2	Types of sol	Surface chemistry
100	2	Cleavage of ether	Alcohol phenol ether
<b>BOTANY</b>			
101	2	Pleiotropism	Principles of Inheritance and Variation
102	1	Tissue culture	Strategies for Enhancement in Food Production
103	3	Movement of ions	Transport in Plants
104	4	Loss of biodiversity	Biodiversity and Conservation
105	3	Recombinant DNA Technology	Biotechnology : Principles and Processes
106	4	Bryophytes	Plant Kingdom

Q. No.	Answer Key	Topic's Name	Chapter Name
107	1	Transcription	Molecular basis of inheritance
108	1	Conservation	Biodiversity and Conservation
109	4	Glycolysis	Respiration in Plant
110	4	Ozone	Environmental Issues
111	3	Vascular tissue	Anatomy of Flowering plants
112	1	Pteridophytes	Plant Kingdom
113	4	Food Chain	Organisms and Populations
114	3	Placentation	Morphology of Flowering Plant
115	4	Families	Morphology of Flowering Plant
116	4	Photosystems	Photosynthesis in Higher Plants
117	1	DNA Purification	Biotechnology and its Applications
118	1	Replication	Molecular basis of inheritance
119	1	Cell cycle	Cell Cycle and Cell Division
120	1	Glycolysis	Respiration in Plant
121	2	Productivity	Organisms and Populations
122	1	Pollination	Morphology of Flowering plants
123	1	Hormones	Plant growth and development
124	4	Photosynthesis	Photosynthesis in Higher Plants
125	4	Gene expression	Molecular basis of inheritance
126	2	Recombination	Principles of inheritance and variation
127	4	Transpiration	Transport in plants
128	2	Transformation technique	Biotechnology: Principles and processes
129	4	Tissue System	Anatomy of flowering plants
130	1	Pollination	Morphology of flowering plants
131	2	Female Reproductive System	Respiration in plants
132	2	Hormones	Plants growth and development
133	2	Cell Cycle	Cell cycle and cell division
134	1	Genetic Material	Principles of inheritance and variation
135	2	Plant Tissues	Anatomy of flowering plants
136	3	Respiration	Respiration in plants
137	4	ATP Synthesis	Respiration in plants
138	4	Microbes	Microbes in human welfare
139	2	Gymnosperms	Photosynthesis in higher plants
140	2	Recombinant DNA technology	Biotechnology and its Applications
141	4	Transport	Transport in plants
142	1	Algal blooms	Environmental issues
143	4	Ribosomes	Cell: the unit of life

Q. No.	Answer Key	Topic's Name	Chapter Name
144	1	Biotic interactions	Ecosystem
145	4	Structure of flower	Sexual Reproduction in Flowering Plants
146	1	Secondary growth	Plant growth and development
147	2	Biotic interactions	Ecosystem
148	2	Genetic Variation	Principles of inheritance and variation
149	2	Cell cycle	Cell cycle and cell division
150	2	Nutrition	Plant growth and development
<b>ZOOLOGY</b>			
151	3	Nucleus	Cell: The Unit of Life
152	4	HIV	Reproductive Health
153	1	Eutrophication	Environmental Issues
154	1	Heart	Body fluids and Circulation
155	4	Down's Syndrome	Principles of Inheritance and Variation
156	4	Mutation	Molecular Basis of Inheritance
157	1	Bones	Locomotion and Movement
158	2	Nephrons	Excretory Products and their Elimination
159	3	Vectors	Biotechnology : Principles and Processes
160	3	Proteins	Biomolecules
161	1	Digestive system	Digestion and Absorption
162	1	STDs	Reproductive Health
163	2	Cytoskeleton	Locomotion and Movement
164	1	STDs	Reproductive Health
165	3	Lungs	Breathing and Exchange of Gases
166	1	Endomembrane system	Cell: The Unit of Life
167	4	Hormones	Chemical Coordination and Integration
168	1	Lac Operon	Molecular Basis of Inheritance
169	4	Eye Structure	Neural Control and Coordination
170	1	Adaptive Radiation	Evolution
171	4	Female reproductive system	Human Reproduction
172	4	Chemicals	Human Health and Disease
173	4	Diseases	Human Health and Disease
174	3	Sex determination	Reproductive Health
175	1	Phylums	Animal Kingdom (Part- I) Invertebrata
176	4	Enzymes	Biomolecules
177	2	Excretion	Animal Kingdom (Part- I) Invertebrata
178	3	Menstruation	Human Reproduction
179	2	Pollution	Environmental Issues



Q. No.	Answer Key	Topic's Name	Chapter Name
180	2	Digestive enzymes	Digestion and Absorption
181	1	Menstruation	Human Reproduction
182	1	Joints	Locomotion and Movement
183	1	Pedigree Analysis	Principles of Inheritance and Variation
184	1	Diagnostic techniques	Biotechnology and its Applications
185	4	Biotic interactions	Ecosystem
186	3	Cell Cycle	Cell Cycle and Cell Division
187	4	Population growth	Organisms and Populations
188	2	Cockroach	Animal Kingdom (Part- I) Invertebrata
189	1	Cell Cycle	Cell Cycle and Cell Division
190	2	Hormones	Chemical Coordination and Integration
191	1	Cockroach	Animal Kingdom (Part- I) Invertebrata
192	2	Blood cells	Body Fluids and Circulation
193	1	Hormones	Chemical Coordination and Integration
194	2	Nephrons	Excretory Products and their Elimination
195	1	Chordates	Animal Kingdom (Part -II) Vertebrata
196	1	Ear	Neural Control and Coordination
197	4	Brain	Neural Control and Coordination
198	2	Transcription	Molecular Basis of Inheritance
199	1	Muscles	Locomotion and Movement
200	3	Inbreeding	Strategies for Enhancement in Food Production

# NEET (UG)

## 7<sup>th</sup> May 2023 Paper

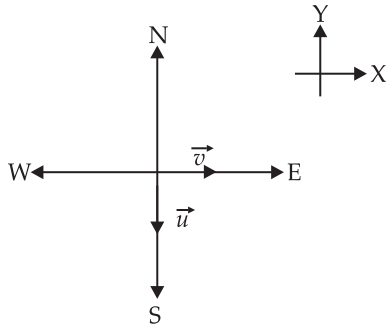
### ANSWERS WITH EXPLANATIONS

#### PHYSICS

##### Section—A

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

**Explanation:** Let's his speed is  $V$



Force will act along the direction of acceleration.

And acceleration =  $\frac{\text{Change in velocity}}{\text{time interval}}$

Change in velocity,

$$\Delta \vec{v} = \vec{v} - \vec{u}$$

$$\vec{u} = v(-\hat{j})$$

$$\vec{v} = v\hat{i}$$

$$\begin{aligned} \text{So, } \Delta \vec{v} &= v\hat{i} - v(-\hat{j}) \\ &= v\hat{i} + v\hat{j} \end{aligned}$$

So,  $\Delta \vec{v}$  is along N-E direction.

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

**Explanation:** Displacement current,  $(i_d) =$  Conduction current  $(i_c)$

$$i_d = i_c = \frac{V}{X_c}, \text{ where } X_c = \text{Capacitive reactance.}$$

$$X_c = \frac{1}{\omega c}, \text{ where, } \omega = \text{angular frequency and}$$

$C =$  capacitance.

$$\omega = 2\pi f, \text{ where } f = \text{frequency,}$$

When  $f$  decreases,  $\omega$  decreases, than  $X_c$  increases so  $i_c$  or  $i_d$  decreases.

3. **Out of Syllabus**

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

**Explanation:**

Magnetic monopole doesn't exist.

$$\text{So, } \oint \vec{B} \cdot d\vec{s} = 0$$

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

**Explanation:** The equivalent capacitance in parallel is  $3\mu\text{F} + 3\mu\text{F} = 6\mu\text{F}$ .

&  $6\mu\text{F}$  is in series with  $3\mu\text{F}$ .

$$\text{So, } C_{\text{equivalent}} = \frac{3 \times 6}{3 + 6} = 2\mu\text{F}.$$

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

**Explanation:** Fundamental mode of vibration for open pipe is  $\frac{V}{2l}$  and the that of closed pipe is  $\frac{V}{4l}$ .

So, their ratio  $\frac{\frac{V}{2l}}{\frac{V}{4l}} = 2:1$ . Where  $V$  is the speed of sound &  $l$  in length.

