Time : 03:00:00   **Marks : 720**

1. The time dependence of a physical quantity P is given by $P = P_0 e^{at^2} - at^2$ where α is a constant and t is time. Then constant α is
   a) Dimensionless
   b) Dimensionless of T^{-2}
   c) Dimensionless of P
   d) Dimensionless of T^2

2. In the equation S_{nth} the $= u + \frac{a}{2}(2n-1)$, the letters have their usual meanings. The dimensional formula of S_{nth} is
   a) $[ML^0T]$ b) $[ML^{-1}T^{-1}]$
   c) $[M^0LT^{-1}]$ d) $[M^0LT^0]$

3. A packet is dropped from a balloon which is going upwards with the velocity $12\ m/s$, the velocity of the packet after 2 seconds will be
   a) $-12\ m/s$ b) $12\ m/s$
   c) $-7.6\ m/s$ d) $7.6\ m/s$

4. A body of mass m is projected at an angle of $45°$ with the horizontal. If air resistance is negligible, then total change in momentum when it strikes the ground is
   a) $2mv$ b) $\sqrt{2}\ mv$ c) mv d) $mv/\sqrt{2}$

5. In uniform circular motion, the velocity vector and acceleration vector are
   a) Perpendicular to each other
   b) Same direction
   c) Opposite direction
   d) Not related to each other

6. A heavy uniform chain lies on horizontal table top. If the coefficient of friction between the chain and the table surface is 0.25, then the maximum fraction of the length of the chain that can hang over one edge of the table is
   a) 20%   b) 25%   c) 35%   d) 15%

7. A force of 1200 N acts on a 0.5 kg steel ball as result of collision lasting 25 ms. If the force is in a direction opposite to the initial velocity of $14\ ms^{-1}$ then the final speed of the steel ball would be
   a) $24\ ms^{-1}$ b) $35\ ms^{-1}$ c) $12\ ms^{-1}$ d) $46\ ms^{-1}$

8. A spring, which is initially in its unstretched condition, is first stretched by a length x and then again by a further length x. The work done in the first case is w_1, and in the second case is w_2. Then
   a) $W_2 = W_1$ b) $W_2 = 2W_1$
   c) $w_2 = 3w_1$ d) $w_2 = 4w_1$

9. Which relation is not correct of the following
   a) Torque= Moment of inertia × angular acceleration
   b) Torque=Dipole moment × magnetic induction
   c) Moment of inertia = Torque/angular acceleration
   d) Liner momentum = Moment of inertia ×angular velocity

10. A ball falls freely from a height of 45m. When the ball is at a height of 25 m, it explodes into two equal pieces. One of them moves horizontally with a speed of $10\ ms^{-1}$. The distance between the two pieces when both strike the ground is
    a) 10 m   b) 20 m   c) 15 m   d) 30 m

11. If the density of the earth is doubled keeping radius constant, find the new acceleration due to gravity? ($g = 9.8\ m/s^2$)
    a) $9.8\ m/s^2$ b) $19.6\ m/s^2$
    c) $4.9\ m/s^2$ d) $39.2\ m/s^2$

12. The general form of potential energy curve for atoms or molecules can be represented by the following equation $U(R) = \frac{A}{R^n} - \frac{B}{R^m}$. Here, R is the interatomic or molecular distance, A and B are coefficients, n and m are the exponents. In the above equation
    a) First term represents the attractive part of the potential
    b) Second term represents the attractive part of the potential
    c) Both terms represents the attractive part of the potential
    d) Second term represents the repulsive part of the potential

13. Water flows steadily through a horizontal pipe of variable cross-section. If the pressure of

water is p at a point where flow speed is v, the pressure at another point where the flow of speed is $2v$, is (take density of water as ρ)

a) $p - \dfrac{3\rho v^2}{2}$ b) $p - \dfrac{\rho v^2}{2}$

c) $p - \dfrac{3\rho v^2}{4}$ d) $p - \rho v^2$

14. Two capillaries of radii r_1 and r_2, length l_1 and l_2 respectively are in series. A liquid of viscosity η is flowing through the combination under a pressure difference p. What is the rate of volume flow of liquid?

a) $\dfrac{\pi\, p}{8\,\eta}\left(\dfrac{l_4}{r_1^4} + \dfrac{l_4}{r_2^4}\right)^{-1}$ b) $\dfrac{8\pi\, p}{\eta}\left(\dfrac{l_1}{r_1^4} + \dfrac{l_2}{r_2^4}\right)$

c) $\dfrac{\pi\, p}{8\,\eta}\left(\dfrac{r_1^4}{l_1} + \dfrac{r_2^4}{l_2}\right)^{-1}$ d) $\dfrac{\pi\, p}{8\,\eta}\left(\dfrac{l_1}{r_1^4} + \dfrac{l_2}{r_2^4}\right)^{-1}$

15. If the ratio of densities of two substances is $5 : 6$ and that of the specific heats is $3 : 5$. Then the ratio between heat capacities per unit volume is

a) $1 : 1$ b) $2 : 1$ c) $1 : 2$ d) $1 : 3$

16. A diatomic ideal gas is compressed adiabatically to $\dfrac{1}{32}$ of its initial volume. In the initial temperature of the gas is T_f (in kelvin) and the final temperature is T_f, the value of a is

a) 4 b) 6 c) 5 d) 9

17. Value of adiabatic bulk modulus of elasticity of helium at NTP is

a) 1.01×10^5 Nm^{-2} b) 1.01×10^{-5} Nm^{-2}

c) 1.69×10^5 Nm^{-2} d) 1.69×10^{-5} Nm^{-2}

18. Which of the following cylindrical rods will conduct maximum heat, when their ends are maintained at a constant temperature difference?

a) $l = 1\text{m}, r = 0.2\text{m}$ b) $l = 1\text{m}, r = 0.1\text{m}$

c) $l = 10\text{m}, r = 0.1\text{m}$ d) $l = 0.1\text{m}, r = 0.3\text{m}$

19. In simple harmonic motion, the ratio of acceleration of the particle to its displacement at any time is a measure of

a) Spring constant b) Angular frequency

c) (Angular frequency)^2 d) Restoring force

20. Acceleration A and time period T of a body in S.H.M. is given by a curve shown below. Then corresponding graph, between identic energy (K.E) and time t is correctly represented by


a)

b)

c)

d)
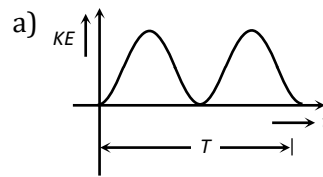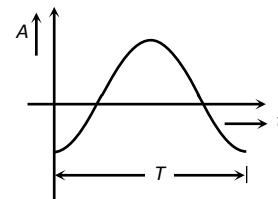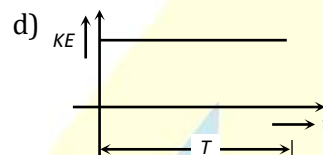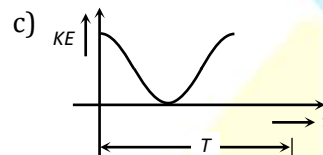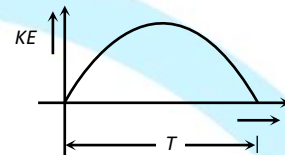
21. A string is rigidly tied at two ends and its equation of vibration is given by $y = \cos 2\pi\, t \sin 2\pi x$. Then minimum length of string is

a) $1\ m$ b) $\dfrac{1}{2}m$ c) $5\ m$ d) $2\ \pi m$

22. Two point charges repel each other with a force of 100 N. One of the charges is increased by 10% and other is reduced by 10%. The new force of repulsion at the same distance would be

a) 100 N b) 121 N

c) 99 N d) None of these

23. Two equal charges as separated by distance d. A third charge placed on a perpendicular bisector at x distance from centre will experience maximum coulomb force, when

a) $x = d/\sqrt{2}$ b) $x = d/2$

c) $x = d/2\sqrt{2}$ d) $x = d/2\sqrt{3}$

24. The electrostatic potential energy between proton and electron separated by a distance 1Å is

a) 13.6eV b) 27.2eV c) 14.4eV d) 1.44eV

25. A tap supplies water at 22°C, a man takes of 1 L of water per min at 37°C from the geyser.

The power of geyser is
a) 525 W   b) 1050 W c) 1775 W d) 2100 W

26. A thermo couple develops $200\mu V$ between 0°C and 100°C. If it develops $64\ \mu V$ and $76\ \mu V$ respectively between (0°C − 32°C) and (32°C − 70°C) then what will be the thermo emf it develops between 70°C and 100°C
a) $65\ \mu V$ b) $60\ \mu V$ c) $55\ \mu V$ d) $50\ \mu V$

27. What will happen when a 40 $watt$, 220 $volt$ lamp and 100 $watt$, 220 $volt$ lamp are connected in series across 40 $volt$ supply
a) 100 $watt$ lamp will fuse
b) 40 $watt$ lamp will fuse
c) Both lamps will fuse
d) Neither lamp will fuse

28. Four charged particles are projected perpendicularly into the magnetic field with equal. Which will have minimum frequency?
a) Proton   b) Electron c) Li^+ d) He^+

