

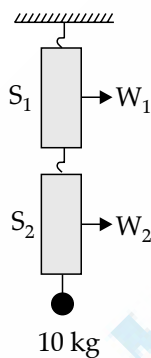
Time : 1 hr. 40 min.

Total Marks : 400

Instructions :

- This Test Booklet contains **100** items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **ONLY ONE** response for each item.
- You have to mark all your responses **ONLY** on the separate Answer Sheet provided. See directions in the Answer Sheet.
- All items carry equal marks.
- Penalty for wrong answers :**
THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE IN THE OBJECTIVE TYPE QUESTION PAPERS.
 - There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third** of the marks assigned to that question will be deducted as penalty.
 - If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.
 - If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

- Two identical spring balances S_1 and S_2 are connected one after the other and are held vertically as shown in the figure. A mass of 10 kg is hanging from S_2 . If the readings on S_1 and S_2 are W_1 and W_2 respectively, then :

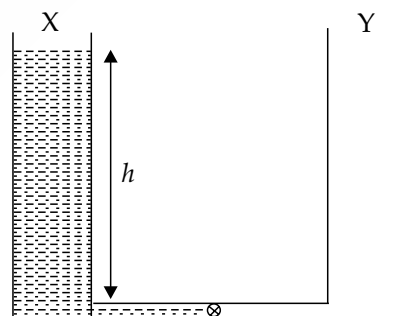


- $W_1 = 5 \text{ kg}$ and $W_2 = 10 \text{ kg}$
 - $W_1 = 10 \text{ kg}$ and $W_2 = 5 \text{ kg}$
 - $W_1 = 5 \text{ kg}$ and $W_2 = 5 \text{ kg}$
 - $W_1 = 10 \text{ kg}$ and $W_2 = 10 \text{ kg}$
- A stone is thrown horizontally from the top of a 20 m high building with a speed of 12 m/s. It hits the ground at a distance R from the building. Taking $g = 10 \text{ m/s}^2$ and neglecting air resistance will give :
 - $R = 12 \text{ m}$
 - $R = 18 \text{ m}$
 - $R = 24 \text{ m}$
 - $R = 30 \text{ m}$
 - A sphere of volume V is made of a material with lower density than water. While on Earth, it floats on water with its volume $f_1 V$ ($f_1 < 1$) submerged. On the other hand, on a spaceship

accelerating with acceleration $a < g$ (g is the acceleration due to gravity on Earth) in outer space, its submerged volume in water is $f_2 V$. Then :

- $f_2 = f_1$
- $f_2 = (1 - \frac{a}{g}) f_1$
- $f_2 > f_1$
- $f_2 = -a/g f_1$

- Two identical containers X and Y are connected at the bottom by a thin tube of negligible volume. The tube has a valve in it, as shown in the figure. Initially container X has a liquid filled up to height h in it and container Y is empty. When the valve is opened, both containers have equal amount of liquid in equilibrium. If the initial (before the valve is opened) potential energy of the liquid is P_1 and the final potential energy is P_2 then :

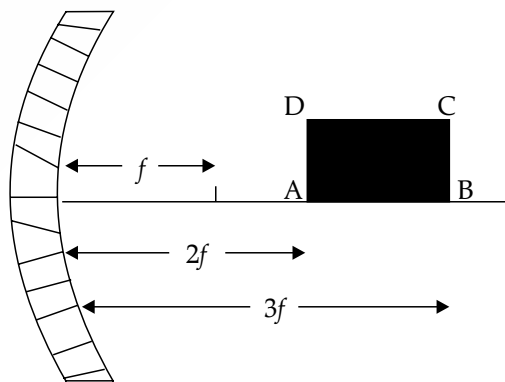


- $P_1 = P_2$
 - $P_1 = 4P_2$
 - $P_1 = 2P_2$
 - $P_1 = 8P_2$
- A particle is moving in a circle of radius R with a constant speed v . Its average acceleration over

the time when it moves over half the circle is :

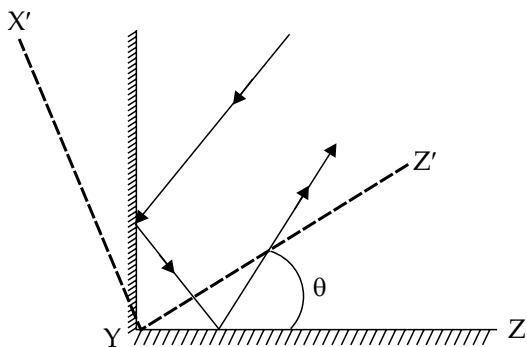
- (a) $\frac{v^2}{R}$ (b) $\frac{\pi v^2}{2R}$
 (c) $\frac{2v^2}{\pi R}$ (d) 0
6. Two forces of 5.0 N each are acting on a point mass. If the angle between the forces is 60° , then the net force acting on the point mass has magnitude close to :
- (a) 8.6 N (b) 4.3 N
 (c) 5.0 N (d) 6.7 N
7. Which one of the following is not an igneous rock ?
- (a) Granite (b) Slate
 (c) Basalt (d) Gabbro
8. Which of the following statements is/are correct ?
- Hypocenter is the point on the surface of the Earth, nearest to the focus.
 - Velocity of earthquake waves is higher in denser materials.
 - P waves move faster and are the first to arrive at the surface of the Earth.
- Select the correct answer using the code given below :
- (a) 1 and 2 (b) 2 and 3
 (c) 1 and 3 (d) 3 only
9. In terms of geological time scale, the quaternary period consists of two epochs. They are :
- (a) Pleistocene and Pliocene
 (b) Holocene and Pleistocene
 (c) Pleistocene and Miocene
 (d) Holocene and Eocene
10. Which one of the following is the correct sequence of arrangement of the given planets in descending order of their density (in gm/cm^3) ?
- (a) Earth > Jupiter > Venus > Saturn
 (b) Jupiter > Earth > Saturn > Venus
 (c) Earth > Venus > Jupiter > Saturn
 (d) Earth > Venus > Saturn > Jupiter
11. Which one of the following is *not* a cold current?
- (a) Western Australian Current
 (b) Eastern Australian Current
 (c) Benguela Current
 (d) Peru Current
12. The process of Podsolization is predominantly found in :
- (a) Equatorial forest
 (b) Monsoon forest
 (c) Taiga forest
 (d) Mediterranean forest
13. Joint Military exercise 'Keen Sword 23' was conducted between :
- (a) India and Japan (b) India and USA
 (c) USA and Japan (d) Japan and Taiwan
14. The Battle of Rezacang La, an epic battle in hostile conditions, was fought by the Indian Army in :
- (a) 1948 (b) 1956
 (c) 1962 (d) 1972
15. Consider the following statements about 'Exercise Sea Vigil-22':
- Its aim is to assess India's preparedness in the domain of Maritime security and coastal defence.
 - Naval forces of USA and Japan also took part in the exercise.
- Which of the statements given above is/are correct ?
- (a) 1 only (b) 2 only
 (c) Both 1 and 2 (d) Neither 1 nor 2
16. Consider the following statements :
- England is the only country that won the ICC T20 World Cup twice.
 - Virat Kohli is the only player to be adjudged as the Player of the Series in the ICC T20 World Cup twice.
- Which of the statements given above is/are correct ?
- (a) 1 only (b) 2 only
 (c) Both 1 and 2 (d) Neither 1 nor 2
17. Who among the following is not a recipient of Nobel Prize in Chemistry in 2022 ?
- (a) Carolyn R. Bertozzi
 (b) Benjamin List
 (c) Morten Meldal
 (d) K. Barry Sharpless
18. Consider the following statements regarding cell wall composition :
- Bacterial cell wall is made of peptidoglycan.
 - Fungal cell wall is made of cellulose.
 - Animals lack cell wall and have extracellular matrix made up of sugar and proteins.
- Select the correct answer using the code given below :
- (a) 2 only (b) 1 and 2 only
 (c) 1 and 3 only (d) 1, 2 and 3
19. Which one of the following structures is *not* present in a prokaryotic cell ?
- (a) Cell wall (b) Ribosomes
 (c) Nucleus (d) Plasma membrane
20. In a plant cell, which one of the following contains their own DNA ?
- (a) Nucleus and Endoplasmic Reticulum
 (b) Ribosome and Golgi apparatus
 (c) Mitochondria and Chloroplast
 (d) Chloroplast and Vacuoles