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

**Explanation:**

$$\frac{1}{\lambda} = RZ^2 \left[ \frac{1}{n_f^2} - \frac{1}{n_i^2} \right]$$

For minimum Wavelength, Energy is maximum, So,  $n_i = \infty$

For Balmer series,  $n_f = 2$ , and for Brackett series,  $n_f = 4$ .

$$\frac{1}{\lambda} = \frac{R}{4}$$

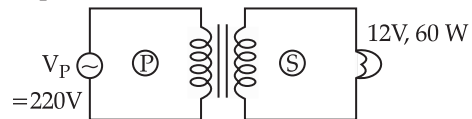
$$\frac{1}{\lambda_{\text{brackett}}} = \frac{R}{16}$$

$$\frac{\lambda_{\text{brackett}}}{\lambda} = \frac{R}{4} \times \frac{16}{R}$$

$$\lambda_{\text{brackett}} = 4\lambda$$

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

**Explanation:**



As transformer is ideal.

$$\text{So, } P_{\text{output}} = P_{\text{input}} = 60$$

$$\Rightarrow I_p V_p = 60$$

$$\Rightarrow I_p = \frac{60}{V_p}$$

$$= \frac{60}{220} = \frac{3}{11}$$

$$= 0.27 \text{ A}$$

9. Option (1) is correct.

**Explanation:** The two batteries are opposing, So  $\epsilon_{\text{net}} = 10\text{V} - 5\text{V} = 5\text{V}$  and  $R_{\text{net}} = 2 + 1 + 7 = 10\Omega$   
 $i = \frac{\epsilon_{\text{net}}}{R_{\text{net}}} = \frac{5}{2} = 0.5\text{A}$ , from A to B though E, as



10. Option (3) is correct.

**Explanation:** Magnetic energy stored in an inductor is

$$\frac{1}{2}Li^2 = \frac{1}{2} \times (4\mu\text{H}) \times 2^2 = 8\mu\text{J}$$

11. Option (3) is correct.

**Explanation:** PE stored in a stretched spring in  $\frac{1}{2}kx^2$ , where  $k$  = spring const. and  $x$  is extension.

$$U = \frac{1}{2}k(2)^2$$

And  $U' = \frac{1}{2}k(8)^2$

$$\Rightarrow \frac{U}{U'} = \frac{1}{16}$$

$$\Rightarrow U' = 16U$$

12. Option (3) is correct.

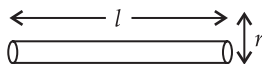
**Explanation:** As the cause of errors in unpredictable, this kind of error is random error.

13. Out of Syllabus

14. Option (2) is correct.

**Explanation:**

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$



$$d = \frac{m}{\pi r^2 l}$$

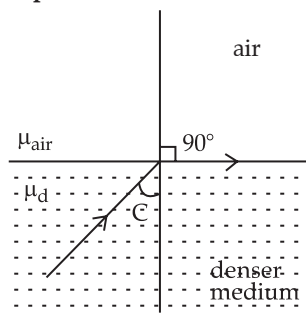
$$\left( \pm \frac{\Delta d}{d} \right) \% = \pm \left( \frac{\Delta m}{m} + \frac{2\Delta r}{r} + \frac{\Delta l}{l} \right) \times 100$$

$$= \pm \left( \frac{0.002}{0.4} + 2 \frac{0.001}{0.3} + \frac{0.02}{5} \right) \times 100$$

$$= 1.6 \%$$

15. Option (3) is correct.

**Explanation:**



$$\mu_d \sin C = \mu_{\text{air}} \sin 90^\circ$$

$$\frac{e}{V_d} \sin C = \frac{C}{V_{\text{air}}} \quad \left[ \because \mu_{\text{medium}} = \frac{C}{V_{\text{medium}}} \right]$$

$$\sin C = \frac{V_d}{V_{\text{air}}} = \frac{t_2}{\frac{x}{t_1}} = \frac{10t_1}{t_2}$$

$$C = \sin^{-1} \left( \frac{10t_1}{t_2} \right)$$

16. Option (2) is correct.

**Explanation:**

$$C = \frac{E_0}{B_0}$$

Where symbols have their usual meanings.

$$\begin{aligned} \text{So, } B_0 &= \frac{E_0}{C} \\ &= \frac{48}{3 \times 10^8} \\ &= 1.6 \times 10^{-7} \text{ T} \end{aligned}$$

17. Option (4) is correct.

**Explanation:**

$$I_{\text{solid sphere}} = \frac{2}{5} MR^2 = MK_{\text{solid}}^2$$

$$\Rightarrow K_{\text{solid}} = \sqrt{\frac{2}{5}} R$$

Similarly, that of hollow sphere

$$I_{\text{hollow}} = \frac{2}{3} MR^2 = MK_{\text{hollow}}^2$$

$$\Rightarrow K_{\text{hollow}} = \sqrt{\frac{2}{3}} R$$

$$\text{So, } \frac{K_{\text{solid}}}{K_{\text{hollow}}} = \frac{\sqrt{\frac{2}{5}} R}{\sqrt{\frac{2}{3}} R} = \sqrt{\frac{3}{5}} = \sqrt{3} : \sqrt{5}$$

18. Option (2) is correct.

**Explanation:** Surface tension =  $\frac{\text{Work done}}{\Delta \text{Area}}$

A soap bubble has 2 free surface.

$$\begin{aligned} \text{So, area, } A &= 2 \times 4\pi r^2 = 8\pi r^2 \\ \Rightarrow \text{Work done} &= \text{surface tension} \times 8\pi r^2 \\ &= (0.03) \times 8 \times \pi \times (2 \times 10^{-2})^2 \\ &= 3.01 \times 10^{-4} \text{ J.} \end{aligned}$$

19. Option (3) is correct.

**Explanation:** In Resonance condition of LCR circuit.

$$X_L = X_C$$

$$\Rightarrow \omega_r L = \frac{1}{\omega_r C}$$

$$\Rightarrow \omega_r = \frac{1}{\sqrt{LC}}$$

$$\Rightarrow f_r = \frac{1}{2\pi\sqrt{LC}}$$

$$= \frac{1}{2\sqrt{10 \times 10^{-3} \times 10^{-6}}}$$

$$= 1.59 \text{ kHz.}$$

(Where symbols have their usual meanings.)

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

**Explanation:** According to Gauss law of electrostatics.

$$\text{The net flux } \phi_E = \oint \vec{E} \cdot d\vec{S} = \frac{q_{en}}{\lambda_0}$$

So, here net flux is zero, that means net charge enclosed by the surface is Zero.

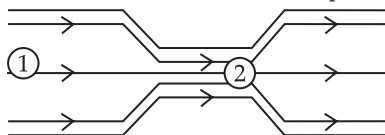
So the flux entering the surface is equal to flux leaving the surface in same.

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

**Explanation:** Bernoulli's principle is based on conservation of energy, that is the total work done by pressure, gravity and change in KE is constant for an ideal fluid flowing in a closed tube.

$$P + \frac{1}{2}\rho v^2 + \rho gh = \text{const}$$

Venturimeter works on this principle.



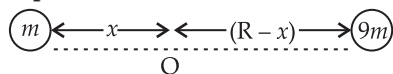
$$P_1 + \frac{1}{2}\rho v_1^2 + \rho gh = P_2 + \frac{1}{2}\rho v_2^2 + \rho gh$$

Perpendicular and parallel axes theorem helps to find moment inertia at different axes of rotation.

Huygens theory explain the wave nature of light.

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

**Explanation:**



At 'O' field due to mass  $m \times 9m$  is zero. So

$$\frac{Gm}{x^2} = \frac{G(9m)}{(R-x)^2}$$

$$\Rightarrow \frac{1}{x} = \frac{3}{R-x}$$

$$\Rightarrow x = \frac{R}{4} \times (R-x) = \frac{3R}{4}$$

So, potential at that point will be

$$\frac{-Gm}{\left(\frac{R}{4}\right)} + \frac{-G9m}{\left(\frac{3R}{4}\right)} = \frac{-16Gm}{R}$$

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

**Explanation:** The rms speed is

$$V = \sqrt{\frac{3RT}{M}}$$

When it is increased by 3 times, i.e.,

$$4V = \sqrt{\frac{3RT'}{M}}$$

(where symbols have their usual meanings)

$$\Rightarrow T' = 16 T$$

$$= 16 (273-50)$$

$$= 3568 \text{ K}$$

$$= 3295^\circ \text{ C.}$$

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

**Explanation:** Minimum wave length of X-Rays is

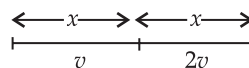
$$\lambda_{\min} = \frac{hc}{eV}$$

$$\text{Hence } \lambda_{\min} \propto \frac{1}{V}$$

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

**Explanation:** Average speed,

$$v_{\text{avg}} = \frac{\text{Total distance}}{\text{Total time}}$$



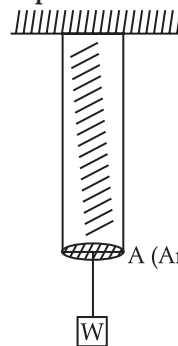
$$\text{So, } v_{\text{avg}} = \frac{2x}{\frac{x}{v} + \frac{x}{2v}} = \frac{2(v)(2v)}{v+2v} = \frac{4v}{3}$$

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

**Explanation:** Angular displacement, angular velocity and angular acceleration are axial vectors, So, their direction is always along the axis of rotation.