29. A bar magnet of magnetic moment $10^4 J/T$ is free to rotate in a horizontal plane. The work done in rotating the magnet slowly from a direction parallel to a horizontal magnetic field of $4 \times 10^{-5} T$ to a direction 60° from the field will be
a) $0.2\ J$ b) $2.0\ J$ c) $4.18\ J$ d) $2 \times 10^2 J$

30. A bar magnet is oscillating in the earth's magnetic field with time period T. If its mass is increased four times, then its time period will be
a) $4T$ b) $2T$ c) T d) $\dfrac{T}{2}$

31. The current i in an induction coil varies with time t according to the graph shown
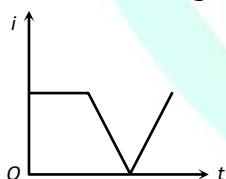
in figure. Which of the following graphs shows the induced emf (e) in the coil with time
a)   b)

c)   d)
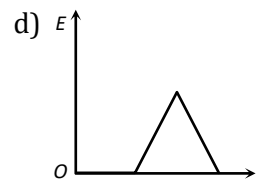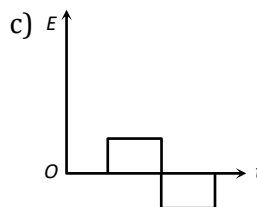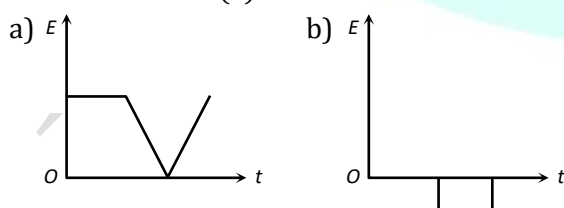
32. The natural frequency (ω_0) of oscillations in L-C circuit is given by
a) $\dfrac{1}{2\pi}\dfrac{1}{\sqrt{LC}}$ b) $\dfrac{1}{2\pi}\sqrt{LC}$ c) $\dfrac{1}{\sqrt{LC}}$ d) $\sqrt{LC}$

33. A resistor and a capacitor are connected in series with an AC source. If the potential drop across the capacitor is 5 V and that across resistor is 12 V, then applied voltage is
a) 13 V   b) 17 V   c) 5 V   d) 12 V

34. The wave of wavelength 5900 Å emitted by any atom or molecule must have some finite total length which is known as the coherence length. For sodium light, this length is 2.4 cm. The number of oscillations in this length will be
a) 4.068×10^8 b) 4.068×10^7
c) 4.068×10^6 d) 4.068×10^5

35. A large glass slab $\left(\mu = \dfrac{5}{3}\right)$ of thickness 8 cm is placed over a point source of light on a plane surface. It is seen that light emerges out of the top surface of the slab from a circular area of radius R cm. What is the value of R?
a) 6 cm   b) 7 cm   c) 8 cm   d) 9 cm

36. A light ray is incident upon a prism in minimum deviation position and suffers a deviation of 34°. If the shaded half of the prism is knocked off, the ray will
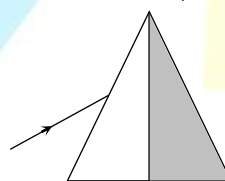
a) Suffer a deviation of 34°
b) Suffer a deviation of 68°
c) Suffer a deviation of 17°
d) Not come out of the prism

37. If fringes width $\lambda = 5.89 \times 10^{-5}$ cm is 0.431 mm and shift of white central fringe on introducing a mica sheet in one path is 1.89 mm. Thickness of the mica sheet will be $(\mu = 1.59)$
a) 438×10^{-6} m   b) 538×10^{-6} m
c) 638×10^{-6} m   d) None of these

38. In vacuum an electron of energy 10 keV hits tungsten target, then emitted radiation will be

a) Cathode rays   b) X-rays
c) Infrared rays   d) Visible spectrum

39. Cathode rays are similar to visible light rays as
   a) They both can be deflected by electric and magnetic fields
   b) They both have a definite magnitude of wavelength
   c) They both can ionize a gas through which they pass
   d) They both can expose a photographic plate

40. The ionization energy of Li^{2+} is equal to
   a) $9hcR$ b) $6\,hcR$ c) $2\,hcR$ d) hcR

41. The diagram shows the energy levels for an electron in a certain atom. Which transition shown represents the emission of a photon with the most energy
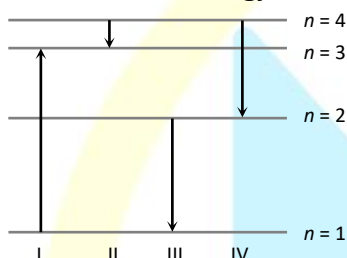
   a) I   b) II   c) III   d) IV

42. Consider two nuclei of the same radioactive nuclide. One of the nuclei was created in a supernova explosion 5 billion years ago. The probability of decay during the next time is
   a) Different for each nuclei
   b) Nuclei created in explosion decays first
   c) Nuclei created in the reactor decays first
   d) Independent of the time of creation

43. The main cause of zener breakdown is
   a) The base semiconductor being germanium
   b) Production of electron-hole pairs due to thermal excitation
   c) Low doping
   d) High doping

44. For good demodulation of AM signal of carrier frequency f, the value of RC should be
   a) $RC = \dfrac{1}{f}$ b) $RC < \dfrac{1}{f}$ c) $RC \geq \dfrac{1}{f}$ d) $RC > \dfrac{1}{f}$

45. A given fiber has core refractive index of 1.5 and a core cladding index difference factor (Δ) of 0.01125. The numerical aperture is
   a) 0.252   b) 0.225   c) 0.5   d) 2.25

46. 2 g of metal carbonate is neutralised completely by 100mL of 0.1 (N) HCl. The equivalent weight of metal carbonate is
   a) 50   b) 100   c) 150   d) 200

47. Law of constant composition is same as the law of
   a) Conservation of mass
   b) Conservation of energy
   c) Multiple proportion
   d) Definite proportion

48. What does the electronic configuration $1s^2, 2s^2, 2p^5, 3s^1$ indicate?
   a) Ground state of fluorine
   b) Excited state of fluorine
   c) Excited state of neon
   d) Excited state of the O_2^- ion

49. The uncertainty in momentum of an electron is 1×10^{-5} kg m/s. the uncertainty in its position will be ($h = 6.62 \times 10^{-34}$ kg m^2/s)
   a) 2.36×10^{-28}m   b) 5.25×10^{-28}m
   c) 2.27×10^{-30}m   d) 5.27×10^{-30}m

50. Which of the following elements never show positive oxidation number?
   a) O   b) Fe   c) Ga   d) F

51. In the anion $HCOO^-$ the two carbon-oxygen bonds are found to be of equal length. What is the reason for it?

a)	b)	c)	d)
Electronic orbits of carbon atom are hybridised	The C=O bond is weaker than the C−O bond	The anion HCOO⁻ has two resonating structures	The anion is obtained by removal of a proton from the acid molecule

52. 6, 6
   a) 6, 6   b) 6, 6
   c) 6, 6   d) 6, 6

53. If both oxygen and helium gases are at the same temperature, the rate of diffusion of O_2 is very close to
   a) 4 times that of He   b) 2 times that of He
   c) 0.35 times that of He d) 8 times that of He

54. Hess's law is used to calculate
   a) Enthalpy of reaction
   b) Entropy of reaction
   c) Work done in reaction
   d) All of these

55. The quantity of heat measured for a reaction in a bomb calorimeter is equal to
   a) ΔG b) ΔH c) $p\Delta V$ d) ΔE

56. 100 mL of 0.015 M HCl solution is mixed with 100 mL of 0.005 M HCl. What is the pH of the resultant solution?
   a) 2.5   b) 1.5   c) 2   d) 1
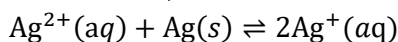
57. The reaction,
   $Ag^{2+}(aq) + Ag(s) \rightleftharpoons 2Ag^+(aq)$
   is an example of
   a) Reduction   b) Oxidation
   c) Comproportionation   d) Disproportionation

58. The oxidation number of chromium in potassium dichromate is
   a) +2   b) +4   c) +6   d) +8

59. When hydrogen peroxide is added to acidified potassium dichromate, a blue colour is produced due to formation of
   a) CrO_3 b) Cr_2O_3 c) CrO_5 d) CrO_4^{2-}

60. The carbonate that will not decompose on heating is
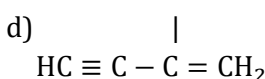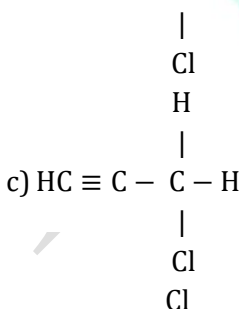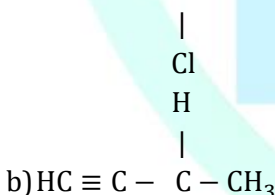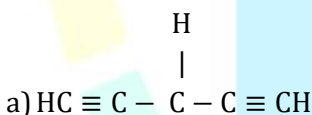   a) Na_2CO_3 b) $CaCO_3$ c) $BaCO_3$ d) $SrCO_3$

61. The correct order of increasing atomic radii, is
   a) $B < Al < Ga$ b) $Ga < Al < B$
   c) $Al < B < Ga$ d) $B < Ga < Al$

62. Which of the following is used in making printer's ink, shoe polish, black varnish and paint?
   a) Lamp black   b) Bone black
   c) Carbon black   d) None of these