21. One advantage of sexual reproduction over asexual reproduction is that it helps species to survive over long evolutionary time. This is because sexual reproduction produces :
- more offspring in each reproductive cycle.
 - robust and healthy offspring.
 - genetically similar offspring.
 - more variation in offspring.
22. Which one of the following structures or components is *not* always present in living cells ?
- Cell wall
 - Plasma membrane
 - Cytoplasm
 - Genetic material
23. Browning of the chopped apple can be minimized by :
- using table sugar.
 - preserving in a container.
 - using lemon juice.
 - using milk of magnesia.
24. Which of the hydrocarbons are arranged as per the increasing order of their boiling points ?
- Methane, Butane, Propane, Heptane
 - Propane, Butane, Pentane, Octane
 - Propane, Butane, Heptane, Methane
 - Octane, Ethane, Methane, Propane
25. Which one of the following apparatus is used for separating benzene and water mixture ?
- Round bottom flask
 - Conical flask
 - Separating funnel
 - Dean and Stark apparatus
26. An iron nail dipped in copper sulphate solution turns brown. This is due to which one of the following types of reactions ?
- Addition reaction
 - Decomposition reaction
 - Substitution reaction
 - Displacement reaction
27. Among the following, which is not the correct method for keeping the curd ?
- Keeping in stainless steel vessel
 - Keeping in copper vessel
 - Keeping in plastic vessel
 - Keeping in glass vessel
28. Toothpaste prevents tooth decay by :
- neutralizing the excess acidity.
 - means of emulsification.
 - the action of fluoride.
 - making a coat of calcium over the teeth surface.
29. Freedom fighter Kanaklata Barua was martyred in:
- Sepoy Mutiny
 - Quit India Movement
 - Non-Cooperation Movement
 - Peasant Uprising of 1893 - 1894
30. Which one among the following statements about the Mansabdari system is correct ?
- All army troopers were allotted mansabs.
 - Mansabs were usually assigned on the basis of ancestry.
 - Position and salary of mansabdars were indicated by a numerical designation called zat.
 - Mansabdars were never paid in cash.
31. Which Governor General of Bengal underwent impeachment proceedings in the British Parliament ?
- Robert Clive
 - Henry Vansittart
 - Warren Hastings
 - Lord Cornwallis
32. Who among the following composed the 'Prayag Prashasti' of Samudragupta ?
- Harishena
 - Chand Bardai
 - Vishakhadatta
 - Kalidasa
33. Which one of the following kingdoms was founded by the two brothers Harihar and Bukka ?
- Bahmani
 - Vijayanagara
 - Malwa
 - Maratha
34. At which one of the following places did the Danes establish their settlement in India ?
- Chinsura
 - Karaikal
 - Mahe
 - Tranquebar
35. A rectangle ABCD is kept in front of a concave mirror of focal length f with its corners A and B being, respectively, at distances $2f$ and $3f$ from the mirror with AB along the principal axis as shown in the figure. It forms an image A'B'C'D' in front of the mirror. What is the ratio of B'C' to A'D' ?



- 1
- $\frac{2}{3}$
- $\frac{1}{2}$
- $\frac{2}{3}$

36. Shown in the figure are two plane mirrors XY and YZ ($XY \perp YZ$) joined at their edge. Also shown is a light ray falling on one of the mirrors and reflected back parallel to its original path as a result of this arrangement. The two mirrors are now rotated by an angle θ to their new position $X'YZ'$, as shown. As a result the new reflected ray is at an angle a from the original reflected ray. Then :



- (a) $a = 0$ (b) $a = \theta$
 (c) $a = 2\theta$ (d) $a = 4\theta$
37. A railway wagon (open at the top) of mass M_1 is moving with speed v_1 along a straight track. As a result of rain, after some time it gets partially filled with water so that the mass of the wagon becomes M_2 and speed becomes v_2 . Taking the rain to be falling vertically and water stationary inside the wagon, the relation between the two speeds v_1 and v_2 is :
- (a) $v_1 = v_2$
 (b) $\frac{1}{2}M_1v_1^2 < \frac{1}{2}M_2v_2^2$
 (c) $M_1v_1 = M_2v_2$
 (d) $M_1v_1 < M_2v_2$
38. Which one of the following statements is not true for a flute, a musical instrument ?
- (a) Momentum of waves on the blowing jet determines the loudness of the produced note.
 (b) Arrival time of the waves on the blowing jet determines the pitch of the produced note.
 (c) Sound comes from a vibrating column of air inside the flute.
 (d) Sound comes from a vibrating column of air inside as well as outside the flute.
39. A positive charge is moving towards south in a space where magnetic field is pointing in the north direction. The moving charge will experience :
- (a) a deflecting force towards north direction.
 (b) a deflecting force towards east direction.
 (c) a deflecting force towards west direction.
 (d) no deflecting force.

40. Which one of the following is not a main greenhouse gas ?

(a) Water vapour (b) Oxygen
 (c) Carbon dioxide (d) Methane

41. Which one of the following statements about X-rays is *not* true ?

(a) They have wavelengths of about 1 \AA .
 (b) These can be generated by bombarding a metal target by high energy electrons.
 (c) Due to their wavelengths being shorter, these can be used for radar systems.
 (d) These are also used for the treatment of certain forms of cancer.

42. Which one among the following is the northernmost geographical location ?

(a) New Delhi (b) Kathmandu
 (c) Thimphu (d) Dhaka

43. Consider the following statements :

- Distance between the longitudes becomes zero on North Pole and South Pole.
- Distance between the longitudes is maximum on the Equator.
- Number of longitudes is more than number of latitudes.

Which of the statements given above is/are correct ?

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

44. Which one among the following states is the leading producer of Manganese in India ?

(a) Madhya Pradesh (b) Jharkhand
 (c) Rajasthan (d) Karnataka

45. Mica is mainly used in :

(a) food and beverage industry.
 (b) iron and steel industry.
 (c) aluminium industry.
 (d) electrical and electronic industries.

46. According to Koppen's climatic classifications, the Great Northern Plains of India have which one of the following climates ?

(a) Aw climate (b) Cwg climate
 (c) Amw climate (d) Dfc climate

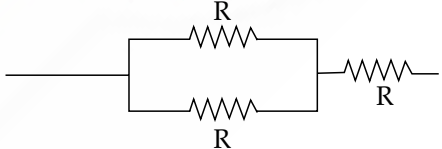
47. Which of the following statements about Lachit Borphukan is/are correct ?