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

**Explanation:**



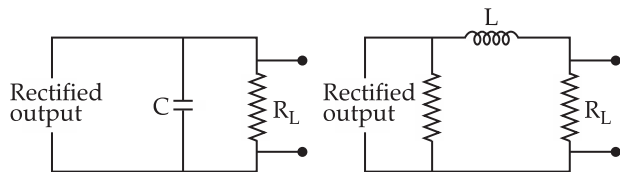
Stress is, restoring force per unit area. As there is no mass of Rod. Restoring force is equal to the applied force in magnitude.

$$\text{So, stress} = \frac{W}{A}$$

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

**Explanation:** To remove the ac ripples from the rectified output, a filter circuit is connected, which

contains capacitor or inductor, as capacitor allows the ac while inductor allows the dc.



29. Option (3) is correct.

Explanation:  $\tau = p E \sin\theta$  &  $p = q \times l$

Where symbols have their usual meanings.

$$\Rightarrow 4 = (q \times 2 \times 10^{-2}) (2 \times 10^5) \times \sin 30^\circ$$

$$\Rightarrow q = 2 \times 10^{-3} \text{ C}$$

$$= 2 \text{ mC}$$

30. Out of Syllabus

31. Option (2) is correct.

Explanation: Angular fringe width,  $\theta = \frac{\lambda}{d}$ , where

$\lambda$  = wavelength of light &  $d$  is the slit separation. So  $\theta$  is independent of separation between screen and slit ( $D$ ).

If  $\lambda$  increases, then  $\theta$  must increase.

32. Option (4) is correct.

Explanation: According to Einstein's Photo electric equation.

$$KE_{\max} = h\nu - \phi_0$$

So, photoelectric effect is only possible, when the energy of incident radiation is larger than work function ( $\phi_0$ ).

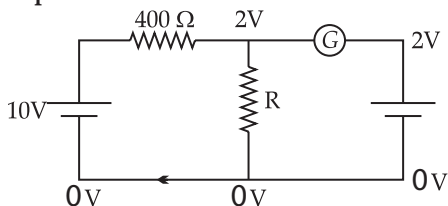
Hence, in the given situation, Photoelectric effect is possible in case of Cs only, as 2.20 eV is larger than 2.14 eV, and lower from 2.30 eV and 2.75 eV as well.

33. Option (4) is correct.

Explanation: Photo voltaic cells (or solar cells). Convert radiation energy into electrical energy. Zener diodes are heavily doped to operate at breakdown voltage in reverse bias.

34. Option (2) is correct.

Explanation:



As Galvanometer has no current, voltage across R will be 2V as shown.

So voltage applied is 10V and voltage across 400  $\Omega$  is  $10 - 2 = 8\text{V}$ .

$$\text{So current in the circuit is } i = \frac{8}{400} \text{ amp.}$$

That current will flow through R,

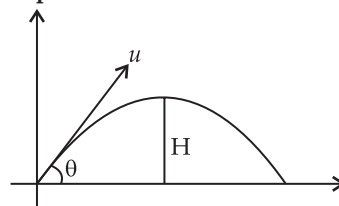
$$\text{So, } 2 = i R$$

$$= \frac{8}{400} R$$

$$\Rightarrow R = 100 \Omega$$

35. Option (2) is correct.

Explanation:



$$H = \frac{u^2 \sin^2 \theta}{2g}$$

$$\Rightarrow H = \frac{(280)^2 (\sin 30^\circ)^2}{2 \times 9.8}$$

$$= 1000 \text{ m.}$$

### Section—B

36. Option (1) is correct.

Explanation: It can be solved by dimensional analysis.

$$\frac{3\pi}{Gd} = \frac{1}{[M^{-1}L^3T^{-2}][ML^{-3}]} = [T^2]$$

OR

It can be derived from the formula.

$$\begin{aligned} T &= 2\pi \sqrt{\frac{R}{g}} \\ &= 2\pi \sqrt{\frac{R^3}{GM}} \\ &= 2\pi \sqrt{\frac{R^3}{G \times \frac{4}{3}\pi R^3 \times d}} \end{aligned}$$

$$\Rightarrow T^2 = \frac{4\pi^2 \times 3}{4\pi Gd}$$

$$= \frac{3\pi}{Gd}$$

37. Option (1) is correct.

Explanation:

$$y = \overline{\overline{A \cdot B}} = \overline{\overline{A + B}}$$

$$y = A + B$$

Which is 'OR' gate.

38. Option (3) is correct.

Explanation: In bohr's model, the radius of  $n^{\text{th}}$  orbit is

$$r_{n^{\text{th}}} = r_0 \frac{\overset{\circ}{\text{A}}}{z}$$

(Symbols have their usual meanings)

For H - atom, and for  $n = 3$

$$\begin{aligned} r_{nth} &= r_0 (3)^2 \\ &= 0.53 \times 9 \\ &= 4.77 \text{ \AA} \end{aligned}$$

39. Option (2) is correct.

**Explanation:** The magnetic force (F), on a current (I) carrying conductor of length (L) in a magnetic field (B) is

$$\begin{aligned} \vec{F} &= I\vec{L} \times \vec{B} \\ &= IL\hat{i} \times (2\hat{i} + 3\hat{j} - 4\hat{k}) \\ &= 3IL\hat{k} + 4IL\hat{j} \\ |\vec{F}| &= \sqrt{(3IL)^2 + (4IL)^2} \\ &= 5IL \end{aligned}$$

40. Option (2) is correct.

**Explanation:**  $Z = \sqrt{R^2 + (X_C - X_L)^2}$

$$R = 10 \Omega$$

$$X_C = \frac{1}{\omega C} = \frac{1 \times 10^6}{2\pi(50) \times \frac{10^3}{\pi}}$$

$$= 10 \Omega$$

$$X_L = \omega L$$

$$= 2\pi(50) \times \frac{50}{\pi} \times 10^{-3}$$

$$= 5 \Omega$$

$$\text{So } Z = \sqrt{10^2 + (10 - 5)^2}$$

$$= \sqrt{125}$$

$$= 5\sqrt{5} \Omega$$

Symbols have their usual meanings.

41. Option (1) is correct.

**Explanation:** Current,  $i_s = \frac{E_{net}}{R_{net}}$

$$\text{In series, } i_s = \frac{E}{10R}$$

$$\text{In parallel, } i_p = \frac{E}{\frac{R}{10}}$$

$$\text{So, } \frac{i}{i_p} = \frac{E \times R}{10R \times E \times 10} = \frac{1}{100}$$

$$i_p = 100 i_s, n = \frac{i_p}{i_s}$$

$$\text{So, } n = 100.$$

42. Option (3) is correct.

**Explanation:** In Shm, acceleration,

$$\vec{a} = -\omega^2 \vec{x}$$

$$T = 8 \text{ s,}$$

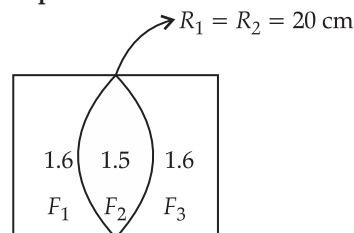
$$\omega = \frac{2\pi}{8}$$

$$\text{at } t = 2 \text{ s, } x = +1$$

$$\text{So } a = -\left(\frac{2\pi}{8}\right)^2 (+1) = \frac{-\pi^2}{16} \text{ m/s}^2$$

43. Option (2) is correct.

**Explanation:**



$$\frac{1}{f_1} = (1.6 - 1) \left( \frac{1}{\infty} - \frac{1}{20} \right) = \frac{1}{f_3}$$

$$\Rightarrow \frac{1}{f_1} = \frac{1}{f_3} = \frac{-0.3}{10}$$

$$\frac{1}{f_2} = (1.5 - 1) \left[ \frac{1}{20} + \frac{1}{20} \right]$$

$$= \frac{0.5}{10}$$

For combination of lens.

$$\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3}$$

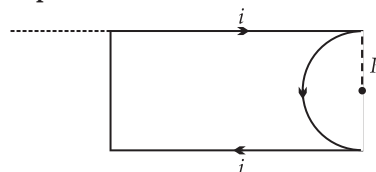
$$= \frac{-0.3}{10} + \frac{-0.3}{10} + \frac{0.5}{10}$$

$$= \frac{-1}{100}$$

$$\Rightarrow F = -100 \text{ cm.}$$

44. Option (3) is correct.

**Explanation:**



At the end of an current carrying conductor, magnetic field.

$$B_1 = \frac{\mu_0 i}{4\pi R} \otimes \text{ (into the page) and for semicircles}$$

$$\text{part, magnetic field, } B_2 = \frac{\mu_0 i}{4R} \otimes \text{ (Out of the page)}$$

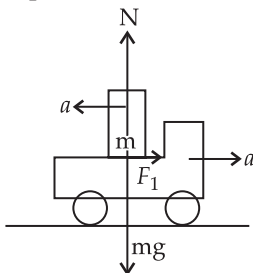
There are two straight conductors (having same direction of  $\vec{B}$ ) and a circular wire.

$$\text{So } B_{net} = \frac{\mu_0 i}{4R} \left( 1 - \frac{2}{\pi} \right) \otimes \text{ out of the page.}$$



45. Option (2) is correct.

Explanation:



The block to move with the truck without sliding.