63. Which of the following is most likely to show optical isomerism?

   a)
   $$HC \equiv C - \underset{\underset{Cl}{|}}{\overset{\overset{H}{|}}{C}} - C \equiv CH$$

   b)
   $$HC \equiv C - \underset{\underset{Cl}{|}}{\overset{\overset{H}{|}}{C}} - CH_3$$

   c)
   $$HC \equiv C - \underset{\underset{Cl}{|}}{\overset{\overset{H}{|}}{C}} - H$$

   d)
   $$HC \equiv C - \underset{\underset{CH_3}{|}}{C} = CH_2$$

64. The conditions for aromaticity is
   a) Molecule must have clouds of delocalised π-electrons

   b) Molecule must contain $(4n + 2)\pi$-electrons
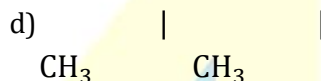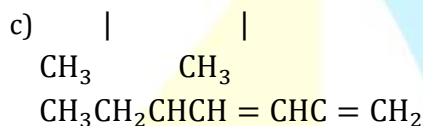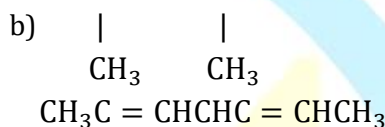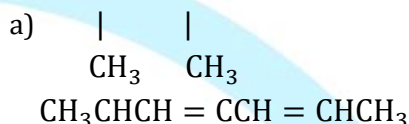   c) Both (a) and (b)
   d) None of the above

65. An organic alkadiene on reductive ozonolysis produces
   (i) acetaldehyde
   (ii) acetone
   (iii) 2-methylpropane-1, 3-dial
   The formula of alkadiene will be

   a)
   $$CH_3C = CHCHCH = CHCH_3$$
   $$\quad\quad |\quad\quad\quad |$$
   $$\quad\quad CH_3\quad CH_3$$

   b)
   $$CH_3CHCH = CCH = CHCH_3$$
   $$\quad\quad |\quad\quad\quad\quad |$$
   $$\quad\quad CH_3\quad\quad CH_3$$

   c)
   $$CH_3C = CHCHC = CHCH_3$$
   $$\quad\quad |\quad\quad\quad\quad |$$
   $$\quad\quad CH_3\quad\quad\quad CH_3$$

   d)
   $$CH_3CH_2CHCH = CHC = CH_2$$
   $$\quad\quad\quad\quad |\quad\quad\quad\quad |$$
   $$\quad\quad\quad CH_3\quad\quad\quad CH_3$$

66. Addition of phosphate fertilizers into water leads to
   a) Increased growth of decomposers
   b) Reduced algal growth
   c) Increased algal growth
   d) Eutrophication

67. Which one of the following is a covalent crystal?
   a) Rock salt   b) Ice
   c) Quartz   d) Dry ice

68. Which element is used for making a transistor?
   a) Sn   b) Sb   c) Si   d) Mg

69. Assuming that sea water is a 3.50 weight per cent aqueous solution of NaCl. What is the molality of sea water?
   a) 0.062 m   b) 0.0062 m
   c) 0.62 m   d) 6.2 m

70. How many grams of dibasic acid (mol. wt. 200) should be present in 100 mL of the aqueous solution to give 0.1 N?
   a) 10 g   b) 20 g   c) 2 g   d) 1 g

71. The cell reaction of the galvanic cell
   $Cu\ (s)\ |\ Cu^{2+}\ (aq)\ ||\ Hg^{2+}\ (aq)\ |\ Hg\ (l)$ is
   a) $Hg + Cu^{2+} \rightarrow Hg^{2+} + Cu$
   b) $Hg + Cu^{2+} \rightarrow Cu^+ + Hg^+$
   c) $Cu + Hg \rightarrow CuHg$
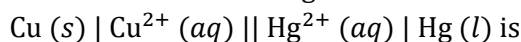
d) $Cu + Hg^{2+} \rightarrow Cu^{2+} + Hg$

72. For a gaseous reaction, the units of rate of rate of reaction are
    a) $L\ atm\ s^{-1}$
    b) $atm\ s^{-1}$
    c) $atm\ mol^{-1}s^{-1}$
    d) $mol\ s^{-1}$

73. In the reversible reaction

    $$2NO_2 \underset{k_2}{\overset{k_1}{\rightleftharpoons}} N_2O_4$$

    The rate of disappearance of NO_2 is equal to
    a) $\dfrac{2k_1}{k_2}[NO_2]^2$
    b) $2k_1[NO_2]^2 - 2k_2[N_2O_4]$
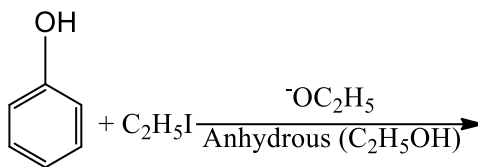   c) $2k_2[NO_2]^2 - k_2[N_2O_4]$
    d) $(2k_1 - k_2)[NO_2]$

74. Paste is
    a) Suspension of solid in a liquid
    b) Mechanical dispersion of a solid in liquid
    c) Colloidal solution of a solid in solid
    d) None of the above

75. The luster of a metal is due to
    a) Its high polishing
    b) Its high density
    c) Its chemical inertness
    d) Presence of free electrons

76. Purest form of iron is
    a) Pig iron
    b) Wrought iron
    c) Cast iron
    d) Steel

77. In the manufacture of sulphuric acid by contact process, tyndall box is used to
    a) Filter dust particles
    b) Remove impurities
    c) Convert SO_2 to SO_3
    d) Test the presence of dust particles

78. The methods chiefly used for the extraction of lead and tin from their ores are respectively
    a) Self reduction and carbon reduction
    b) Self reduction and electrolytic reduction
    c) carbon reduction and self reduction
    d) Cyanide process and carbon reduction

79. Which metal gives hydrogen gas on heating with hot concentrated alkali?
    a) Ag
    b) Ni
    c) Zn
    d) Cu

80. Which of the following is not an isomer of but-1-yne?
    a) But-2-yne
    b) Buta-1-3-diene
    c) Methyl cyclopropene
    d) But-2-ene

81. One of the following that cannot undergo dehydrohalogenation is
    a) iso-propyl bromide
    b) ethanol
    c) Ethyl bromide
    d) None of the above

82.
    $$\text{(phenol: } C_6H_5OH) + C_2H_5I \xrightarrow[\text{Anhydrous } (C_2H_5OH)]{^-OC_2H_5}$$
    a) $C_6H_5OC_2H_5$
    b) $C_2H_5OC_2H_5$
    c) $C_6H_5OC_6H_5$
    d) C_6H_5I

83. The dehydration of butane-1-ol gives
    a) 1-butene as the main product
    b) 2-butene as the main product
    c) Equal amounts of 1-butene and 2-butene
    d) 2-methyl propene

84. Amides contain $>C=O$ group, yet they do not give characteristic reactions of $>C=O$ group because
    a) They dimerise
    b) Of resonance
    c) They posses cyclic structure
    d) Of attached alkyl group

85. Gabriel's sunthesis is used frequently for the preparation of which of the following?
    a) Primary amines
    b) Primary alcohols
    c) Tertiary amines
    d) Tertiary alcohols

86. Secondary nitroalkanes can be converted into ketones by using Y. Identify Y from the following

    $$\underset{R}{\overset{R}{>}}CHNO_2 + Y \longrightarrow \underset{R}{\overset{R}{>}}C=O$$

    a) Aqueous HCl
    b) Aqueous NaOH
    c) $KMnO_4$
    d) CO

87. Which one of the following is not a protein?
    a) Wool
    b) Nail
    c) Hair
    d) DNA

88. In the natural rubber, the isoprene units are joined in
    a) Head to heat manner
    b) Tail to tail manner
    c) Head to tail manner
    d) Random manner

89. Which is a polymer of three different monomers?
    a) ABS
    b) SBR
    c) NBR
    d) Nylon-2-nylon-6

90. Which set has different class of compounds?
    a) Tranquillizers : equanil, heroin, valium
    b) Antiseptic : bithional, dettol, boric acid
    c) Analgesics : naproxen, morphine, aspirin
    d) Bactericidal : Penicillin, aminoglycosides, ofloxacin

91. Phylogenetic system of classification was

proposed by
a) Linnaeus   b) Bentham
c) Hutchinson   d) Theophrastus

92. Which one of the following branch is applicable to both plants and animals?
a) Herpetology   b) Saurology
c) Taxonomy   d) Ichthyology

93. The concept of genus was proposed by
a) John Ray   b) Tourne Fort
c) Hooker   d) Bessey

94. Fungi shows vegetative reproduction by all of the following except
a) Fragmentation   b) Fission
c) Budding   d) Akinetes

95. Auxospores and homocysts are formed, respectively by
a) Several diatoms and a few cyanobacteria
b) Several cyanobacteria and several diatoms
c) Some diatoms several cyanobacteria
d) Some cyanobacteria and many diatoms

96. Top-shaped multiciliate male gametes and the mature seed, which bears only one embryo with two cotyledons, are characteristic features of
a) Polypetalous angiosperms
b) Gamopetalous angiosperms
c) Conifers
d) Cycads

97. In flowering plants meiosis occurs at the time of
a) Formation of buds
b) Germination of seed
c) Formation of root primordia
d) Formation of pollen grains