- He was a General of the Ahom Force.
- He is known for his leadership in the Battle of Saraighat.
- Lachit Borphukan Gold Medal is given to the best cadet at the National Defence Academy.

Select the correct answer using the code given below :

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

48. The 4th edition of joint military exercise 'DUSTLIK' between the Indian Army and the Uzbekistan Army was held in :
 (a) Ranikhet (b) Gangtok
 (c) Pithoragarh (d) Leh
49. Which of the following is India's first privately developed rocket launched by ISRO recently ?
 (a) Skyroot (b) Prarambh
 (c) Bazoomq (d) Vikram-S
50. Which one among the following villages was recently declared as India's first 24×7 solar-powered village ?
 (a) Mawlynnong, Meghalaya
 (b) Modhera, Gujarat
 (c) Ziro village, Arunachal Pradesh
 (d) Malana, Himachal Pradesh
51. Tableaux of which one of the following States was adjudged the best in the Republic Day Parade, 2023 ?
 (a) Uttarakhand (b) Punjab
 (c) Gujarat (d) Uttar Pradesh
52. Organisms capable of using CO_2 as principal carbon source are called :
 (a) Autotrophs (b) Heterotrophs
 (c) Parasites (d) Decomposers
53. When yeast cells are O_2 starved, fermentation serves as the source of energy. This results in the production of:
 (a) $\text{ATP} + \text{CO}_2 + \text{Ethanol}$
 (b) $\text{ATP} + \text{O}_2 + \text{Pyruvate}$
 (c) $\text{ATP} + \text{CO}_2 + \text{Lactic acid}$
 (d) $\text{ATP} + \text{O}_2 + \text{Acetaldehyde}$
54. During a laboratory experiment, a student immerses epidermal leaf peel in a hypertonic solution. After some time, the student examined the cells under a microscope and observed that:
 (a) the cells swelled.
 (b) the cells were plasmolysed.
 (c) the cells built up turgor pressure.
 (d) the cells size was unaffected.
55. Which one of the following is *not* a characteristic feature of fungi ?
 (a) Cell wall is made of chitin
 (b) Filamentous mycelium is present
 (c) Can carry out photosynthesis
 (d) Asexual spores are produced
56. Which one of the following statements about bryophytes is *not* correct ?
 (a) The plant body is a gametophyte.
 (b) They are also called the amphibians of plant kingdom.
 (c) The plant body is attached to the substratum by rhizoids.
 (d) Specialized water-conducting tissues are present.
57. What is the specific purpose of using potassium hydroxide during the saponification process ?
 (a) To obtain soaps which are hard on the skin
 (b) To obtain soaps which are soft on the skin
 (c) To obtain natural fragrance
 (d) To make the saponification very economical
58. Which one of the following is the correct arrangement of metals in the decreasing order of their reactivity ?
 (a) Iron, Sodium, Silver, Copper
 (b) Silver, Copper, Iron, Sodium
 (c) Sodium, Copper, Silver, Iron
 (d) Sodium, Iron, Copper, Silver
59. Which among the following statements is not correct with respect to allotropes of Carbon ?
 (a) Graphite is a good conductor of electricity.
 (b) Diamond is the hardest substance known.
 (c) Fullerene is one of the allotropes of carbon.
 (d) Next to diamond, graphite is the second hardest known substance.
60. Which among the following is the popular method for manufacture of ammonia ?
 (a) Ostwald's process
 (b) Haber-Bosch process
 (c) Electric furnace process
 (d) Electrolysis process
61. For manufacturing of glass, which among the following is used as a source of silica ?
 (a) Fine clay soil
 (b) Wood powder
 (c) Coconut shell
 (d) Sand
62. Which among the following is the correct arrangement of halogens in the increasing order of their oxidizing nature ?
 (a) F, Cl, Br, I (b) Cl, Br, F, I
 (c) Br, I, Cl, F (d) I, Br, Cl, F
63. Copper sulphate crystals available in the market are blue coloured crystals. By careful heating, they turn to white colour. Which one of the following is responsible for the blue colour ?
 (a) Oxygen (b) Nitrogen
 (c) Water (d) Hydrogen
64. Equal volume of all gases, when measured at the same temperature and pressure, contain an equal number of particles. Who proposed the above law ?
 (a) Charles (b) Boyle
 (c) Avogadro (d) Gay Lussac

65. Airbags work on the principle of a chemical reaction triggered by the impact producing a gaseous product that causes a sudden volume change. Which one among the following chemical conversions is responsible for this ?
 (a) Sodium azide into nitrogen gas
 (b) Solid carbon dioxide into gaseous carbon dioxide
 (c) Carbon dioxide into carbon monoxide
 (d) Sudden conversion of gaseous carbon dioxide into carbon monoxide
66. Which one among the following districts of Eastern India held a referendum in 1947 to decide whether or not to join Pakistan ?
 (a) Sylhet (b) Goalpara
 (c) Cachar (d) Jalpaiguri
67. Which one of the following statements about Rabatak inscription is *not* correct ?
 (a) It throws important light on Kushana genealogy.
 (b) It refers to Kanishka as 'a king of kings and a son of God'.
 (c) The 23-line inscription is written in Gandhari language.
 (d) It mentions names of States which were part of Kanishka's empire.
68. Who among the following was the author of the famous Sanskrit work 'Mrichchhakatika' ?
 (a) Kalidasa (b) Bhasa
 (c) Valmiki (d) Shudraka
69. Yashovarman was ruler of which one of the following kingdoms ?
 (a) Kannauj (b) Mewar
 (c) Marwar (d) Kalinga
70. Which one among the following rulers established Pataliputra as the capital of the Magadhan Empire ?
 (a) Bimbisara (b) Bindusara
 (c) Ajatashatru (d) Ashoka
71. Which one of the following astronomers proved that the Earth and other planets revolve around the Sun ?
 (a) Copernicus (b) Kepler
 (c) Galileo (d) Newton
72. Sand falls vertically on a conveyor belt at a rate of 0.1 kg/s. In order to keep the belt moving at a uniform speed of 2 m/s, the force required to be applied on the belt is :
 (a) 0 N (b) 0.2 N
 (c) 1.0 N (d) 2.0 N
73. The power required to lift a mass of 8.0 kg up a vertical distance of 4 m in 2 s is (taking acceleration due to gravity as 10 m/s^2):
 (a) 80 W (b) 160 W
 (c) 320 W (d) 640 W
74. One block of 2.0 kg mass is placed on top of another block of 3.0 kg mass. The coefficient of static friction between the two blocks is 0.2. The bottom block is pulled with a horizontal force F such that both the blocks move together without slipping. Taking acceleration due to gravity as 10 m/s^2 , the maximum value of the frictional force is :
 (a) 50 N (b) 30 N
 (c) 4 N (d) 10 N
75. A mass is attached to a spring that hangs vertically. The extension produced in the spring is 6 cm on Earth. The acceleration due to gravity on the surface of the Moon is one-sixth of its value on the surface of the Earth. The extension of the spring on the Moon would be :
 (a) 6 cm (b) 1 cm
 (c) 0 cm (d) 36 cm
76. Which one of the following is an example of Second Class Lever ?
 (a) A pair of scissors (b) A bottle opener
 (c) A cricket bat (d) A bow and arrow
77. In an electric circuit, a wire of resistance 10Ω is used. If this wire is stretched to a length double of its original value, the current in the circuit would become :
 (a) half of its original value.
 (b) double of its original value.
 (c) one-fourth of its original value.
 (d) four times of its original value.
78. What is the total resistance in the following circuit element ?