$$\begin{aligned}
 ma &\leq F_1 \\
 ma_{\max} &= \mu N \\
 \Rightarrow \cancel{m} a_{\max} &= \mu \cancel{m} g \\
 &= 0.15 \times 10 \\
 &= 1.5 \text{ ms}^{-2}
 \end{aligned}$$

46. Option (3) is correct.

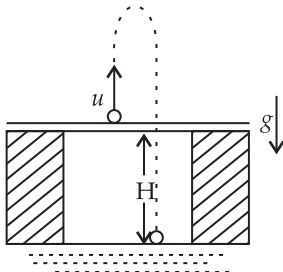
Explanation:  $\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2}$

$$= \frac{1}{f} - \frac{1}{f} = 0$$

$\Rightarrow F = \infty$

47. Option (2) is correct.

Explanation:  $u = 4 \text{ m/s}$   
 $t = 4 \text{ s}$



Applying equation of motion

$$\begin{aligned}
 \vec{s} &= \vec{u}t + \frac{1}{2} \vec{a}t^2 \\
 -H &= 4 \times 4 + \frac{1}{2}(-10) \times 4^2 \\
 -H &= -64 \text{ m}, H = 64 \text{ m} \\
 \text{So height of the bridge is } &64 \text{ m.}
 \end{aligned}$$

48. Option (2) is correct.

Explanation:  $R_{30^\circ} = 6.8$   
 $R_0 = 2$

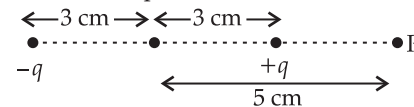
$$\begin{aligned}
 R_t &= R_0 (1 + \alpha \Delta t) \\
 \Rightarrow 6.8 &= 2 [1 + \alpha(80 - 0)] \\
 \Rightarrow \alpha &= \frac{2.4}{80} = 3 \times 10^{-2} \text{ } ^\circ\text{C}^{-1}
 \end{aligned}$$

(Symbols have their usual meanings)

49. Option (4) is correct.

Explanation:

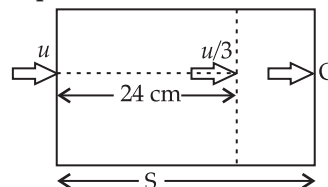
Electrostatic potential



$$\begin{aligned}
 V_P &= \frac{k(-q)}{8 \text{ cm}} + \frac{kq}{2 \text{ cm}} \\
 &= Kq \left( \frac{1}{2 \text{ cm}} - \frac{1}{8 \text{ cm}} \right) \\
 &= \frac{3Kq}{8 \times 10^{-2}} \text{ V} \\
 &= \frac{3}{8} Kq \times 10^2 \text{ V}
 \end{aligned}$$

50. Option (4) is correct.

Explanation:



By  $v^2 - u^2 = 2as$

$$\left( \frac{u}{3} \right)^2 - u = 2(-a) \times 24$$

$$\frac{u^2}{9} - u^2 = -48a$$

$$\frac{-8u^2}{9} = -48a$$

$$\frac{8u^2}{9} = 48a$$

Similarly

$$0 = u^2 - 2as$$

$$u^2 = 2as$$

$$\frac{8u^2}{9u^2} = \frac{48a}{2as}$$

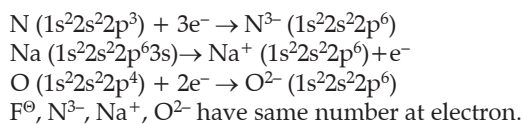
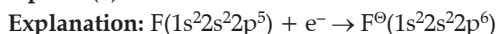
$$s = 27 \text{ m}$$

□□□

## CHEMISTRY

### Section A

51. Option (2) is correct.



So they are known as iso electronic species. As the Charge on anion increase, ionic size also increases.

$\therefore N^{3-}$  is the anion with largest ionic size.

52. Option (3) is correct.

**Explanation:**  $Na + \overset{\text{Organic compound}}{C+N+S} \rightarrow NaSCN$

$Fe^{3+} + NaSCN \rightarrow [Fe(SCN)]^{2+}$   
Blood Red Colour

In case of organic compound contain both Nitrogen and sulphur, they react with sodium and leads to the formation of sodium thiocyanate which gives blood red colour on reaction with  $Fe^{3+}$ .

53. Option (4) is correct.

**Explanation:** For gives value of  $l, m_e$  can take value.  
 $m_e = -l \dots 0 \dots +l$ .

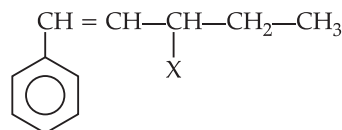
$$\begin{aligned} \text{if } l = 1, m_e = -1, 0, +1 \\ \therefore n_m = 2l + 1 \\ \boxed{l = \frac{n_m - 1}{2}} \end{aligned}$$

54. Out of Syllabus

55. Out of Syllabus

56. Option (2) is correct.

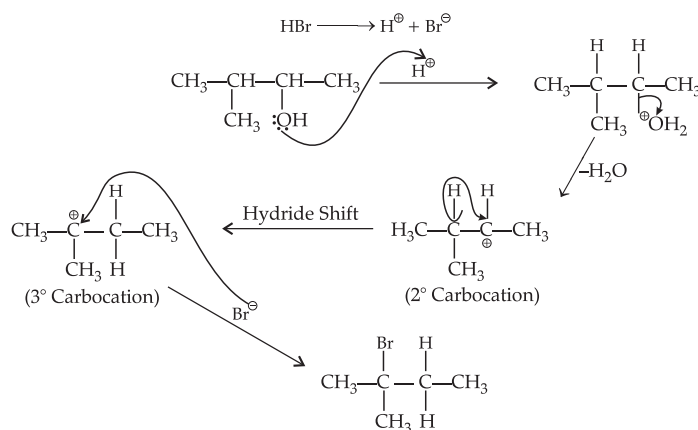
**Explanation:**



$\alpha'$  Carbon Atom attached to multiple bond in called Allylic carbon Atom.

57. Option (4) is correct.

**Explanation:**



Reaction proceed through Carbocation intermediate, less stable Carbocation rearrange itself to more stable Carbocation.

58. Option (2) is correct.

**Explanation:** Helium is used to dilute oxygen in diving apparatus because it has low solubility in blood.

$\therefore$  Assertion is true but reason is false.

59. Option (2) is correct.

**Explanation:**  $(k) = g \times \frac{l}{a} \dots (i)$

Conductivity = conductance  $\times$  cell constant

Since, we know that  $g = \frac{1}{R}$

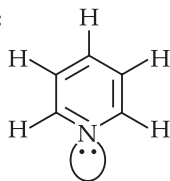
$$k = \frac{1}{R} \times \frac{l}{a} \Rightarrow \frac{l}{a} = R \times k$$

$$R = 60 \Omega, k = 0.0210$$

$$\therefore \frac{l}{a} = 0.0210 \times 60 = 1.26 \text{ cm}^{-1}$$

60. Option (2) is correct.

**Explanation:**



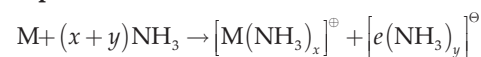
No. of  $\pi$  bond = 3

No. of lone pair = 1

No. of  $\sigma$  bond = 11

61. Option (2) is correct.

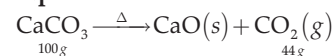
**Explanation:**



When metal is dissolved in liquid ammonia, a blue colour paramagnetic solution is formed. This blue colour paramagnetic solution is due to an unpaired electron.

62. Option (1) is correct.

**Explanation:**



$$\text{Amount of } CaCO_3 = 20 \times \frac{20}{100} = 4g$$

( $\therefore CaCO_3$  from 20% pure)

$$\therefore 100g \text{ of } CaCO_3 \text{ produced } CO_2 = 44g$$

$$1g \text{ of } CaCO_3 \text{ produced } CO_2 = \frac{44}{100}$$

$$4g \text{ of } CaCO_3 \text{ produced } CO_2 = \frac{44}{100} \times 4$$

$$= 1.76g$$

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

**Explanation:** Since covalent bond hold atom within the molecule together however intermolecular forces of attraction and repulsion between the molecule.

∴ Intermolecular forces are dipole-dipole forces, dipole-induced dipole forces, Hydrogen Bonding dispersion forces.

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

**Explanation:** Since Rate =  $K[A]^2[B]$

New concentration of A

$$[A] = 3 \times [A]$$

$$\therefore \text{Rate} = K[3A]^2[B]$$

$$\text{Rate} = 9K[A]^2[B]$$

∴ Rate increases by a factor of 9.

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

**Explanation:** B Al Ga In Tl

As we move down the group stability of +1 oxidation state increases due to inert pair effect.