98. Engulfing of food either in solid or liquid is called
a) Sporozoic nutrition
b) Holozoic nutrition
c) Parasitic nutrition
d) Saprophytic nutrition

99. Different colours of frog skin are controlled by
a) Hormones   b) Melanocytes
c) Nervous system   d) Both (a) and (c)

100. Addition of which element in water speed up the metamorphosis in frog tadpole larva?
a) I_2 b) K   c) Na   d) Cl

101. Which is odd one?
a) China rose   b) Maize
c) Mango   d) Sunflower

102. Pedicel of flower is called
a) Thalamus   b) Receptacle
c) Both (a) and (b) d) Either (a) or (b)

103. Bright colour of petals is due to presence of
a) Chloroplast   b) Anthocyanin
c) Chromoplast   d) Leucoplast

104. Ovary is half-inferior in the flowers of
a) Guava   b) Plum
c) Brinjal   d) Cucumber

105. Vascular bundle without cambium is called
a) Closed vascular bundle
b) Open vascular bundle
c) Radial vascular bundle
d) Conjoint vascular bundle

106. Which statements are correct about guard cells?
I. They are modified ground tissue
II. They are chlorophyllous
III. Its outer wall is thin and inner wall is highly thickened
IV. They regulate stomatal movement for transpiration and gaseous exchange
a) All except I   b) All except II
c) All except III   d) All except IV

107. For capturing the prey frog uses its
a) Lips   b) Teeth
c) Tongue   d) Hand

108. Note the following statements.
1. It forms the lining of the cavities of alveoli of the lungs.
2. It forms the lining of wet surface like buccal cavity and oesophagus.
3. It occurs in the ducts of sweat glands.
4. It forms the lining of salivary glands and sweat glands.
5. It is a loose connective tissue.
Which of the above statements are associated with simple epithelial tissue?
a) I and IV b) II and III c) III and I d) IV and V

109. Which of the following enzymes has/have haeme as a prosthetic group?
I. Catalase
II. Carboxypeptidase
III. Succinic dehydrogenase
IV. Peroxidase
a) I only   b) I and II
c) II and III   d) III and IV

110. Which of the following enzymes helps in crossing plasma membrane?
a) Protease   b) Pepsin
c) Dehydrogenase   d) Permease

111. Inulin is a polymer of

a) Glucose b) Galactose
c) Fructose d) Arabinose

112. Given below is the chemical formula of

$$CH_3(CH_2)_{14} - \overset{\overset{\displaystyle O}{\displaystyle \|}}{C} - OH$$

a) Palmitic acid b) Stearic acid
c) Glycerol d) Galactose

113. Select the correct option with respect to mitosis.
   a) Chromatids start moving towards opposite poles in telophase
   b) Golgi complex and endoplasmic reticulum are still visible at the end of prophase
   c) Chromosomes move to the spindle equator and get aligned along equatorial plate in metaphase
   d) Chromatids separate but remains in the centre of the cell in anaphase

114. Synapsis occurs between
   a) A male and a female gamete
   b) mRNA and ribosomes
   c) Spindle fibres and centromere
   d) Two homologous chromosomes

115. A cell dipped in 0.5 M sucrose solution has no effect but when the same will be dipped in 0.5 M NaCl solution, the cell will
   a) Increase in size
   b) Decrease in size
   c) Will be turgid
   d) Will get deplasmolysed

116. Hydroponics is the method of
   a) Water conservation
   b) Plant development in water without soil
   c) Plant development without soil
   d) Plant development in saline soil

117. Cohension and adhension theory, is otherwise called
   a) Relay pump theory
   b) Pulsation theory
   c) Root pressure theory
   d) Transpiration pull theory

118. Hydroponics were first time demonstrated in the year
   a) 1860 b) 1866
   c) 1859 d) 1886

119. Which element is located at the centre of the porphyryin ring in chlorophyll?
   a) Potassium b) Manganese
   c) Calcium d) Magnesium

120. I. Chlorophyll-a
   II. Chlorophyll-b
   III. Xanthophyll
   IV. Carotenoid
   Separate the given pigments into the accessory and main pigments involved during photosynthesis

   Main pigment **Accessory Pigment**
   a) I II, III, IV
   b) II, III and IV I
   c) II and III I and IV
   d) I and IV II and III

121. Identify the 5-C compound from the given option
   a) RuBP b) OAA c) 3PGA d) $NADPH_2$

122. During its formation, bread becomes porous due to release of Carbon dioxide by the action of
   a) Yeast b) Bacteria
   c) Virus d) Protozoans

123. Glycolysis takes place in
   a) All living cells b) Eukaryotic cells only
   c) Prokaryotic cells only d) None of these

124. A plant have 13 hours critical day light under which condition it will flower

Duration of light period	Duration of dark period
a) 13	11
b) 11	13
c) 12	12
d) 10	14

125. Growth of an organism is characterised by
   a) An irreversible permanent increase in size of an organ
   b) An irreversible permanent increase in size of a cell
   c) Both (a) and (b)
   d) Reversible permanent changes

126. I. On plotting the length of an organ against time, a linear curve is obtained
   II. $L_t = L_0 + rt$
   III. Following mitotic division, one daughter cell continues to divide while the other differentiate and mature
   Above are the properties of

a) Arithmetic growth rate
b) Geometric growth rate
c) Both (a) and (b)
d) Elongation growth rate

127. The diagram below shows how things get to and from the liver. They are labeled as A, B, C, D, E and F. Which one of the following labellings is the correct one?

a) A is the hepatic portal vein and E is the hepatic vein
b) C is the intestine and F is the hepatic portal vein
c) D is the hepatic portal vein and F is hepatic vein
d) B is the pancreatic artery and E is the hepatic artery

128. Aggregates of lymphoid tissue present in the distal portion of the small intestine are known as
a) Villi
b) Peyer's patches
c) Rugae
d) Choroid plexux

129. When the oxygen supply to the tissue is inadequate, the condition is
a) Dyspnea
b) Hypoxia
c) Asphyxia
d) Apnea

130. When the body is rapidly oxidizing fats, excess ketone bodies accumulate resulting in
a) Pyruvic acid
b) Lactic acid
c) Ketoacidosis
d) ATP

131. In which one of the following pairs, the two items mean one and the same thing?
a) Malleus – Anvil
b) SA-node – Pacemaker
c) Leucocytes – Lymphocytes
d) Haemophilia - Blood cancer

132. Lead concentration in blood is considered alarming if it is
a) 20 μg/100 mL
b) 30 μg/100 mL
c) 4 − 6 μg/100 mL
d) 10 μg/100 mL

133. Glomerular area of adrenal cortex is responsible for
a) Water and electrolyte balance
b) Carbohydrate metabolism
c) Steroid and hormone secretion
d) Blood pressure

134. The expulsion of urine from the urinary bladder is called
a) Uricolysis
b) Micturition
c) Ornithine
d) None of these

135. Aldosterone causes conditional reabsorption of ..... in the distal part of tubule
a) CO_2
b) Ca^{2+}
c) Na^+
d) Cl^-

136. Myofilaments or myofibrils are
a) Obliquely arranged filaments of muscle fibre
b) Parallely arranged filaments of muscle fibre
c) Horizontally arranged filaments of muscle fibre
d) Radially arranged filaments of muscle fibre

137. Colle's fracture is associated with
a) Femur
b) Ulna
c) Humerus
d) Redius

138. Sigmoid notch is present in
a) Femur
b) Redius-ulna
c) Tibia-fibula
d) Humerus

139. At the neuromuscular function
a) The muscle membrane possesses musculariae receptors
b) The motor nerve endings secrete norepinephrine
c) Curare leads to prolongation of neuromuscular transmission
d) The motor nerve endings secrete acetylcholine

140. The following diagram indicates the reflex arc. Identify the parts labeled as A, B, C, D, E ,F and G and choose the correct option.
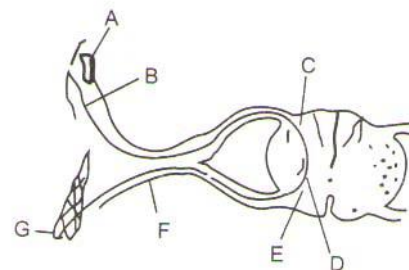
a) A-Sense organ, B-Sensory nerve, C-Dorsal horn, D-Interneuron, E-Ventral horn, F-Motor nerve, G-Effector
b) A-Sense organ, B-Sensory nerve, C-Ventral horn, D-Interneuron, E-Dorsal horn, F-Motor nerve, G-Effector
c) A-Sense organ, B-Motor nerve, C-Dorsal

horn, D-Interneuron, E-Ventral nerve, F-
Sensory nerve, F-Effector

d) A-Effector, B-Motor nerve, C-Ventral
horn, D-Interneuron, E-Dorsal horn,
F-Sensory nerve, G-Sense organ

141. T_3 and T_4 hormones are synthesised by
  a) Follicles   b) Stromal tissue
  c) Isthmus   d) Both (a) and (c)

142. The macromineral essential for the formation
of insulin is
 a) Magnesium   b) Chlorine
  c) Sulphur   d) Iodine

143. 'Bisexual animals that possess both male and
female reproductive organs are called
hermaphrodite'. The above statement is
  a) True
  b) False
  c) Sometimes (a) and sometimes (b)
  d) Neither (a) and (b)