 (a) $R/2$ (b) $3R$
 (c) $3R/2$ (d) $2R/3$
79. Which of the following scheme(s) is/are included under *Bharatmala Pariyojana* ?
 1. Develop the road connectivity to border areas
 2. Development of coastal roads
 3. Improvement in the efficiency of National Corridors
 Select the correct answer using the code given below :
 (a) 1 only (b) 3 only
 (c) 2 and 3 only (d) 1, 2 and 3
80. Deendayal Port was earlier known as :
 (a) Paradip Port
 (b) Tuticorin Port
 (c) Kandla Port
 (d) Visakhapatnam Port

81. The Counter Insurgency and Jungle Warfare School of Indian Army is situated at:
 (a) Dehradun (b) Vairengte
 (c) Gulmarg (d) Mhow
82. In the soil-forming regime, which one of the following occurs in a region where evapotranspiration exceeds precipitation significantly?
 (a) Calcification (b) Laterization
 (c) Podsolization (d) Gleization
83. Which one of the following is found in the innermost part of the Earth?
 (a) Conrad discontinuity
 (b) Moho discontinuity
 (c) Guttenberg discontinuity
 (d) Lehmann discontinuity
84. Which of the following tree species is/are found on Himalayas?
 1. Oak
 2. Rhododendron
 3. Rosewood
 Select the correct answer using the code given below:
 (a) 1 only (b) 2 and 3
 (c) 1 and 3 (d) 1 and 2
85. Which one of the following is the lowermost/innermost intrusive igneous rock?
 (a) Laccolith (b) Batholith
 (c) Lopolith (d) Phacolith
86. If it is 12 noon in New Delhi, what will be the time in London, UK?
 (a) 7:30 A.M. (b) 6:30 P.M.
 (c) 5:30 A.M. (d) 5:30 P.M.
87. Which of the following positions of Sun, Earth and Moon is/are suitable for Spring Tide?
 1. SYZYG Y Conjunction
 2. SYZYG Y Opposition
 3. Quadrature
 Select the correct answer using the code given below:
 (a) 1 only (b) 2 only
 (c) 1 and 2 (d) 1 and 3
88. Which Renaissance artist painted 'The Last Supper' ?
 (a) Michelangelo (b) Donatello
 (c) Botticelli (d) Leonardo da Vinci
89. Which one of the following European explorer conquered Mexico?
 (a) Vasco da Gama (b) Bartholomew Diaz
 (c) Magellan (d) Hernan Cortes
90. Near which one of the following cities in India have large statues of Kushana rulers been discovered?
 (a) Kamal (b) Ropar
 (c) Hisar (d) Mathura
91. The Treaty of Yandabo was concluded as part of which one of the following wars?
 (a) First Anglo-Burmese War
 (b) Second Anglo-Burmese War
 (c) Anglo-Kuki War
 (d) Anglo-Maratha War
92. Plan allocation in agriculture and irrigation as percentage of total plan outlay was highest in:
 (a) Seventh Five-Year Plan
 (b) Third Five-Year Plan
 (c) First Five-Year Plan
 (d) Second Five-Year Plan
93. The UN COP-27 Summit relates to:
 (a) Russia-Ukraine war
 (b) Terrorism and counter-terrorism
 (c) Climate change
 (d) Interpol
94. Which one of the following tribes from India's North-East had the earliest known association with cultivation and production of tea?
 (a) Khasis (b) Garos
 (c) Singphos (d) Jaintias
95. By which one of the following amendments, was Article 51A, relating to the Fundamental Duties, inserted into the Constitution of India?
 (a) The Constitution (42nd Amendment) Act
 (b) The Constitution (44th Amendment) Act
 (c) The Constitution (85th Amendment) Act
 (d) The Constitution (92nd Amendment) Act
96. Which one of the following statements is true?
 (a) The force of gravity of the Earth on the Moon is greater than the force of gravity of the Moon on the Earth.
 (b) The force of gravity of the Moon on the Earth is greater than the force of gravity of the Earth on the Moon.
 (c) The force of gravity of the Earth on the Moon and of the Moon on the Earth are equal in magnitude and are in the same direction.
 (d) The force of gravity of the Earth on the Moon and of the Moon on the Earth are equal in magnitude but are in opposite directions.
97. An electric bulb is rated as 220 V and 80 W. When it is operated on 110 V, the power rating would be:
 (a) 80 W (b) 60 W
 (c) 40 W (d) 20 W
98. In the dispersion of white light by a common glass prism, which one among the following is correct?
 (a) Red light deviates the most because red light has highest speed in prism
 (b) Blue light deviates the most because blue light has highest speed in prism

- (c) Red light deviates the most because red light has lowest speed in prism
 (d) Blue light deviates the most because blue light has lowest speed in prism
99. Which one among the following is true for the speed of sound in a given medium ?
 (a) Speed of sound remains same at all frequencies
 (b) Speed of sound is faster at higher frequencies
- (c) Speed of sound is slower at higher frequencies
 (d) Speed of sound is slower at higher wavelengths
100. Which one of the following telescopes contains only mirrors ?
 (a) Galilean telescope
 (b) Keplerian telescope
 (c) Newtonian telescope
 (d) Schmidt telescope

ANSWER KEY

Q. No.	Answer Key	Topic's Name	Chapter's Name
1	d	Spring	Laws of Motion
2	c	Projectile Motion	Motion in a Plane
3	a	Density	Properties of Bulk Matter
4	c	Pressure due to Fluid Column	Properties of Bulk Matter
5	c	Uniformly Accelerated Motion	Laws of Motion
6	a	Vectors	Motion in a Plane
7	b	Types of Rocks	Rocks and its Structure
8	b	Earthquake	Interior of Earth
9	b	Human Evolution: The Old Stone Age	Ancient History
10	c	Planets	Solar System
11	b	Warm and Cold Currents	Ocean Currents
12	c	Soil formation	Soil Science
13	c	Military Exercises	Defence
14	c	After Independence	Modern History
15	a	Military Exercises	Defence
16	b	ICC Tournaments	Sports
17	b	Nobel Prize	Awards and Prizes
18	c	Cell wall	Cell and its structure
19	c	Types of Cells in living beings	Cells and its structure
20	c	Plant Cell	Cells and its structure
21	d	Types of Reproduction	Reproduction
22	a	Cells	Cells and its structure
23	c	Chemistry in everyday life	Chemistry in everyday life
24	b	Boiling Points of Hydrocarbons	Hydrocarbons
25	d	Seeration of mixture	Azeotropic mixture
26	d	Displacement reaction	Chemical reaction
27	b	Reaction of Acids	Acids, Bases and Salts
28	a	Tooth Decay	Acids, Bases and Salts
29	b	Independence struggle	Modern History
30	c	Ranks in Mughal Dynasty	Mughal Dynasty