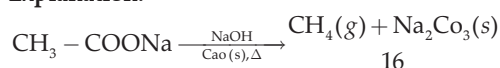
∴ Tl in +1 oxidation state have more stability

∴  $TlI > TlI_3$

66. **Out of Syllabus**

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

**Explanation:**



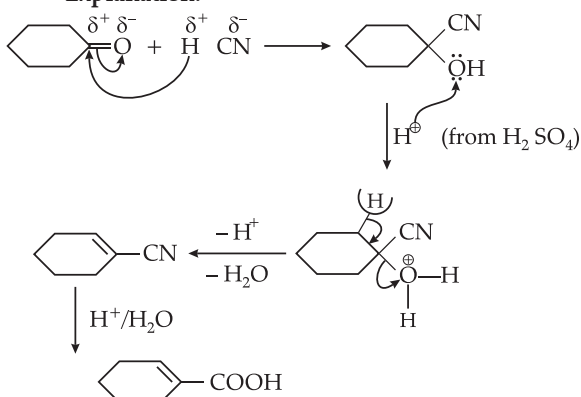
16

Weight of 1 mole of  $CH_4 = 16g$

2 mole of  $CH_4 = 2 \times 16 = 32g$

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

**Explanation:**



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

**Explanation:** Relationship between  $\Delta G$  and  $E_{\text{cell}}^\circ$  is given by

$$\Delta G = -n F E_{\text{cell}}$$

$n$  = no. of electron

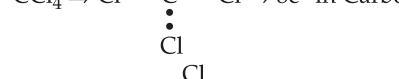
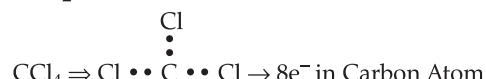
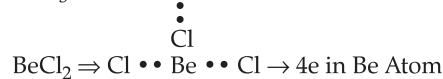
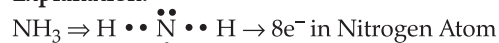
$F$  = Faraday

Also  $E_{\text{cell}}$  is an intensive property

$\Delta G$  is extensive property

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

**Explanation:**



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

**Explanation:** For molecule up to  $N_2$  increasing order of energies in various molecular orbital is  $\sigma 1s, \sigma^* 1s, \sigma 2s, \sigma^* 2s, \pi 2p_x = \pi 2p_y, \sigma 2p_z, \pi^* 2p_x = \pi^* 2p_y, \sigma^* 2p_z$

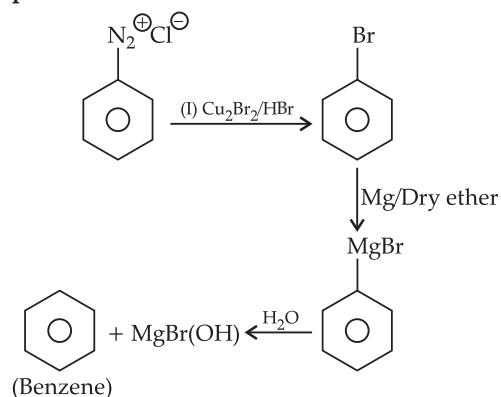
72. **Out of Syllabus**

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

**Explanation:** Stability of  $Cu^{2+}$  is more than  $Cu^+$  salts in aqueous solution. This is due to high hydration energy of  $Cu^{2+}$  ion than  $Cu^+$ .

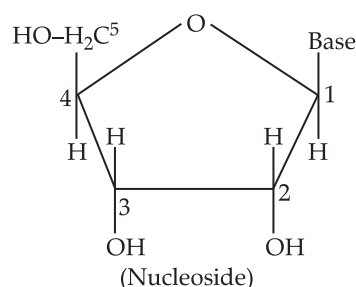
74. **Option (1) is correct.**

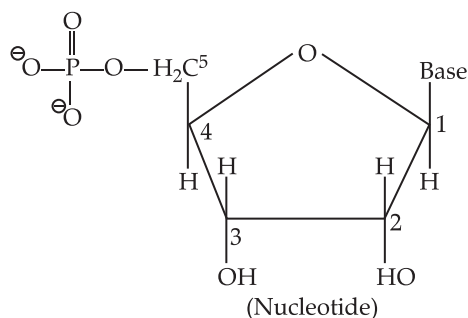
**Explanation:**



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

**Explanation:**



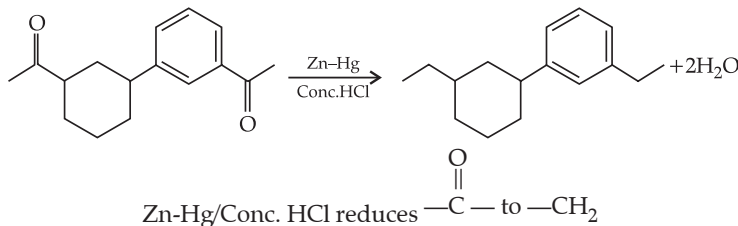


Nucleoside is formed by the attachment of a base to 1' position of sugar. Nucleotide is formed when nucleotide is attached to position 5' to the phosphoric acid.

76. Out of Syllabus

78. Option (4) is correct.

Explanation:



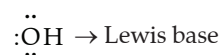
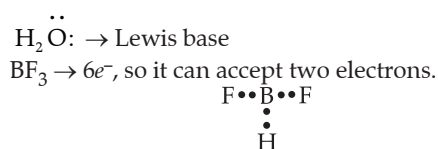
79. Option (2) is correct.

Explanation:

- Coke is used as reducing agent in metallurgical process.
- Diamond each Carbon Atom is  $sp^3$  hybridized.
- Fullerene consist of a Cage like structure.
- Graphite is used as lubricant.

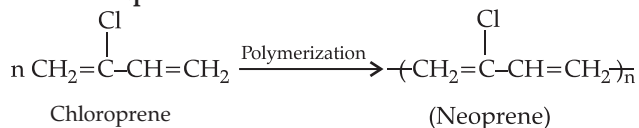
80. Option (2) is correct.

Explanation: Lewis Acids are those substance which can accept a pair of electron, Lewis base are those substance which can donate a pair of electron.



81. Option (1) is correct.

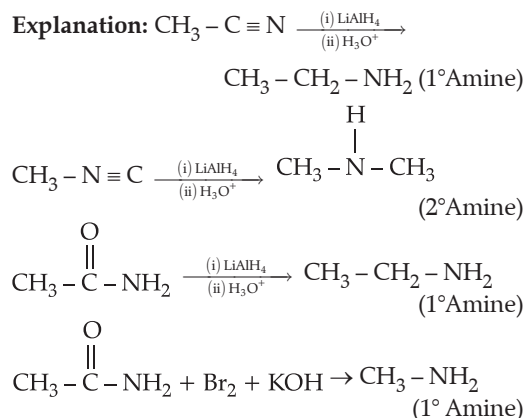
Explanation:



Chloroprene produces neoprene with the help of free radical polymerization.

82. Out of Syllabus

77. Option (2) is correct.



83. Option (4) is correct.

Explanation: Homoleptic complexes are those complexes which contain only one types of ligand.  $\text{K}_3[\text{Al}(\text{OX})_3]$  – Potassium trioxalatoaluminate (III)

84. Option (1) is correct.

Explanation: Activation energy of certain reaction may be zero. e.g., diradical reaction.

Activation energy is defined as the minimum energy which must be supplied to the reactant so that there energy become equal to threshold energy.

85. Option (3) is correct.

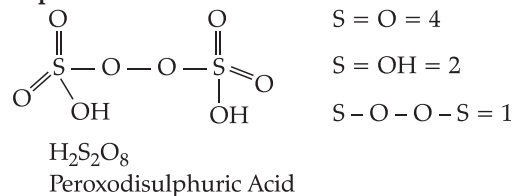
Explanation: Atom consist of three fundamental particle proton, electron and neutron.

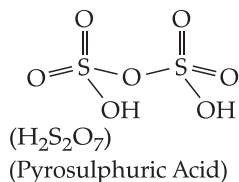
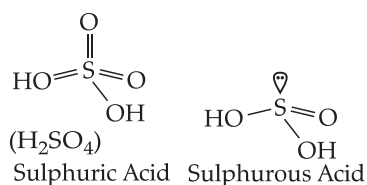
- Mass of electron ( $m_e$ ) =  $9.10939 \times 10^{-31}$  kg
- Isotope have same chemical properties.
- Nucleon = neutron + proton
- According to Dalton's Atomic theory atom can't be further subdivided.

## Section B

86. Option (1) is correct.

Explanation:



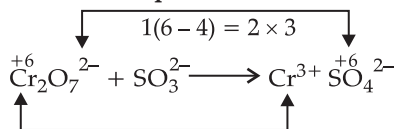


87. Option (4) is correct.

Explanation:

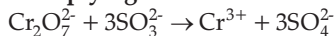


Step (i) to write balanced equation first of all write Skelton eqn.