144. In oviparous individuals development of
zygote takes place
  a) Outside the body
  b) Inside the body
  c) Inside the freshwater
  d) Inside the marine water

145. Identify *A* to *E* in the following diagram
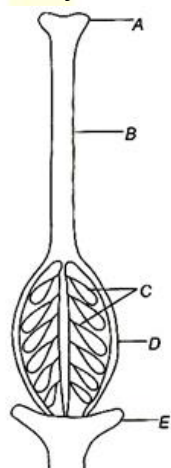
  a) A-Style, B-Stigma, C-Ovules, D-Thalamus, E-
Ovary
  b) A- Ovary, B- Thalamus, C- Ovules, D- Style, E-
Stigma
  c) A- Thalamus, B- Style, C- Stigma, D- Ovary, E-
Ovules
  d) A- Stigma, B- Style, C- Ovules, D- Ovary, E-
Thalamus

146. Which one of the following pairs of plants
structures has haploid number of
chromosomes?
  a) Megaspore mother cell and antipodal cells

  b) Egg cell and antipodal cells
  c) Nucellus and antipodal cells
  d) Egg nucleus and secondary nucleus

147. In which one pair, both the plants can be
vegetatively propagated by leaf pieces?
  a) *Bryophyllum* and *kalanchoe*
  b) *Chrysanthemum* and *Agave*
  c) *Agave* and *kalanchoe*
  d) *Asparagus* and *Bryophyllum*

148. Which of the following represents a condition,
where the motility of the sperms is highly
reduced?
  a) Oligospermia   b) Athenospermia
  c) Azoospermia   d) Poolyspermy

149. Ovulatory phase lasts for
  a) 1 day
  b) 2 days
  c) 3 days
  d) 4 days

150. Function of bulbourethral gland is to
  a) Lubricate the penis
  b) Increase the motility of sperm
  c) Enhance the sperm count
  d) All of the above

151. In which of the following animal, cleavage
divisions are restricted to a small part of
cytoplasm and nucleus in animal pole of egg?
  a) Cockroach   b) Frog   c) Chick   d) Rabbit

152. Example of copper releasing IUD is
  a) Cu-T   b) Cu-7
  c) Multiload-375   d) All of these

153. Growth curve is normally:
  a) J-shaped   b) V-shaped
  c) S-shaped   d) C-shaped

154. Mendel's experiment were based on
hybridization between two plants differing in
  a) A pair of contrasting character   b) Three pairs of contrasting character   c) Many pairs of contrasting character   d) None of the above

155. A condition characterized by not having an
exact number of chromosomes in a multiple of
haploid set is called
  a) Polyploidy   b) Synploidy
  c) aneuploidy   d) None of these

156. Broadly the genetic disorders may be classified
in ...A... group Mendelian disorder and ...B...
disorders. Mendelian disorder are mainly

determined by ...C... in single gene.
Choose the correct option for A, B and C
a) A-two, B-chromosomal, C-genetic
b) A-two, B-chromosomal, C-inversion
c) A-two, B-chromosomal, C-alteration
d) A-three, B-chromosomal, C-deficiency

157. According to the *Lac* operon concept, which functional unit of the bacterial genetic material is responsible for suppressing the activity of the operator gene in the absence of lactose?
a) Regulator gene   b) Structural gene
c) Promoter gene   d) Repressor gene

158. S and R strains have several subtypes which one were used by Griffith
a) S III and R II
b) S II and R III
c) S IV and R III
d) S V and R II

159. Hugo de Vries based on his work on ...A... brought forth the idea of ...B..., large difference arising suddenly in a population. He believed that it is mutation which causes evolution and not the ...C... that Darwin talked about. Mutations are random and ...D..., while Darwinian variations are small and ...E... Choose the correct option for A, B, C, D and E to complete the given statement

a) A-evening primorse, B-mutations, C-minor variation, D-direction less, E-directional

b) A-evening primorse, B-mutations, C-minor variation, D-directional, E-non-directional

c) A-four O' clock plant, B-mutations, C-minor variation, D-directional, E-non-directional

d) A-four O' clock plant, B-mutations, C-minor variation, D-direction less, E-directional

160. Which of the following features are connected with the modern theory of evolution?
I. Genetic and chromosomal mutation
II. Genetic recombination and natural selection
III. Reproductive isolation
The correct combination is
a) I and II
b) II and III
c) I and III
d) I, II and III

161. Neurasthenia refers to
a) Undue concern about health
b) Traumatic experience like rape
c) Disorder of sensory perception
d) Mental inability to concentrate on or enjoy things

162. What is the name of complex formed at the time of action of T-cells?
a) HLA
b) STD antigen complex
c) HLA antigen complex
d) MHC antigen complex

163. Transformation of normal cell cancerous cell is induced by
a) Carcinogens   b) UV-rays
c) Neoplastic cells   d) Mutagens

164. The management of animals for milk and its products for human consumption is called
a) Dairying   b) Poultry
c) Cattle farming   d) Livestock improvement

165. Rice, maize, sorghum and millets are the principal cereals of the:
a) Temperate region   b) Tropics
c) North pole   d) Cold regions

166. The natural method of pest and pathogen control involving use of viruses, bacteria and other insects is called
a) Biochemical control
b) Biological gene control
c) Biocontrol
d) Chemical control

167. Consider the following statements
I. Antibiotics are chemical substances produced by some microorganisms which can kill or retard the growth of other disease-causing microorganisms
II. Penicillin is the first antibiotic discovered by Alexander Fleming (1928), while working o bacterium *Staphylococcus aureus*
III. The function of penicillin as an antibiotic was established by Ernst chain and Howard Florey
Which of the statement given above are correct?
a) I and II
b) I and III
c) II and III
d) I, II and III

168. Colony hybridization procedure for identification of plasmid clones is called:

a) Southern blotting
b) Grunstein-Hogness assay
c) DNA probes
d) Molecular assay

169. Which of the following components are used in gel electrophoresis?
    I. Ethidium bromide
    II. Restriction endonuclease
    III. Agarose
    IV. UV radiation
    Choose the correct option
    a) I and II   b) I and III
    c) I, II and IV   d) I, II, III and IV

170. A probe which is a molecule used to locate specific sequences in a mixture of DNA or RNA molecules could be
    a) A single-stranded RNA
    b) A single-stranded DNA
    c) Either RNA or DNA
    d) Can be ssDNA but not ssRNA

171. All are the biotechnological application in order to increase food production, except
    a) Pisciculture
    b) Agro-chemical based agriculture
    c) Organic-agriculture
    d) Genetically engineered crop-based agriculture

172. Which of the following cells cannot be grown under tissue which of culture condition?
    a) Hela cells   b) Leucocytes
    c) Kidney cells   d) Nerve cells

173. There are two optional ways of exploitation. One way is parasitism. Which is the other one?
    a) Antibiosis   b) Competition
    c) Predation   d) Commensalism

174. Find dN/dt for exponential growth for previous question
    a) 3   b) 4   c) 5   d) 6

175. Which one of the following correctly represents as organism and its ecological niche?

a) *Vallisneria* and pond
b) Desert locust (*Scistocerca*) and desert
c) Plant lice (aphids) and leaf
d) Vultures and denes forest

176. Which of the following is the logical sequence of primary succession in water?
    Small phytoplanktons → Free-floating
    a) angiosperms → Rooted hydrophytes → Sedges → Grasses → Trees
    Free-floating angiosperms → Small
    b) phytoplanktons → Rooted hydrophytes → Grasses → Sedges → Trees
    Small phytoplanktons → Sedges → Free
    c) floating angiosperms → Rooted hydrophytes → Grasses → Trees
    Small phytoplanktons → Sedges → Grasses
    d) → Free-floating angiosperms → Rooted hydrophytes → Trees

177. The relationship between the species richness and the area for a wide variety of taxa appears as
    a) Straight line
    b) Sigmoid curve
    c) Rectangular hyperbola
    d) None of these

178. World summit on sustainable development was held in
    a) USA   b) South Africa
    c) South Korea   d) UK

179. UV-rays are non-ionizing type and are lethal due to inactivation of
    a) Proteins   b) Pigments
    c) Nucleic acid   d) All of these

180. It is used in refrigerator and air conditioners and it is a source of CI⁻
    a) Benzopyrene   b) Freon
    c) Benzene   d) CH_4

Meritstore

NEET   TEST ID: 15

Time : 03:00:00   **Marks** : 720

: ANSWER KEY :