Q. No.	Answer Key	Topic's Name	Chapter's Name
31	c	Governor Generals	Modern History
32	a	Inscriptions	Ancient History
33	b	Vijayanagar Empire	Ancient India
34	d	Arrival of Europeans	Modern India
35	c	Spherical Mirror	Ray Optics
36	c	Plane Mirror	Ray Optics
37	c	Momentum	Laws of Motion
38	d	Waves	Sound
39	d	Force on a Charged Particle in a Magnetic Field	Moving Charges and Magnetism
40	b	Greenhouse gases	Atmosphere
41	c	X rays	Modern Physics
42	a	Geographical Location	India and its neighbours
43	d	Longitude	Longitude and Latitude
44	a	Minerals	Minerals in India
45	d	Mica	Application of Minerals
46	b	Kopper's climatic classification	Climatology
47	a	Ahom Kingdom	Modern India
48	c	Military Exercises	Defence
49	d	ISRO Expeditions	Science and Technology
50	b	Solar Power	Current Affairs
51	a	Tabluxe	Current Affairs
52	a	Autotrophic Nutrition	Autotrophs
53	a	Fermentation	Hydrocarbons
54	b	Cells	Cells and its structure
55	c	Fungi	Plant Kingdom
56	d	Bryophytes	Plant Kingdom
57	b	Saponification	Chemical reaction
58	d	Reactivity series	Reactivity of Metals
59	d	Properties of Carbon	Carbon and its compounds
60	b	Ammonia manufacture	Haber's Process
61	d	Properties of Silica	p block elements
62	d	Halogens	p block elements
63	c	Displacement reaction	Chemical Reactivity
64	c	Gas Law	Gases
65	a	Application	Chemical reaction
66	a	India during partition	Post Independence
67	c	Inscriptions	Ancient India
68	d	Literary works	Ancient India
69	a	Chalukya Dynasty	Sangam Age
70	c	Magadh Empire	Ancient India
71	a	Earth	Astronomy

Q. No.	Answer Key	Topic's Name	Chapter's Name
72	b	Newton's Law of Motion	Laws of Motion
73	b	Power	Work, Power, Energy
74	c	Friction	Laws of Motion
75	b	Weight	Gravitation
76	b	Types of levers	Laws of Motion
77	c	Resistance	Current Electricity
78	c	Equivalent Resistance	Current Electricity
79	d	Bharatmala Pariyojana	Current Affairs
80	c	Ports	Current Affairs
81	b	Defence	Current Affairs
82	a	Soil formation	Soil Science
83	d	Interior of Earth.	Geomorphology
84	d	Vegetation	Forest and its types
85	b	Interior of Earth.	Geomorphology
86	a	Time zone	Latitude, Longitude and Time
87	c	Spring Tide	Tides
88	d	Paintings	Art & Culture
89	d	Travellers	European Travellers
90	d	Kushana Dynasty	Ancient Dynasty
91	a	Anglo Burmese War	Modern India
92	c	Five year plan	Indian economy
93	c	Climate conferences	Current Affairs
94	c	Tribes	Tribes in India
95	a	Important ammendments	Polity
96	d	Gravitational force	Gravitation
97	d	Electric Power	Current Electricity
98	d	Dispersion	Ray Optics
99	a	Properties of Sound	Sound
100	c	Optical Instruments	Ray Optics

ANSWERS WITH EXPLANATION

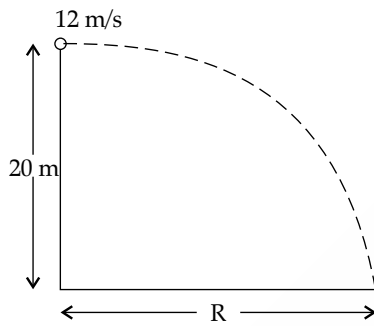
- 1.
- Option (d) is correct.**

Explanation: Since, both the springs are identical in nature. Thus, they will show similar readings.

Hence, $W_1 = 10 \text{ kg}$ and $W_2 = 10 \text{ kg}$.

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

Explanation:



From the above figure, we can say that

$$u_x = 12 \text{ m/s}; u_y = 0 \text{ m/s}; h = 20 \text{ m and } g = 10 \text{ m/s}^2$$

$$\Rightarrow t^2 = 4 \text{ s}$$

$$\Rightarrow t = 2 \text{ s}$$

$$\text{Now, } R = u_x t = 12 \times 2 = 24 \text{ m}$$

- 3.
- Option (a) is correct.**

Explanation: When $f_1 < f_2$ (the body will float)

$f_1 > f_2$ (the body will sink)

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

Explanation: At initial condition $P_1 = mg$

$P_2 = mg$ (height is 0)

When the valve is open P_2 increases because h increases.

Height of P_1 is less after valve opened

$$\text{So, } P_1 = 2 P_2$$

- 5.
- Option (c) is correct.**

Explanation: Over a half circle

$$\Delta p = mv - (-mv) = 2mv$$

$$\Delta t = \frac{\text{distance}}{\text{speed}} = \frac{\pi r}{v}$$

According to 2nd law of motion, $\frac{\Delta P}{\Delta t} = ma$

$$\Rightarrow \frac{2mv}{\pi r / v} = ma \Rightarrow a = \frac{2v^2}{\pi r}$$

- 6.
- Option (a) is correct.**

Explanation:

$$R = \sqrt{(F_1^2 + F_2^2 + F_1 F_2 \cos \theta)}$$

$$R = \sqrt{(5^2 + 5^2 + 25 \cos 60^\circ)}$$

$$R = 8.66 \text{ N}$$

- 7.
- Option (b) is correct.**

Explanation: Shale metamorphoses into slate, a specific type of metamorphic rock. Typically, heat and pressure from beneath the earth's surface cause igneous and sedimentary rock to change into metamorphic rocks.

- 8.
- Option (b) is correct.**

Explanation: The location below the earth's surface where the earthquake starts is called the hypocenter, and the location directly above it on the surface of the earth is called the epicenter. The speed at which earthquake waves propagate is greater when the rock is dense. As a result, P-waves are the first to arrive at the surface of the Earth, owing to their faster velocity.

- 9.
- Option (b) is correct.**

Explanation: The Pleistocene (2.58 million years ago to 11.7 thousand years ago) and the Holocene (11.7 thousand years ago to the present) are the two epochs that make up the Quaternary Period. Pleistocene is referred as the Ice Age, while Holocene is post-ice age period.

- 10.
- Option (c) is correct.**

Explanation: The correct sequence of planets based on the given density in decreasing order is as follows: Earth > Venus > Jupiter > Saturn. Planets and their average densities (gm/cm^3):

Mercury : 5.4

Venus : 5.2

Earth : 5.5

Mars : 3.9

Jupiter : 1.3

Saturn : 0.7

Uranus : 1.3

Neptune : 1.6

- 11.
- Option (b) is correct.**

Explanation: Ocean currents are the continuous flow of huge amount of water in a definite direction. These may be warm or cold. The warm ocean currents originate near the equator and move towards the poles while the cold currents carry water from polar or higher latitudes to tropical or lower latitudes.

Cold currents: West Australian Current, Benguela Current, Peru Current.

Warm current: Eastern Australian Current.

12. **Option (c) is correct.**

Explanation: Taiga forest is where it is most frequently found. Podsolization, a type of severe leaching, results in the release of iron and aluminium sesquioxide. The mechanism is more common where precipitation exceeds evapotranspiration.

13. **Option (c) is correct.**

Explanation: 'Keen Sword 23' is a bilateral exercise conducted between Japan and U.S.A. It has been held since 1986 once in two years to boost the preparedness and interoperability between the military personnel of Japan and the United States.

14. **Option (c) is correct.**

Explanation: The Battle of Rezang La was fought by the Indian Army against the Chinese Army in 1962. Rezang La is a mountain pass on the LAC in Ladakh.

15. **Option (a) is correct.**

Explanation: In 2022, the Indian Navy conducted Sea Vigil-22, the third iteration of its nationwide coastal defense exercise, in collaboration with the Coast Guard and other relevant government agencies involved in maritime operations. This exercise was conceptualised in 2018 to check various measures that have been instituted towards enhancing the maritime security since the 26/11 Mumbai attack.