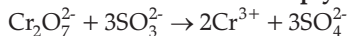


Change in O.N = 2(3-6) = -6 × 1

Step (ii) balance increase and decrease by multiplying with 3



Step (iii) balanced all other atoms except O. So in order to balance cr multiply it with 2

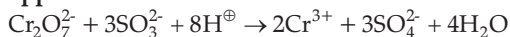


Step (iv) balance O atom by adding H<sub>2</sub>O molecule



O = 16

Step (v) balance H atom by adding H<sup>+</sup> ions opposite site

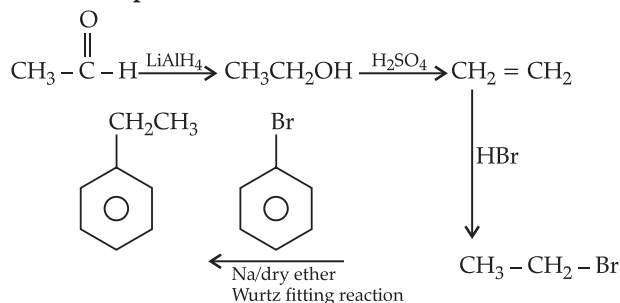


∴ a = 1, b = 3, c = 8

88. Out of Syllabus

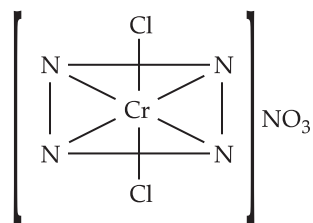
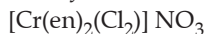
89. Option (4) is correct.

Explanation:



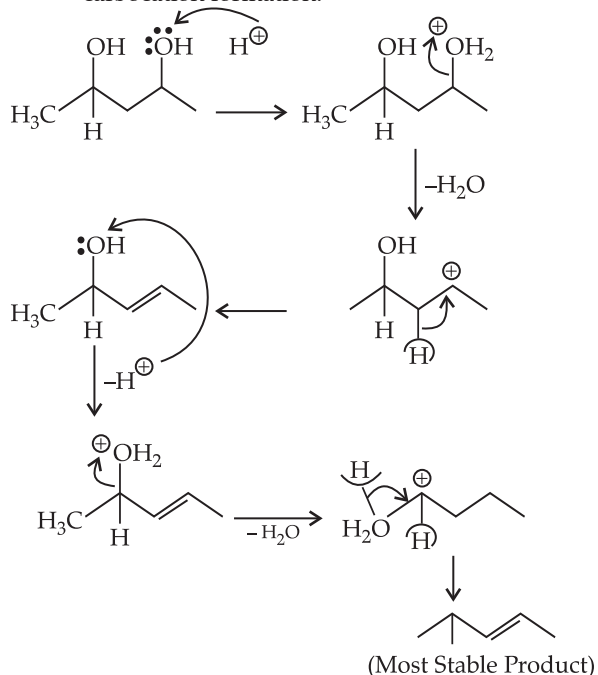
90. Option (2) is correct.

Explanation: Chelating complexes are more stable as they lead to the formation of cyclic structure.



91. Option (1) is correct.

Explanation: Acidic dehydration process through carbocation formation.

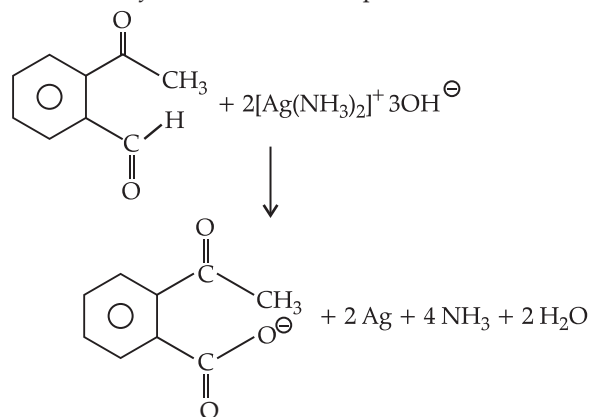


92. Out of Syllabus

93. Out of Syllabus

94. Option (2) is correct.

Explanation: Tollen's Reagent used to differentiate Aldehyde and Ketone and it produces silver mirror.



95. Option (1) is correct.

Explanation: The correct relationship between ΔH and ΔU in given by eqn.

$$\Delta H = \Delta U + \Delta n_g RT$$

96. Option (2) is correct.

Explanation: All the transition metals except scandium form MO oxides which are ionic.

Highest Oxidation state corresponding to group number in transition metal oxide is attained in  $\text{Sc}_2\text{O}_3$  to  $\text{Mn}_2\text{O}_7$ .

Acidic character increases from  $\text{V}_2\text{O}_3$  to  $\text{V}_2\text{O}_5$

$\text{V}_2\text{O}_4$  gives  $\text{VO}^{2+}$  when dissolved in acid.

$\text{CrO}$  is basic but  $\text{Cr}_2\text{O}_3$  is Amphoteric

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

**Explanation:**  $\text{A} + \text{B} \rightleftharpoons \text{C} + \text{D}$

$$K_{\text{eq}} = \frac{[\text{C}]^2 [\text{D}]^3}{[\text{A}]^{10} [\text{B}]^6} = \frac{10 \times 6}{2 \times 3} = 10$$

→ at equilibrium

$$\Delta G = -RT \ln k_{\text{eq}} = -2.303 RT \log_{10} K$$

$$= -2.303 \times 2 \times 300 \times \log(10)$$

$$= -1381.8 \text{ cal}$$

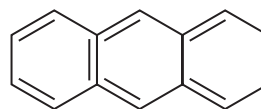
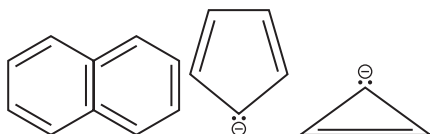
98. **Option (4) is correct.**

**Explanation:** Aromatic compound are those compound which satisfy Huckel's Rule

(i) Compound must be planar

(ii) Complete delocalisation.

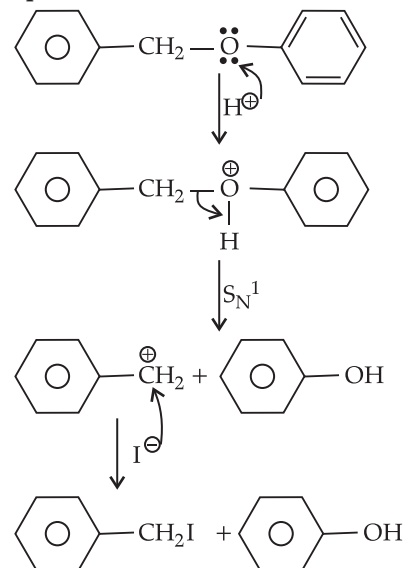
(iii) Must Contain  $(4n+2)$   $\pi$  electron.



99. **Out of Syllabus**

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

**Explanation:**



## BOTANY

### Section A

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

**Explanation:** In pleiotropism, a single gene affects multiple phenotypic expressions and the gene is called a pleiotropic gene.

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

**Explanation:** In tissue culture experiments, when leaf mesophyll cells are put in a culture medium, it will result in the formation of an undifferentiated mass of cells called callus. This phenomenon in which living plant cells that are differentiated by now and have lost the capacity to divide, regain the property of division is known as dedifferentiation.

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

**Explanation:** Active transport involves the movement and accumulation of ions across a membrane against the concentration gradient. It requires energy and special carrier proteins to transport molecules from their lower concentration to their higher concentration.

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

**Explanation:** The evil quartet is the term used for four major reasons for biodiversity loss. They include: a) habitat loss and fragmentation, b) alien species invasion, c) co-extinction, d) over-explo-

tation. Among these habitat loss and fragmentation is the most important cause driving plants and animals to extinction.

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

**Explanation:** Ethidium Bromide (EtBr) is added to the running buffer during the separation of DNA fragments by agarose gel electrophoresis. It is used because upon binding with the DNA molecule and subsequent illumination with a UV light source, the DNA will appear in bright orange in colour.

As a result, DNA banding pattern can be visualised.

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

**Explanation:** The main stage of the life cycle of a moss is the gametophyte which consists of two stages. The first stage is the protonema stage, which develops directly from a spore. Capsule of the sporophyte contains spore which gives rise to protonema. The second stage is the leafy stage, which develops from the protonema.

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

**Explanation:** In eukaryotes, there are three major types of RNA polymerases.

RNA polymerase I help in the transcription of 5.8S, 18S, and 28S rRNAs.

RNA polymerase II helps in the transcription of hnRNAs (precursor of mRNA).



RNA polymerase III helps in the transcription of tRNAs, ScRNA, 5S rRNA and snRNA.

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

**Explanation:** The historic convention on Biological Diversity, also called "The Earth Summit" was held in Rio de Janeiro in the year 1992. It called upon all nations to take the required measures for the conservation of biodiversity.

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

**Explanation:** ATP in glycolysis is used in two steps in the first or preparatory phase.

(i) Glucose → Glucose-6-phosphate

(ii) Fructose-6-phosphate → Fructose-1,6-bisphosphate

110. **Out of Syllabus**

111. **Out of Syllabus**

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

**Explanation:** Heterosporous pteridophyte produces two different kinds of spores. Examples include *Selaginella* and *Salvinia*. While homosporous pteridophytes produce a single type of spores. Examples include *Psilotum*, *Lycopodium* and *Equisetum*.

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

**Explanation:** Earthworms and other detritivores contribute to decomposition by fragmentation of detritus in which a part of detritus is eaten by them and comes out in highly pulverised state in their faeces. Mineralisation is the process in which humus is degraded to release inorganic nutrients. Leaching is the process in which water-soluble inorganic substances such as fertilizers or pesticides are washed out from the soil, go down and get precipitated. The detritus food chain starts with dead organic matter. The saprotrophic bacteria and fungi break down detritus into simpler inorganic substances by a process called catabolism. Earthworms do fragmentation not catabolism.