1)	b	2)	c	3)	c	4)	b	5)	a	6)	a	7)	d
8)	c	9)	d	10)	b	11)	b	12)	b	13)	a	14)	d
15)	c	16)	a	17)	c	18)	d	19)	c	20)	a	21)	b
22)	c	23)	c	24)	c	25)	b	26)	b	27)	d	28)	c
29)	a	30)	b	31)	c	32)	a	33)	a	34)	c	35)	a
36)	c	37)	a	38)	b	39)	d	40)	a	41)	c	42)	d
43)	b	44)	d	45)	b	46)	d	47)	d	48)	c	49)	d
50)	d	51)	c	52)	a	53)	c	54)	a	55)	d	56)	c
57)	c	58)	c	59)	c	60)	a	61)	d	62)	a	63)	b
64)	c	65)	a	66)	d	67)	c	68)	c	69)	c	70)	d
71)	d	72)	b	73)	b	74)	a	75)	d	76)	b	77)	d
78)	a	79)	c	80)	d	81)	b	82)	a	83)	b	84)	b
85)	a	86)	a	87)	d	88)	c	89)	a	90)	a	91)	c
92)	c	93)	c	94)	d	95)	a	96)	b	97)	d	98)	b
99)	d	100)	a	101)	b	102)	d	103)	b	104)	b	105)	a
106)	a	107)	c	108)	a	109)	d	110)	d	111)	c	112)	a
113)	c	114)	d	115)	b	116)	b	117)	d	118)	a	119)	d
120)	a	121)	a	122)	a	123)	a	124)	a	125)	c	126)	a
127)	c	128)	b	129)	b	130)	c	131)	b	132)	b	133)	a
134)	b	135)	c	136)	b	137)	d	138)	b	139)	d	140)	a
141)	a	142)	c	143)	a	144)	a	145)	d	146)	b	147)	a
148)	b	149)	b	150)	a	151)	c	152)	d	153)	c	154)	a
155)	c	156)	c	157)	c	158)	a	159)	a	160)	d	161)	d
162)	d	163)	a	164)	a	165)	b	166)	c	167)	d	168)	b
169)	d	170)	c	171)	a	172)	d	173)	c	174)	a	175)	c
176)	a	177)	c	178)	b	179)	d	180)	b				

: HINTS AND SOLUTIONS :

Single Correct Answer Type

1 **(b)**

Here αt^2 is a dimensionless. Therefore, $\alpha = \frac{1}{t^2}$ and has the dimension of $[\mathrm{T}^{-2}]$.

2 **(c)**

S_{nth} represents the distance covered in nth sec.

3 **(c)**

When packet is released from the balloon, it acquires the velocity of balloon of value $12\ m/s$. Hence velocity of packet after $2\ sec$, will be
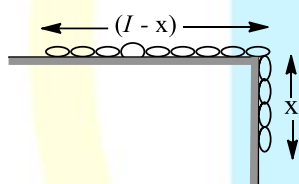
$v = u + gt = 12 - 9.8 \times 2 = -76\ m/s$

4 **(b)**

Change in momentum $= 2mv \sin\theta = 2mv \sin\frac{\pi}{4} = \sqrt{2}mv$

5 **(a)**

Because velocity is always tangential and centripetal acceleration is radial.

6 **(a)**

Let length of chain be l and mass m. Let a part x of chain can hang over one edge of table having coefficient of friction

$\therefore$ Pulling force, $F = \frac{mx}{l}g$

and friction force, $f = \mu N = \mu \frac{m}{l}(l-x)g$

For equilibrium, $F = f$, hence

$\frac{mx}{l} \cdot g = \mu \frac{m}{l}(l-x)g = 0.25\frac{m}{l}(l-x)g$

$\Rightarrow x = \frac{l}{5}$ or $\frac{x}{l} = \frac{1}{5} = 20\%$

7 **(d)**

Initial velocity of steel ball $u = 14\ \mathrm{ms}^{-1}$

Mass of steel ball $m = 0.5\ \mathrm{kg}$

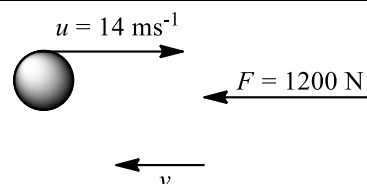Force acting on the steel ball from opposite direction.

$F = -1200\ \mathrm{N}$

Time duration for collision,

$t = 25\ \mathrm{ms} = 25 \times 10^{-3}\ \mathrm{s}$

Let final velocity of ball$= v$

Applying Newton's II law of motion to steel ball ie,

$F = \frac{p_2 - p_1}{t}$

$\Rightarrow -1200 = \frac{mv - mu}{t}$

$\Rightarrow \frac{-1200}{m} + u = v$

$\Rightarrow v = \frac{-1200 \times 25 \times 10^{-3}}{0.5} = -60\ \mathrm{ms}^{-1}$

$v = -60 + 14\ \mathrm{ms}^{-1}$

$= -46\ \mathrm{ms}^{-1}$

[$-$ve sign shows that now ball will move in the direction of force]

8 **(c)**

The work done in stretching a sprig by a length x,

$W_1 = \frac{1}{2}kx^2$ ...(i)

The work done in stretching the spring by a further length$x$.

$W_2 = \frac{1}{2}k(2x)^2 - \frac{1}{2}kx^2$

Or $W_2 = \frac{1}{2}k \times 4x^2 - \frac{1}{2}kx^2$

Or $W_2 = 3 \times \frac{1}{2}kx^2$ ...(ii)

From Esq. (i) and (ii)we have

$W_2 = 3W_1$

10 **(b)**

Let at the time explosion velocity of one piece of mass $m/2$ is $(10\hat{\imath})$. If velocity of other be $\vec{v}_2$, then from conservation law of momentum (since there is no force in horizontal direction), horizontal component of $\vec{v}_2$, must be $-10\hat{\imath}$.

$\therefore$ Relative velocity of two parts in horizontal direction $= 20\mathrm{ms}^{-1}$

Time taken by ball to fall through 45m,

$= 20 = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2\times45}{10}} = 3s$ and time taken by ball

to fall through first 20m, $t' = \sqrt{\frac{2h'}{g}} = \sqrt{\frac{2\times20}{10}} = 2s$.

Hence time taken by ball pieces to fall from 25 m height to ground $= t - t' = 3 - 2 = 1s$.

$\therefore$ Horizontal distance between the two pieces at the time of striking on ground

$= 20 \times 1 = 20m$

11 **(b)**

Acceleration due to gravity $g = \frac{4}{3}\pi\rho GR$

or $\qquad g \propto \rho$

$\therefore \qquad \dfrac{g_1}{g_2} = \dfrac{\rho_1}{\rho_2}$

$\dfrac{g_1}{g_2} = \dfrac{\rho}{2\rho} [\because \rho_2 = 2\rho]$

$g_2 = g_1 \times 2 = 9.8 \times 2$

$g_2 = 19.6 \text{ m/s}^2$

12 (b)

$U(R) = \dfrac{A}{R^n} - \dfrac{B}{R^m}$

The negative potential energy (2nd part) is the attractive

13 (a)

From Bernoulli's equation, the sum of all forms of energy in a fluid flowing along an enclosed path (a streamline) is the same at any two points in the path. Therefore,

$p + \dfrac{1}{2}\rho v_1^2 = p' + \dfrac{1}{2}\rho v_2^2$

Given, $\qquad v_2 = 2v, \quad v_1 = v$

$\therefore \quad p + \dfrac{1}{2}\rho v^2 = p' + \dfrac{1}{2}\rho(2v)^2$

$\Longrightarrow \quad p' = p - \dfrac{3}{2}\rho v^2$

14 (d)

The rate of flow of liquid (V) through capillary tube is

$V = \dfrac{\pi p r^4}{8\eta l} = p\left(\dfrac{\pi r^4}{8\eta l}\right) = \dfrac{p}{R} = \dfrac{\text{pressure difference}}{\text{resistance}}$

Where, $R = \dfrac{8\eta h l}{\pi r^4}$

When two tubes are in series

Total resistance $R = R_1 + R_2$

Rate of flow of liquid, $V' = \dfrac{p}{R_1 + R_2}$

$= \dfrac{p}{\frac{8\eta}{\pi}\left[\frac{l_1}{r_1^4} + \frac{l_2}{r_2^4}\right]} = \dfrac{\pi p}{8\eta}\left[\dfrac{l_1}{r_1^4} + \dfrac{l_2}{r_2^4}\right]^{-1}$

15 (c)

Heat capacity/volume $= c \times \dfrac{m}{V} = c \times \rho$

Desired ratio $= \dfrac{c_1 \rho_1}{c_2 \rho_1} = \dfrac{3}{5} \times \dfrac{5}{6} = 1 : 2$

17 (c)

$k_a = \gamma p = \left(\dfrac{5}{3}\right) \times 1.01 \times 10^5 \text{Nm}^{-2}$

$= 1.69 \times 10^5 \text{Nm}^{-2}$

18 (d)

$\dfrac{\Delta Q}{\Delta t} = KA\left(\dfrac{\Delta T}{\Delta x}\right) = K\pi r^2 \left(\dfrac{\Delta T}{l}\right) \propto \dfrac{r^2}{l}$

As $\dfrac{r^2}{l}$ is maximum for (d), it is the correct choice.