16. **Option (b) is correct.**

Explanation: The West Indies is the only country to have triumphed in the ICC T20 World Cup on two occasions, during the 2012 and 2016 tournaments. Similarly, Virat Kohli is the sole player to have been awarded the Player of the Series title twice in the ICC T20 World Cup.

17. **Option (b) is correct.**

Explanation: Carolyn R. Bertozzi (U.S.A) Morten Meldal (Denmark) and K. Barry Sharpless (U.S.A) were awarded the Nobel Prize in Chemistry for the development of click chemistry and biorthogonal chemistry in the year 2022.

18. **Option (c) is correct.**

Explanation: Bacterial cell wall is made of peptidoglycan or murein.

Fungal cell wall is made of tough sugar complex called chitin. It is a large polysaccharide of N-acetyl-d-glucosamine (NAG) which is linked by beta-glycosidic bond.

Animals lack cell wall and have extracellular matrix made up of sugar and proteins.

19. **Option (c) is correct.**

Explanation: The structures that are present in a prokaryotic cell are the cell wall, ribosomes, plasma membrane, etc. However, the nucleus is not present in a prokaryotic cell. Due to this, their genetic material is basically naked and not enveloped by a nuclear membrane.

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

Explanation: In a plant cell, chloroplast and mitochondria are the two cell organelles that have

their own DNA and ribosomes. Mitochondria possesses single circular DNA molecule in its matrix. Whereas, chloroplast contains small, double stranded circular DNA molecules in its stroma.

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

Explanation: Compared to asexual reproduction, the offspring of sexual reproduction have more variations. This is due to the involvement of both parents. Hence, offspring inherit the attributes of both. This benefit aids the sexually reproducing species' long-term evolutionary survival.

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

Explanation: The outermost layer of plant cells is called the cell wall. It is a non-living rigid structure. Only plants and a few types of fungi, bacteria, and algae have cell walls. It exists outside of the cell membrane and has a texture that is sometimes hard, sometimes flexible. It is primarily made of cellulose. On the other hand, plasma membrane, cytoplasm and genetic material are present in all the living cells.

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

Explanation: Apple slices can be coated with lemon or pineapple juice, both of which naturally contain antioxidants, to prevent enzymatic browning. Additionally, both fruit juices are acidic, which results in a lower pH and reduced browning activity.

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

Explanation: As the molecular mass of hydrocarbons rises, so does their boiling point.

The intermolecular forces of attraction (Van der Waal's force and London force) grow with molecular mass, making it more difficult to break the bond and requiring more energy.

Therefore, the correct order will be: Propane, Butane, Pentane, Octane.

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

Explanation: Dean and Stark apparatus is used to separate benzene and water mixture.

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

Explanation: Because iron is more reactive than copper, it will take the place of copper in its salt and create a new salt called ferrous sulphate. The colour of copper sulphate, which is initially blue, will change during the reaction to become greenish-blue ferrous sulphate.

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

Explanation: Acids are present in curd and other sour foods. As a result, when they are stored in brass and copper containers, the metal reacts with the acid to release hydrogen gas and other dangerous byproducts, ruining the food.

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

Explanation: In the mouth, bacteria break down sugar and food particles and produce acids. The tooth enamel corrodes and dental decay begins as a result of the acids produced. The nature of toothpastes is base. They counteract the effects of acids and stop tooth decay as a result.

29. **Option (b) is correct.**

Explanation: In 1924, Kanaklata Barua was born in

Barangabari, Assam. She marched with a group of freedom fighters towards the Gohpur Police station on September 20, 1942, to raise the Tricolour in support of the Quit India Movement. The Police warned the procession of dire consequences if they proceeded further. Even after the warning, the procession continued marching ahead when the police fired upon the procession and Barua was shot dead.

30. **Option (c) is correct.**

Explanation: Both the personal rank (referred to as zat) and the cavalry rank (referred to as sawar) were used to indicate the mansab or rank. Every mansabdar had both the zat and sawar rank, was paid rupees two per horse.

31. **Option (c) is correct.**

Explanation: Warren Hastings was the Governor-General of Bengal from 1774 to 1785. He was the first governor-general to undergo impeachment proceedings in the British Parliament. In 1787, he was accused of corruption during his tenure in India and impeached, but after a long trial, he was acquitted in 1795.

32. **Option (a) is correct.**

Explanation: Allahabad Pillar Inscription also known as 'Prayag Prashasti' was composed in Sanskrit by the court poet of Samudragupta, Harisena.

33. **Option (b) is correct.**

Explanation: Harihar and Bukka founded the Vijaynagara empire in 1336.

34. **Option (d) is correct.**

Explanation: The Danish East India Company was established in 1616. They founded a factory at Tranquebar near Tanjore in 1620 on the eastern coast of India. Their principal settlement was at Serampore near Calcutta. The Danish factories, which were not important at any time, were sold to the British government in 1845. The Danes are better known for their missionary activities than for commerce.

35. **Option (c) is correct.**

Explanation: Line AD is at center of curvature (2f), So A'D' = AD

For image of CB, $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

$$\Rightarrow \frac{1}{f} = \frac{1}{v} + \frac{1}{3f} \Rightarrow \frac{1}{v} = \frac{2}{3f} \Rightarrow v = \frac{3f}{2}$$

$$\text{Now, } m = -\frac{v}{u} = -\frac{\frac{3f}{2}}{3f} = \frac{1}{2}$$

$$B'C' = \frac{1}{2} BC$$

$$\text{Hence } \frac{B'C'}{A'D'} = \frac{\frac{1}{2} BC}{AD} = \frac{1}{2}$$

36. **Option (c) is correct.**

Explanation: For same incident ray, if mirror is rotated by an angle of θ , then reflected ray will be at an angle of 2θ .

Hence, $a = 2\theta$

37. **Option (c) is correct.**

Explanation: According to conservation of momentum

$$M_1 v_1 = M_2 v_2$$

38. **Option (d) is correct.**

Explanation: Sound produced is due to air column present inside a flute, outside it only propagates. Hence, option (d) is an incorrect statement.

39. **Option (d) is correct.**

Explanation: As magnetic field and current are anti parallel ($\theta = 180^\circ$ and $\sin 180^\circ = 0$)

Moving charge experience no force in any direction.

$$F = IBL \sin 180^\circ = IBL \times 0 = 0$$

40. **Option (b) is correct.**

Explanation: The greenhouse effect is a naturally occurring phenomenon that is responsible for heating the Earth's surface and atmosphere. It is due to the trace amounts of greenhouse gases are water vapor, carbon-dioxide, methane, nitrous oxide, chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), and ozone. These gases allow solar radiation to reach the Earth's surface, but they absorb infrared radiation emitted by the Earth, causing the planet's surface to heat up.

41. **Option (c) is correct.**

Explanation: In medicine, X-rays are employed as a diagnostic tool, whereas in aircraft navigation, radar systems employ microwaves. When high-energy electrons come to an abrupt halt on a metal surface with a high atomic number, X-rays are generated.

42. **Option (a) is correct.**

Explanation: The following sequence will form when we arrange the given capitals from north to south. New Delhi, Kathmandu, Thimphu, Dhaka. Hence, the northernmost geographical location among the given options is New Delhi.