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

**Explanation:** China rose, Tomato, Petunia and Lemon show axile placentation. In axile placentation, the ovary is partitioned into two or more chambers by septa. The placenta is formed in the central axial column where all the septa meet.

*Dianthus* and *Primrose* show free central placentation. Peas, Lupin and Beans show marginal placentation. Cucumbers and mustard show parietal placentation.

115. **Out of Syllabus**

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

**Explanation:** In Photosystem-I, the reaction centre chlorophyll a has an absorption peak at 700 nm,

while in Photosystem-II, the reaction centre has an absorption maxima at 680 nm.

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

**Explanation:** On addition of chilled ethanol, purified DNA precipitates out. It can be seen as a collection of fine threads in the suspension.

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

**Explanation:** Replication of DNA takes place in the S-phase of the cell cycle in eukaryotes while other cell organelles duplicate in the G<sub>1</sub> phase of the cell cycle.

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

**Explanation:** The process of recombination occurs at the pachytene stage of prophase I. It is characterised by the appearance of recombination nodules.

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

**Explanation:** For one turn in the Calvin cycle:

ATP used = 3 molecules

NADPH used = 2 molecules

Thus for six cycles:

ATP used = 3×6 = 18 molecules

NADPH used = 2×6 = 12 molecules

Therefore number of total ATP and NADPH required to produce one molecule of glucose during the Calvin cycle is 18 and 12 respectively.

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

**Explanation:** A considerable amount of GPP is utilised by plants in respiration. Gross primary productivity minus respiratory losses (R), is the net primary productivity.

So R = Respiratory loss

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

**Explanation:** Colourful fragrant flowers with nectar help to attract biotic pollinators (insects, birds, bats, etc.), Bird pollinated plants are larger, and have more nectar. Insect pollinated plants can be small in size. Bat pollinated flowers are pale and nocturnal.

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

**Explanation:** Spraying of gibberellins (GAs) on juvenile conifers hastens the maturity period, thus leading to early seed production.

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

**Explanation:** Manganese plays a major role in the splitting of water to release oxygen during photosynthesis.

Copper is required for the overall metabolism in plants.

Molybdenum helps in nitrogen metabolism.

Magnesium activates enzymes involved in photosynthesis and respiration.

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

**Explanation:** All the genes that are expressed as RNA are known as Expressed Sequence Tags (ESTs).

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

**Explanation:** Alfred Sturtevant for the first time used the frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes and for mapping of their position on the chromosome.

Sutton and Boveri gave the chromosomal theory of inheritance.

Henking discovered X-chromosome.

Thomas Hunt Morgan proved the chromosomal theory of inheritance.

127. **Out of Syllabus**

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

**Explanation:** A gene gun is a method of recombinant DNA technology where the DNA, RNA, genes, or proteins are transferred to the target cells without the help of any vectors. In this method, microparticles of gold or tungsten are used. Gold and tungsten are inert so they do not react with the chemicals of cells.

129. **Out of Syllabus**

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

**Explanation:** Tassels in the corn cob are elongated exerted stigmas and styles which help to trap pollen grains.

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

**Explanation:** Synergids are the cells of gametophytes and so these are haploid. Zygote is formed by the fusion of two gametes and thus it is diploid. On the other hand primary endosperm nucleus is formed by the fusion of a diploid secondary nucleus with a male gamete. Therefore, it is triploid.

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

**Explanation:** Ethylene helps in rapid internode/petiole elongation in deep-water rice plants.

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

**Explanation:** Anaphase II of meiosis involves the splitting of centromere. During Metaphase I and II, chromosomes align at the equator. During telophase, chromosomes reach the respective poles.

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

**Explanation:** The proof that DNA is the genetic material came first time from the experiment

of Alfred Hershey and Martha Chase. Avery, Macleod and McCarty gave the biochemical characterisation of the Transforming Principle. The transformation experiments using *Pneumococcus* were conducted by Frederick Griffith. Wilkins and Franklin produced X-ray diffraction data of DNA.

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

**Explanation:** Cellulose does not form a blue colour with iodine because cellulose does not have a helical structure so it does not bind to iodine to form a coloured product.

## Section B

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

**Explanation:** Pyruvate is formed by catabolism of glucose in the cytosol. After it enters the mitochondria, it undergoes oxidative decarboxylation with the help of complex set of reactions that are catalysed by pyruvate dehydrogenase. The scheme of glycolysis is often referred to as the EMP pathway. In an electron transport system, the energy produced is utilised for the production of the proton gradient required for phosphorylation. So, this process is also called oxidative phosphorylation. The TCA (tricarboxylic acid cycle) starts with the condensation of the acetyl group with oxaloacetic acid (OAA) and water to produce citric acid. The reaction uses the enzyme citrate synthase.

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

**Explanation:** The process of ATP synthesis using 'free energy' obtained when electrons are passed to several carriers (ETC) is known as chemiosmosis. Chemiosmosis requires a membrane, a proton pump, a proton gradient and ATP synthase.

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

**Explanation:** Melonate acts as an antibiotic which inhibits the growth of pathogenic bacteria by inhibiting the activity of Succinic dehydrogenase. Thus, it affects TCA cycle and hampers cellular respiration.

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

**Explanation:** In gymnosperms, the pollen grains are released from the microsporangium and they are carried in air currents. They come in touch with the opening of the ovules borne on megasporophylls. The *pollen tube* having the male gametes grows towards archegonia in the ovules and empties its contents near the mouth of the archegonia.

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

**Explanation:** Recombinant DNA technology involves several steps in specific sequences

like isolation of DNA then fragmentation of DNA by restriction endonucleases followed by isolation of desired DNA fragment and then ligation of the DNA fragment into a vector following transferring the recombinant DNA into the host and finally culturing the host cells in a medium at large scale and extraction of the desired product.

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

**Explanation:** Cohesion involves mutual attraction between water molecules. Adhesion represents the attraction of water molecules to polar surfaces. Surface tension involves the attraction of water molecules towards each other in the liquid phase more than to water in the gas phase. Guttation represents the loss of water in the liquid phase.

142. **Out of Syllabus**

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

**Explanation:** The ribosome consists of about 80 different proteins.

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

**Explanation:** (+, +) Mutualism: In this interaction, both the interacting species are benefitted.

(+, 0) Commensalism: Only one species is benefitted and the other species remains unaffected.

(-, 0) Amensalism: One species is harmed and other is unaffected.

(+, -) Parasitism: One species is benefitted and the other is negatively affected.

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

**Explanation:** A flower is a modified shoot wherein

the shoot apical meristem changes to a floral meristem. Internodes do not get elongated and as a result the axis gets condensed. The apex produces many kinds of floral appendages laterally at the successive nodes instead than of leaves.

146. **Out of Syllabus**

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

**Explanation:** Gause's 'Competitive Exclusion Principle' states that two species that are closely related and competing for the same resources cannot co-exist indefinitely and the species which is competitively inferior will get eliminated. Herbivores and plants appear to be more affected by competition than carnivores.

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

**Explanation:** Klinefelter's syndrome is the result of presence of an additional copy of the X-chromosome resulting in a karyotype of 47, XXY. Such an individual has overall masculine development, however, the feminine development is also expressed in these individuals. Such individuals are sterile.

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

**Explanation:** M phase or mitosis is the phase where the actual cell division occurs. Mitosis is also called equational division. During the  $G_2$  phase DNA synthesis stops but the cell synthesises of RNA, proteins, etc. for the next phase. The quiescent stage is the inactive phase in which non-dividing cells enter. The  $G_1$  phase represents the stage between mitosis and initiation of DNA replication.

150. **Out of Syllabus**

## ZOOLOGY

### Section A

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

**Explanation:** In prokaryotes, the negatively charged DNA is held by some positively charged non-histone proteins in a region known as the nucleoid. In eukaryotes, nucleosome represents the structure that is formed by the negatively charged DNA wrapped around the positively charged histone octamer.

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

**Explanation:** HIV enters into helper T-lymphocytes ( $T_H$ ), undergoes replication and produces progeny viruses.

153. **Out of Syllabus**

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

**Explanation:** In an ECG:

P-wave represents the depolarisation of the atria. Q-wave represents the beginning of systole. QRS complex represents the depolarisation of ventricles. T-wave represents the repolarisation of the ventricles.

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

**Explanation:** Down's syndrome is the result of an additional copy of chromosome number 21. Its symptoms are:

- Broad palm with characteristic palm crease
- Short statured with small round head
- Furrowed tongue and partially open mouth, etc.

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

**Explanation:** RNA being unstable and single-stranded, mutates at a faster rate. So viruses having RNA genome and shorter life span mutate and evolve very fast.

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

**Explanation:** A ligament is an example of dense regular connective tissue. Cartilage is a specialised connective tissue.