19 (c)

$a = -\omega^2 x \Rightarrow \left|\dfrac{a}{x}\right| = \omega^2$

20 (a)

In S.H.M. when acceleration is negative maximum or positive maximum, the velocity is zero so kinetic energy is also zero. Similarly for zero acceleration, velocity is maximum so kinetic energy is also maximum

21 (b)

Given equation of stationary wave is

$y = \sin 2\pi x \cos 2\pi t$, comparing it with standard equation

$y = 2A \sin\dfrac{2\pi x}{\lambda}\cos\dfrac{2\pi x}{\lambda}$

We have $\dfrac{2\pi x}{\lambda} = 2\pi x \Rightarrow \lambda = 1m$

Minimum distance of string (first mode) $L_{\min} = \dfrac{\lambda}{2} = \dfrac{1}{2}m$

22 (c)

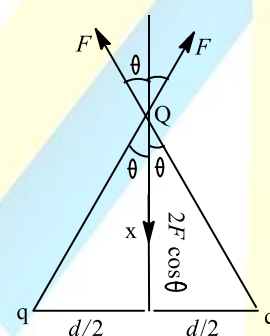$F = \dfrac{1}{4\pi\varepsilon_0}\dfrac{q_1 q_2}{r^2}(110/100)\,(90/100)$ times

$ie, \dfrac{99}{100}$ times

$\therefore$ net force $= \dfrac{99}{100} \times 100 = 99N$

23 (c)

$F = \dfrac{1}{4\pi\varepsilon_0}\dfrac{q_1 q_2}{r^2}$

Taking the net force, we have

$F_{\text{net}} = 2F\cos\theta = 2\left[\dfrac{1}{4\pi\varepsilon_0}\dfrac{Qqx}{\left(x^2 + \frac{d^2}{4}\right)^{\frac{3}{2}}}\right]$

For maximum, $\qquad \dfrac{dF_{\text{net}}}{dx} = 0$

$\therefore \left(x^2 + \dfrac{d^2}{4}\right)^{3/2} - \dfrac{3}{2}x\left[x^2 + \dfrac{d^2}{4}\right]^{1/2}(2x) = 0$

$\therefore \left(x^2 + \dfrac{d^2}{4}\right)^{\frac{1}{2}}\left(x^2 + \dfrac{d^2}{4} - 3x^2\right) = 0$

or $2x^2 = \frac{d^2}{4}$

$x = \frac{d}{2\sqrt{2}}$

24 **(c)**

$U = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r}$

$\therefore U = \frac{9\times 10^9 \times (1.6\times 10^{-19})(-1.6\times 10^{-19})}{10^{-10}}$

$= -9\times 10^9 \times 1.6\times 10^{-19} \times 10^{10}$eV

$= -14.4$eV

25 **(b)**

Mass of water = volume × density

= $1000 \times 1 = 1000$ g.

Heat taken by water = $mc\,\Delta\theta$

= $1000 \times 1(37 - 22)$ cal

= $1000 \times 15 \times 4.2$ J

Power of geyser = $\frac{\text{energy spent}}{\text{time}}$

$= \frac{1000\times 15\times 4.2}{60}$ 1050 W.

26 **(b)**

By using $e_0^{100} = e_0^{32} + e_{32}^{70} + e_{70}^{100}$

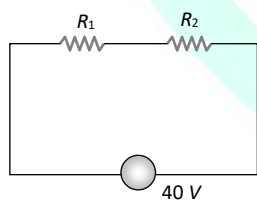$\Rightarrow 200 = 64 + 76 + e_{70}^{100} \Rightarrow e_{70}^{100} = 60\ \mu V$

27 **(d)**

Bulb (I):Rated current$I_1 = \frac{P}{V} = \frac{40}{220} = \frac{2}{11}\ amp$

Resistance$R_1 = \frac{V^2}{P} = \frac{(220)^2}{40} = 1210\Omega$

Bulb (II):Rated current$I_2 = \frac{100}{220} = \frac{5}{11}\ amp$

Resistance $R_2 = \frac{(220)^2}{100} = 484\ \Omega$

When both are connected in series across $40\ V$ supply

Total current through supply

$I = \frac{40}{P_1 + P_2} = \frac{40}{1210 + 484} = \frac{40}{1254} = 0.03A$

This current is less than the rated current of each bulb. So neither bulb will fuse

Short Trick : Since $V_{Applied} < V_{Rated}$, neither bulb will fuse

28 **(c)**

Frequency $f = \frac{Bq}{2\pi m}$

As proton, electron, Li$^+$, He$^+$ have same charge in

magnitude and since magnetic field is also constant.

So, $f \propto \frac{1}{m}$

Among the given charged particles, Li$^+$ has highest mass, therefore it will have minimum frequency.

29 **(a)**

Magnetic moment of bar $M = 10^4\ J/T$

$B = 4\times 10^{-5}T$

Hence work done $W = \vec{M}.\vec{B}$

$= 10^4 \times 4\times 10^{-5} \times \cos 60° = 0.2\ J$

30 **(b)**

The time period of vibration magnetometer is given by

$$T = 2\pi\sqrt{\frac{I}{MB_H}}$$

Where I is moment of inertia, M the magnetic moment and B_H the horizontal component of earth's magnetic field.

Also, $I = mr^2$

Where m is mass and r the radius.

When mass is increased four times

$I' = 4I$

$\therefore T' = 2\pi\sqrt{\frac{4I}{MB_H}}$ T

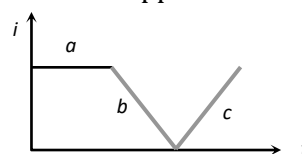$= 2 \times 2\pi\sqrt{\frac{I}{MB_H}} = 2T$

31 **(c)**

Emf induces during 'a' = 0

emf induces during 'b' is constant throughout emf induces during 'c' is constant throughout magnitude of emf induced during 'b' is equal to the magnitude of emf induced during 'c'. But the direction opposite

32 **(a)**

Natural frequency is nothing but resonant frequency.

In this case $X_L = X_C$

$$\Rightarrow \qquad \omega_0 L = \frac{1}{\omega_0 C}$$
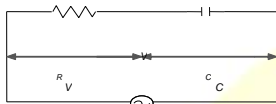
$$\Rightarrow \qquad \omega_0^2 = \frac{1}{LC}$$

$$\Rightarrow \qquad \omega_0 = \frac{1}{\sqrt{LC}}$$

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

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

33 **(a)**

Let the applied voltage be V volt.

Here, $V_R = 12\,V, V_C = 5\,V$

$$\therefore \qquad V = \sqrt{V_R^2 + V_C^2} = \sqrt{(12)^2 + (5)^2}$$

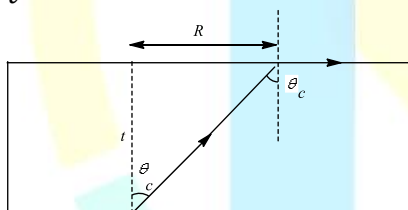$$= \sqrt{144 + 25} = \sqrt{169} = 13V$$

34 **(c)**

Number of oscillator in coherence length

$$= \frac{l}{\lambda} = \frac{0.024}{5900 \times 10^{-10}}$$

$$= 4.068 \times 10^6$$

35 **(a)**

$$\frac{R}{t} \tan \theta_C$$

Or $R = t(\tan \theta_C)$

But, $\sin \theta_C = \frac{1}{\mu} = \frac{3}{5}$

$$\therefore \tan \theta_C = \frac{3}{4}$$

$$R = \frac{3}{4} t = \frac{3}{4}(8\text{ cm}) = 6\text{ cm}$$
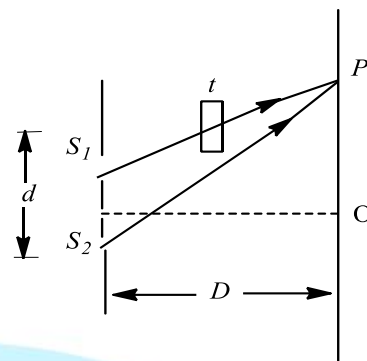
Hence, the answer is 6.

36 **(c)**

By formula $\delta = (\mu - 1)A \Rightarrow 34 = (\mu - 1)A$ and in

the second position $\delta' = (\mu - 1)\frac{A}{2}$

$$\therefore \frac{34}{\delta'} = \frac{(\mu - 1)A}{(\mu - 1)\frac{A}{2}} \text{ or } \delta' = \frac{34}{2} = 17°$$

37 **(a)**

When a mica sheet is introduced in the path of one of the two interfering beams, then entire fringe pattern is displaced towards the beam is the path of which plate is introduce, but fringe

width is not changed.

$$x_0 = \frac{D}{d}(\mu - 1)t \qquad \dots (i)$$

Also fringe width is

$$W = \frac{D\lambda}{d}$$

$$\therefore \frac{W}{\lambda} = \frac{D}{d} \qquad \dots (ii)$$

Using Eq. (ii) we get Eq. (i) as

$$x_0 = \frac{W}{\lambda}(\mu - 1)t$$

Given, $x_0 = 1.89 \times 10^{-3}$m, $W = 0.431 \times 10^{-3}$m,

$\mu = 1.59, \quad \lambda = 5.89 \times 10^{-7}$m.

$$1.89 \times 10^{-3} = \frac{0.431 \times 10^{-3}}{5.89 \times 10^{-7}}(1.59 - 1)t$$

$$\Rightarrow \qquad t = \frac{5.89 \times 10^{-7} \times 1.89 \times 10^{-3}}{0.431 \times 0.59 \times 10^{-3}}$$

$$\Rightarrow \qquad t = 4.38 \times 10^{-6}\text{m}$$

38 **(b)**

When a high energy electron is incident on heavy metal, it produces X-rays

39 **(d)**

Light consists of photons and cathode rays consists of electrons. However both effect the photographic plate

40 **(a)**

Ionization energy $= RchZ^2$

$Z = 3$ for Li^{2+}

$\therefore$ Ionization energy $=(3)^2 Rch = 9Rch$

41 **(c)**

Emitted enegy $\Delta E = \frac{hc}{\lambda}\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$

42 **(d)**

Radioactive decay does not depend upon the time

of creation.

43 (b)

The main cause of zener breakdown is production of electron-hole pairs due to thermal excitation.