43. **Option (d) is correct.**

Explanation: The longitude indicates how far a location is to the east or west of the Prime Meridian, a hypothetical line that connects the North and South Poles. On the North and South Poles, the distance between the longitudes equalises to zero. On the Equator, the distance between the longitudes is maximum. There are more longitudes than latitudes in the world.

44. **Option (a) is correct.**

Explanation: Madhya Pradesh is the leading producing State of manganese ore accounting for 33% of total production during 2019-20 followed by Maharashtra 25% and Odisha 19%.

If we talk about the reserves of manganese ore, Odisha tops the total reserves/ resources with 44% share followed by Karnataka (22%).

45. **Option (d) is correct.**

Explanation: Primarily, mica finds its application in the electrical and electronic sectors, including its use in microwave ovens. Moreover, mica sheets serve as window sheets in various applications.

46. **Option (b) is correct.**

Explanation: As per Koppen's climate classification, the Great Northern Plains of India exhibit a Cwg type climate, commonly known as a "monsoon type with dry winters" climate.

47. **Option (a) is correct.**

Explanation: An invasion attempted by Mughal forces led by Ramsingh I was thwarted by the Ahom general Lachit Borphukan in the Battle of Saraighat. Since 1999, the National Defence Academy's (NDA) top cadet has received the Lachit Borphukan Gold Medal.

48. **Option (c) is correct.**

Explanation: The Indian Army and Uzbekistan Army conducted the fourth iteration of their joint military exercise, named 'DUSTLIK,' in the town of Pithoragarh in Uttarakhand.

49. **Option (d) is correct.**

Explanation: Developed by Hyderabad-based space startup Skyroot Aerospace, the Vikram-S rocket is India's first privately developed rocket. It was launched on 18 November 2022 from Sriharikota.

50. **Option (b) is correct.**

Explanation: India's Prime Minister, Narendra Modi, has declared Modhera, a village in the Mehsana district of Gujarat, as the country's first village powered entirely by solar energy 24 hours a day, seven days a week.

51. **Option (a) is correct**

Explanation: The wildlife and religious theme tableau of Uttarakhand was awarded the first prize at 2023 Republic Day Parade.

52. **Option (a) is correct**

Explanation: An autotroph is an organism that can use CO_2 as its primary carbon source. Autotrophs include chemosynthetic bacteria, photosynthetic bacteria, algae and plants. These organisms generate complex organic compounds (such as carbohydrates, lipids, and proteins) by obtaining carbon from simple substances such as carbon dioxide and utilizing energy either from light (photosynthesis) or inorganic chemical reactions (chemosynthesis). They transform an abiotic energy source (such as light) into energy stored in organic compounds (glucose), which can then be utilized by other organisms (e.g., heterotrophs).

53. **Option (a) is correct**

Explanation: When yeast cells are oxygen-starved (an anaerobic condition), fermentation serves as a source of energy. In this process, the yeast partially breaks down glucose (a six-carbon molecule) under anaerobic conditions through sets of reactions into pyruvic acid (a three-carbon molecule), which is then converted into CO_2 and ethanol.

54. **Option (b) is correct**

Explanation: During a laboratory experiment, a student immerses an epidermal leaf peel in a hypertonic solution (greater in concentration of solutes compared with the inside of a cell). After some time, the student examined the cells under a microscope and observed that the cells were plasmolysed. It means the contraction or shrinkage of the protoplasm of a plant cell takes place, which results in severe water loss. Hence, plasmolysis takes place when the concentration of water inside the cell is higher than the concentration on the outside of the cell.

55. **Option (c) is correct**

Explanation: Fungi are a distinct kingdom of heterotrophic organisms. As a result, they do not engage in photosynthesis. The majority of fungi are saprophytes because they take up soluble organic matter from dead substrates. Parasites are those who rely on live organisms like plants and animals. They can also exist as symbionts, forming mycorrhizae at the roots of higher plants and lichens in association with algae.

Fungi are filamentous, and their bodies are made up of hyphae, which are long, thin structures that resemble threads. The mycelium is the network of hyphae. Chitin and polysaccharides are the main components of the cell walls of fungi. Asexual reproduction in fungi can take place by spores called conidia or sporangiospores or zoospores.

56. **Option (d) is correct**

Explanation: Bryophytes are also known as amphibians of the plant kingdom because they can survive in soil but require water for sexual reproduction. These are small, thallus-like, prostrate, or erect non-vascular plants with unicellular or multicellular rhizoids that attach to the substratum. They don't have actual roots, stems, or leaves. They can have root, leaf, or stem-like structures. The bryophyte's main plant body is haploid. It is called a gametophyte because it produces gametes.

57. **Option (b) is correct**

Explanation: To neutralize the free fatty acids, and soften the esters.

58. **Option (d) is correct**

Explanation: In the reactivity series Sodium is placed on the top then copper, silver and iron are placed.

59. **Option (d) is correct**

Explanation: Next to the diamond, Born-nitride is the hardest substance.

60. **Option (b) is correct**

Explanation: In the Haber-Bosch process, pure nitrogen and hydrogen gas reacts, and it is an exothermic reaction.

61. **Option (d) is correct**

Explanation: Silica sand is used as a primary source of silicon-dioxide and its proportion is 95% in the composition of silica.

62. **Option (d) is correct**

Explanation: From top to bottom metallic character is increasing: Iodine < Bromine < Chlorine < Fluorine

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

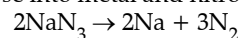
Explanation: Water of crystallization molecules surround the central copper metal and which is responsible for blue colour $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$.

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

Explanation: Avogadro's law states "equal volume of all gaseous at same temperature and pressure have the same number of molecules".

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

Explanation: Heat generation causes sodium azide to decompose into metal and nitrogen.



66. Option (a) is correct

Explanation: The Sylhet referendum was held on 6 July 1947 and the result went in favour of a merger with Pakistan. Assam thus lost a wealthy district causing serious loss of revenue. Today, Sylhet is a city in Bangladesh.

67. Option (c) is correct

Explanation: The Rabatak Inscription is a stone inscribed with text written in the Bactrian language and Greek script. It was found in 1993 at Rabatak, near Surkh Kotal in Afghanistan. It is related to the rule of the Kushan emperor Kanishka, and gives remarkable clues on the genealogy of the Kushan dynasty.

The lines 14–15, describes Kanishka as the king of kings, the son of god.

68. Option (d) is correct

Explanation: The 5th century CE playwright, Shudraka, wrote the Sanskrit drama 'Mrichchhakatika.' The central story is that of a noble but impoverished young Brahmin, who falls in love with a wealthy courtesan.

69. Option (a) is correct

Explanation: Yashovarman of the 'Chandela dynasty' was a ruler of the Kannauj kingdom.

70. Option (c) is correct

Explanation: Ajatashatru was one of the most important kings of the Haryanka dynasty of Magadha. He forcefully took over the kingdom of Magadha from his father, King Bimbisara, and imprisoned him. Pataliputra was originally built by Ajatashatru in 490 BCE and was made capital of the Magadhan Empire.

71. Option (a) is correct

Explanation: Nicolaus Copernicus was a Polish astronomer and mathematician known as the father of modern astronomy. He was the first European scientist to propose that Earth and other planets revolve around the sun, the heliocentric theory of the solar system.