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

**Explanation:** Assertion is true as there are two types of nephrons, i.e., cortical nephrons and juxtamedullary nephrons based on their relative position in the cortex and medulla. The reason is incorrect as the loop of Henle in juxtamedullary nephrons is long.

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

**Explanation:** A probe is a radioactive molecule that helps in the identification of mutated genes. YAC, BAC, and pBR322 are vectors.

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

**Explanation:** A protein is imagined as a line, the left end represented by the first amino acid also called as N-terminal amino acid and the right end is represented by the last amino acid also called the C-terminal amino acid. Adult haemoglobin consists of 4 subunits.

161. **Out of Syllabus**

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

**Explanation:**

- (i) Vasectomy is a surgical technique of contraception.
- (ii) Coitus interruptus is a natural technique of contraception.
- (iii) Cervical cap is a barrier technique of contraception.
- (iv) Saheli pill is an oral method of contraception.

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

**Explanation:** Cytoskeleton which consists of microtubules, microfilaments and intermediate filaments is involved in many functions such as motility, mechanical support, and maintenance of the shape of the cell.

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

**Explanation:** Gonorrhoea is a bacterial STD that can be treated and cured completely. All others are viral diseases which can be managed but have no cure.

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

**Explanation:** Vital capacity is the maximum volume of air a person can inhale after a forced expiration. It is calculated as the sum of inspiratory reserve volume (IRV), tidal volume (TV), and expiratory reserve volume (ERV), i.e.,  $VC = IRV + TV + ERV$ .

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

**Explanation:** Endoplasmic reticulum (ER), Golgi complex, lysosomes and vacuoles together

are known as the endomembrane system. Mitochondria, Chloroplasts and peroxisomes are not included in it.

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

**Explanation:** Cholecystokinin (CCK) acts on both the pancreas and gall bladder and helps in the secretion of pancreatic and bile enzymes respectively. GIP inhibits gastric secretion and motility. Atrial Natriuretic Factor (ANF) is released from the atrial wall of the heart. Anti-diuretic hormone (ADH) acts mainly on the kidney.

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

**Explanation:** In a *lac* operon,

Gene a codes for enzyme transacetylase.

Gene y codes for enzyme permease.

Gene i codes for a repressor protein

Gene z codes for enzyme beta-galactosidase.

169. **Out of Syllabus**

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

**Explanation:** Numbat, spotted cuscus and flying phalanger are Australian marsupials exhibiting adaptive radiation.

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

**Explanation:** The Vas deferens receives a duct from the seminal vesicle and opens into the urethra as the ejaculatory duct. The cavity of the cervix is called the cervical canal which along with the vagina forms the birth canal.

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

**Explanation:** Heroin is an opioid and a depressant that slows down body functions. Marijuana produces effects on the cardiovascular system of the body. Cocaine interferes with the transport of the neurotransmitter dopamine. Morphine is used as a sedative and painkiller.

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

**Explanation:**

(i) Ringworm is caused by *Trichophyton*.

(ii) Filariasis is caused by *Wuchereria bancrofti*.

(iii) Malaria is caused by *Plasmodium* species.

(iv) Pneumonia is caused by *Haemophilus influenzae*.

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

**Explanation:** Amniocentesis is used to test for the presence of certain genetic disorders such as Down's syndrome, and haemophilia, or to determine the survivability of the foetus but it is often misused as a tool for the detection of the sex of the child which results into increase in cases of female foeticide. Ban on this technique helps in preventing female foeticide.

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

**Explanation:** Radial symmetry is not found in adults of hemichordates as these are bilaterally symmetrical animals.

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

**Explanation:** Both statements are correct as low temperature preserves the enzyme in a temporarily inactive state whereas high temperature destroys enzymatic activity because proteins are denatured by heat. A competitive inhibitor is structurally similar to the substrate and it competes with the same for the binding site of the enzyme.

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

**Explanation:** Flame cells are the excretory structures in Platyhelminthes like *Taenia*. *Paramoecium* uses contractile vacuoles for excretion. Nephridia are the excretory structures of annelids like *Pheretima*. Urecose glands are present in the cockroach.

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

**Explanation:** First menstrual cycle that begins at puberty is called menarche. Menopause is the stoppage of the menstrual cycle.

179. **Out of Syllabus**

180. **Out of Syllabus**

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

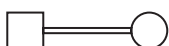
**Explanation:** Cells present on the outer layer of the blastocyst get attached to the outer layer of the endometrium for pregnancy to occur. They release a protein called L-selectin. The Corpus luteum secretes a large amount of progesterone which is required for the maintenance of the endometrium of the uterus. In the absence of fertilisation, the corpus luteum degenerates resulting in a decrease in the level of progesterone hormone that will cause the disintegration of endometrium followed by menstruation.

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

**Explanation:** A cartilaginous joint is present in between the adjacent vertebrae in the vertebral column. The ball and socket joint is present between the humerus and pectoral girdle. A fibrous joint is present between flat skull bones. The saddle joint is present between the carpal and metacarpal of the thumb.

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

**Explanation:** The symbol representing mating between relatives (consanguineous mating) in the human pedigree analysis is:



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

**Explanation:** Conventional methods of diagnosis like serum and urine analysis, etc, do not help in early diagnosis. While Recombinant DNA technology, Polymerase Chain Reaction [PCR] and Enzyme-Linked Immuno-Sorbent Assay (ELISA) are some of the techniques that help in early diagnosis.

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

**Explanation:** A leopard and a lion in a forest/grassland are an example of competition where both species are competing for the same resources. A cuckoo laying an egg in a crow's nest is an example of brood parasitism where the cuckoo is the bird that lays its egg in the nest of a crow.

Fungi and root of a higher plant in mycorrhizae is an example of mutualism where both species are benefitted. A cattle egret and cattle in a field is an example of commensalism where one species benefits and the other remains unaffected.

## Section B

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

**Explanation:** Cells in the  $G_0$  phase of the cell cycle remain metabolically active but no longer proliferate. In animal cells, DNA replication begins in the nucleus during the S phase and the centriole duplicates in the cytoplasm.

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

**Explanation:** Logistic growth occurs in case of limited resource availability conditions. Exponential growth occurs in case of unlimited resources. Expanding age pyramid shows a growing population where the per cent of individuals of pre-reproductive age is the largest followed by reproductive and post-reproductive age groups. A stable age pyramid shows a stable population where number of pre reproductive and reproductive age individuals is almost same.

188. **Out of Syllabus**

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

**Explanation:** Tetrad formation can be seen during the zygotene stage. Centromeres split and chromatids separate during Anaphase. Terminalisation of chiasmata takes place during diakinesis. Nucleolus, Golgi complex and ER are reformed during telophase. Crossing over takes place between non-sister chromatids.

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

**Explanation:** Thyroid hormones play an important role in the regulation of basal metabolic rate, maintenance of water and electrolyte balance and



support the process of RBCs formation, whereas this hormone is not involved in regulating the normal rhythm of the sleep-wake cycle and development of the immune system.

191. **Out of Syllabus**

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

**Explanation:** Basophils secrete histamine, serotonin, heparin etc. and are involved in inflammatory responses. Basophils are granulocytes. Neutrophils are the most abundant cells (60–65 %) of the total WBCs. Basophils are the least (0.5–1%) abundant of all WBCs. Monocytes have a kidney-shaped nucleus.

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

**Explanation:** ADH helps in water reabsorption from the DCT of the nephron to prevent diuresis, which increases blood pressure. It causes constriction of blood vessels thus increases the GFR. ANF is secreted by the heart and it is a vasodilator. Excessive loss of body fluid from the body switches on the osmoreceptors.

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

**Explanation:** Areolar connective tissue contains mast cells, fibroblasts and macrophages. The inner surface of bronchioles is marked by ciliated epithelium. Blood is a specialised connective tissue. Tubular parts of the nephron are covered by cuboidal epithelium.

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

**Explanation:** Chordates have closed circulatory systems and pharyngeal gill slits. The nerve cord is dorsal, hollow and single. The heart is ventral. They are triploblastic and coelomate.

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

**Explanation:** The presence of hairs, pinna and mammary glands are unique features of mammals. Monocondylic skull is present in Aves and reptiles. Mammals have a dicondylic skull. The tympanic membrane is present in amphibians also. Indirect development is not seen in mammals.

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

**Explanation:** The limbic system along with the hypothalamus regulates sexual behaviour, expression of excitement, pleasure, rage, fear, etc.

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

**Explanation:** The sequence of the coding strand is the same as transcribed mRNA except for thymine at the place of uracil.

Template strand → 3'-TAGCTAGCTAGCTAGC-TAGCTAGCTAGC-5'

Coding strand → 5'-ATCGATCGATCG-ATCGATCGATCGATCG-3'

mRNA → 5' AUCGAUCGAUCGAUCGAUC-GAUCG AUCG 3'

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

**Explanation:** Muscle bundles are joined together by a collagenous connective tissue layer called fascia. Muscle bundles are known as fascicles. The portion of the myofibril present between two successive 'Z' lines is the main functional unit of contraction called a sarcomere.

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

**Explanation:** A decrease in the productivity of the inbred population is not an advantage of inbreeding.