72. Option (b) is correct

Explanation:

$$F = \frac{dp}{dt} = \frac{d}{dt}(mv) = v \frac{dm}{dt}$$

$$F = 2 \times 0.1 = 0.2 \text{ N}$$

73. Option (b) is correct

Explanation:

$$\text{Power} = \frac{mgh}{t}$$

$$= 8 \times 4 \times 10 / 2 = 160 \text{ W}$$

74. Option (c) is correct

Explanation:

$$F = \mu_r = \mu mg$$

$$F = 0.2 \times 2 \times 10 = 4 \text{ N}$$

75. Option (b) is correct

Explanation: Acceleration due to gravity on moon,

$$g_m = 1/6 g_e$$

Extension of spring on earth = 6 cm

As extension in spring due to gravity of celestial objects, hence

$$\text{Extension of spring on the moon} = 1/6 \times 6 = 1 \text{ cm}$$

76. Option (b) is correct

Explanation: Second class lever means the fulcrum is at one end and the force applied is on another end.

77. Option (c) is correct

Explanation: On stretching a wire to double to its length, resistance will become 4 times.

As we know, $I \propto 1/R$. So current would be 1/4th of its original value.

78. Option (c) is correct

Explanation: In parallel circuit = $\frac{1}{R} + \frac{1}{R} = \frac{2}{R}$

$$R_{\text{net}} = \frac{R}{2} + R = \frac{3R}{2}$$

79. Option (d) is correct

Explanation: The Bharatmala Pariyojana was announced by Mr Nitin Gadkari, the Minister of Road Transport and Highways of India to improve the road network in the country. The scheme aims:

- To build Economic Corridor.
- To increase Border Road and International Connectivity.
- To increase Port Connectivity with the Coastal Roads.

80. Option (c) is correct

Explanation: Deendayal Port was earlier known as Kandla Port. It is located on the Gulf of Kutch in Gujarat and is one of India's major ports on the west coast.

81. Option (b) is correct

Explanation: The Counter-Insurgency and Jungle Warfare School (CIJWS) is a training and research establishment of the Indian Army.

It is located in Vairengte, Mizoram and is specialised in unconventional warfare, especially counter-insurgency and guerrilla warfare. The school's motto is to "fight the guerrilla like a guerrilla".

82. Option (a) is correct

Explanation: Calcification occurs when evapotranspiration exceeds precipitation causing the upward movement of dissolved alkaline salts from the groundwater. At the same time, the movement of rain water causes a downward movement of the salts. The net result is the deposition of the translocated cations in the B horizon. In some cases, these deposits can form a hard layer called Caliche. The most common substance involved in this process is calcium carbonate.

83. Option (d) is correct

Explanation: The structure of the earth is divided into four major components: the crust, the mantle, the outer core, and the inner core. All these layers are separated from each other through a transition zone. These transition zones are called discontinuities.

Lehmann Discontinuity is the transition zone between outer and inner core. It is an abrupt increase of P-wave and S-wave velocities at the depth of 220 km. It appears beneath continents, but not usually beneath oceans.

84. **Option (d) is correct**
Explanation: Oak and Rhododendron are characteristic plants of the Temperate forest. Temperate forests are mainly found in the middle altitudes of the Himalayas. The trees like Mahogany and Rosewood are found in the tropical evergreen forest. They are found in the Andaman and Nicobar Islands, and the Western Ghats.
85. **Option (b) is correct.**
Explanation: Large body of igneous rock known as a batholith is formed by the intrusion and solidification of magma beneath the surface of the Earth. It often consists of coarse-grained rocks with a surface exposure of 100 square kilometres (40 square miles) or more, such as granite or granodiorite. They are the lowermost/innermost intrusive igneous rock.
86. **Option (a) is correct.**
Explanation: The time difference between London, UK, and New Delhi, India, as measured by UTC, is 4 hours and 30 minutes. As a result, when it is 12 noon in Delhi it will be 7:30 a.m. morning in London.
87. **Option (c) is correct.**
Explanation: When the sun, earth, and a celestial body are in a straight line, they are said to be in one of two positions (conjunction or opposition), which are referred to as SYZYGY. It is referred to as a full moon or a new moon if the celestial body is the moon. A spring tide happens during this time. Astronomers refer to a celestial object as being in quadrature when its direction, as observed from Earth, forms a 90-degree angle with the direction of the Sun. If this celestial body is the moon, it causes a neap tide.
88. **Option (d) is correct.**
Explanation: Leonardo da Vinci, an Italian High Renaissance painter, created The Last Supper between 1495 and 1498. As described in the Gospel of John, the artwork depicts the Last Supper of Jesus with the Twelve Apostles, notably the moment when Jesus predicts that one of them will betray him.
89. **Option (d) is correct.**
Explanation: Hernán Cortés was the European explorer who conquered Mexico. He overthrew the Aztec Empire and established Spanish sovereignty in Mexico by leading an expedition in 1519 on behalf of the Spanish Empire. This was accomplished through numerous wars and agreements with local tribes.
90. **Option (d) is correct.**
Explanation: In a shrine at Mat, close to Mathura (Uttar Pradesh), colossal statues of Kushana kings have been discovered. In an Afghan shrine, similar statues have also been discovered.
91. **Option (a) is correct.**
Explanation: The First Anglo-Burmese War came to its end with the signing of the Treaty of Yandabo on 24 February, 1826.
92. **Option (c) is correct.**
Explanation: Out of the actual investments made in the First 5-Year Plan, which totaled Rs. 1960 crores, the development of agriculture and irrigation was given priority. 31%, or Rs. 601 crores, of the budget went to agriculture. It was the highest investment among all the 5-Year Plans.
93. **Option (c) is correct.**
Explanation: In Sharm el-Sheikh, Egypt, the UN COP-27 Summit took place. The issue of climate change was the summit's main focus.
94. **Option (c) is correct.**
Explanation: Although the British East India Company is credited with founding the Indian tea business, tea was produced, picked, steeped, and consumed in India long before they arrived. The Singpho people, who inhabit areas of Assam and Arunachal Pradesh, are regarded as India's first tea cultivators and producers.
95. **Option (a) is correct.**
Explanation: The Sardar Swaran Singh Committee recommended the inclusion of a separate chapter on fundamental duties in the Constitution. The Congress Government at Centre accepted these recommendations and enacted the 42nd Constitutional Amendment Act in 1976. This amendment added a new part, Part IVA, to the Constitution. This new part consists of only one article, i.e., Article 51-A which for the first time specified a code of ten fundamental duties of the citizens.
96. **Option (d) is correct.**
Explanation: According to the law of gravitation, the force of gravity of the Earth on the moon and of the Moon on the Earth are equal in magnitude but are in opposite directions.
97. **Option (d) is correct.**
Explanation: Since, the resistance (electric bulb) is same in both the cases.
Therefore, $P \propto V^2$
or, $\frac{P_1}{P_2} = \frac{V_1^2}{V_2^2}$
or, $\frac{80W}{P_2} = \frac{(220V)^2}{(110V)^2}$
or, $P_2 = \frac{80W}{4}$
or, $P_2 = 20W$
98. **Option (d) is correct.**
Explanation: Red light bends the least of all the colours since it travels at the fastest speed, whereas blue light travels at the slowest pace and bends the most. All other colours lie somewhere in between.
99. **Option (a) is correct.**
Explanation: The speed of sound remains same at all frequencies.
100. **Option (c) is correct.**
Explanation: Any telescope that just has mirrors and no lenses is referred to as a reflecting telescope, sometimes known as a reflector. The Ritchey-Chrétien telescope, the Cassegrain telescope, and the Newtonian telescope are the three most popular varieties of reflecting telescopes.