44 (d)

For good demodulation,

$\frac{1}{f} << RC$ or , $RC >> \frac{1}{f}$

45 (b)

$NA = \mu_1(2\Delta)^{1/2} = 1.5(2 \times 0.01125)^{1/2} = 0.225$

46 (d)

Number of gram equivalents of

$HCl = \frac{100 \times 0.1}{1000} = 0.01$

Number of gram equivalents of HCl=Number of gram equivalents of metal carbonate

$0.01 = 0.01$

Therefore, mass of 1 g equivalents of carbonate salt

$= \frac{2}{0.01} = 200g$

Equivalent mass of metal carbonate=200

47 (d)

The law of constant composition−According to this law, "A chemical compound is always found to be made up of the same elements combined together in the same proportions by weights". This law is same as law of definite proportions.

48 (c)

The atomic number of neon is 10.

G. S. Ne[10]: $1s^2, 2s^2, 2p^6$

E. S. Ne[10]: $1s^2, 2s^2, 2p^5, 3s^1$

Hence, $1s^2, 2s^2, 2p^5, 3s^1$ electronic configuration indicates the excited state of neon.

49 (d)

$\Delta x \cdot \Delta P = \frac{h}{4\pi}$

$\Delta x = \frac{6.63 \times 10^{-34}}{4 \times 3.14 \times 10^{-5}}$

$= \frac{5.27 \times 10^{-35}}{1 \times 10^{-5}}$

$= 5.27 \times 10^{-30} m$

50 (d)

Fluorine is the most electronegative element in the Periodic Table so it never shows positive oxidation state.

52 (a)

6, 6

53 (c)

According to Graham's law of diffusion

$\frac{r_{O_2}}{r_{He}} = \sqrt{\frac{M_{He}}{M_{O_2}}}$

or $= \sqrt{\frac{4}{32}} = \frac{1}{2.83}$

$\therefore r_{O_2} = 0.35 \, r_{He}$

54 (a)

Hess's law states that enthalpy changes during and process are independent of path. So, this law is used in calculating enthalpy.

55 (d)

Heat of combustion is usually measured by placing a known mass of a compound in a steel container called a constant volume bomb calorimeter.

$\Delta E = C \times \Delta t \times \frac{M}{m}$

Where, C=heat capacity of calorimeter, $\Delta t = (t_2 - t_1)$ m=mass of substance taken and M=molar mass of substance

56 (c)

$N = \frac{N_1 V_1 + N_2 V_2}{V_1 + V_2}$ ($\because$ for HCl $N = M$)

$= \frac{0.015 \times 100 + 0.005 \times 100}{100 + 100}$

$= \frac{1.5 + 1.5}{200} = \frac{1}{100} = 10^{-2}$

Resulting solution is acidic in nature.
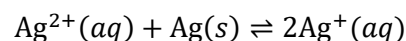
Then, $[H^+] = 10^{-2}$

$pH = - \log[H^+]$

$= \log \frac{1}{[H^+]} = \log \frac{1}{10^{-2}}$

$= 2 \log 10$

$= 2$

57 (c)

The reaction, in which two or more species undergo reduction as well as oxidation to give a single species are called comproportionation reaction. This is reverse of disproportionation reaction.

$Ag^{2+}(aq) + Ag(s) \rightleftharpoons 2Ag^+(aq)$

58 (c)

Let the oxidation number of Cr be x

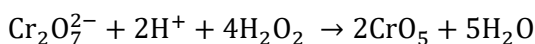$\therefore$ For $K_2Cr_2O_7$

$+1 \times 2 + 2x + 7(-2) = 0$

$2 + 2x - 14 = 0$

$2x = 12$

$x = 6$

59 (c)

H_2O_2 oxidises the acidified potassium dichromate solution into blue peroxide of chromium, CrO_5.

$$Cr_2O_7^{2-} + 2H^+ + 4H_2O_2 \rightarrow 2CrO_5 + 5H_2O$$

60 (a)

Na_2CO_3 will not decompose on heating.

All alkali metal (IA group) carbonates (except Li_2CO_3) are highly stable and not decomposes on heating. Carbonates of alkaline earth metals (II A group) decompose into CO_2 and metal oxide.

61 (d)

Atomic size increases in a group from top to bottom. But in IIIA group, gallium (Ga, 1.35 Å) has size smaller than aluminium (1.43 Å). The reason is that in gallium d-electrons shield nuclear charge poorly and hence, due to greater effective nuclear charge (Z_{eff}) it has smaller size.

62 (a)

Lamp black is used for all these purposes. Carbon black is used in making tyres. Bone black is used for decolourisation of sugar.

63 (b)

Optical isomerism is shown by compounds which have one or more chiral carbon atoms.

$$HC \equiv C - \overset{*}{\underset{\underset{Cl}{|}}{C}} - CH_3$$

(b)
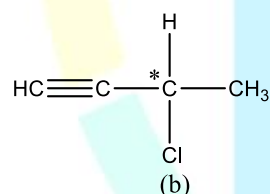
∵ It has asymmetric or chiral carbon atom.

∴ It shows optical isomerism.

64 (c)

The following are the necessary conditions for compound to be aromatic.
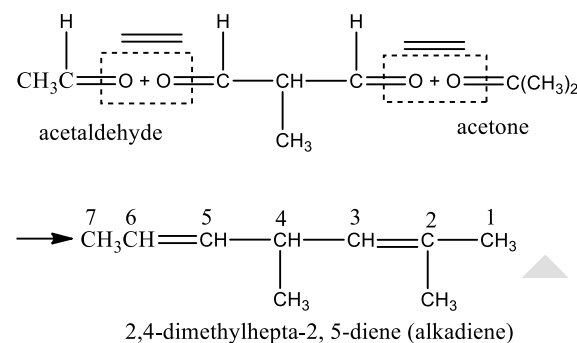
6. Molecule must be planar and cyclic.

7. Conjugated double bond must be present.

8. It must have $(4n + 2)\pi$-electrons.

65 (a)

Since the alkadiene on reductive ozonolysis gives acetaldehyde (CH_3CHO), acetone (CH_3COCH_3) and 2-methylpropane-1, 3-dial [$OHCCH(CH_3)CHO$], the structure of

alkadiene will be obtained as

acetaldehyde CH_3 acetone

$$\overset{7}{CH_3}\overset{6}{CH} = \overset{5}{CH} - \overset{4}{\underset{\underset{CH_3}{|}}{CH}} - \overset{3}{CH} = \overset{2}{\underset{\underset{CH_3}{|}}{C}} - \overset{1}{CH_3}$$

2,4-dimethylhepta-2, 5-diene (alkadiene)

67 (c)

Quartz (SiO_2) is a covalent crystal.

68 (c)

Silicon is used for making a transistor.

69 (c)

3.50 wt% of aqueous solution of NaCl means 100 g of sea water contains 3.50 g NaCl.

Water in sea water = 100-3.5 = 96.5 g

$= 0.0965$ kg

$$\text{Molality} = \frac{3.5}{58.5 \times 0.0965}$$

$= 0.62$ m

70 (d)

$$\text{Normality} = \frac{\text{no.of g-equivalents of solute}}{\text{volume of solution in litre}}$$

Given, basicity = 2, mol. wt. = 200,

V = 100 mL = 100/1000 L

Normality = 0.1

$$\text{Eq. wt.} = \frac{\text{mole.wt.}}{\text{basicity}} = \frac{200}{2} = 100$$

$$N = \frac{\text{mass /eq. wt.}}{\text{volume of solution in litre}}$$

or $\quad 0.1 = \frac{\text{mass /100}}{100/1000}$
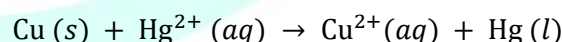
or $\quad 0.1 = \frac{\text{mass /100}}{0.1}$

or $\quad$ mass = $0.1 \times 0.1 \times 100 = 1.0$ g

71 (d)

Galvanic cell is

Cu (s) | Cu^{2+} (aq) || Hg^{2+} (aq) | Hg (l)

In the above cell, oxidation of copper and reduction of mercury takes place. Its cell reaction is written as

Cu (s) + Hg^{2+} (aq) → $Cu^{2+}(aq)$ + Hg (l)

73 (b)

$$2NO_2 \underset{k_2}{\overset{k_1}{\rightleftharpoons}} N_2O_4$$
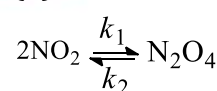
$$\text{Rate} = -\frac{1}{2}\frac{d[NO_2]}{dt}$$

$$= k_1[NO_2]^2 - k_2[N_2O_4]$$

∴ Rate of disappearance of NO_2

$$ie, -\frac{d[NO_2]}{dt} = 2k_1[NO_2]^2 - 2k_2[N_2O_4]$$

74 (a)
Paste is suspension of solid in liquid.

75 (d)
Luster of metals is due to the presence of mobile electrons

76 (b)
Wrought or malleable iron is the purest form of iron

77 (d)
Dust is a colloid which shows tyndall effect. Hence,tyndall box is used to test the presence of dust in gaseous mixture , as dust decreases the effectiveness of catalyst.

78 (a)
The methods chiefly used for the extraction of lead and tin from their ores are respectively self reduction and carbon reduction. (Because the process of heating the ore strongly in the presence of excess of air is called roasting. It is mainly used in case of sulphide ores and the process of extracting a metal by fusion of the oxide ore with carbon is known as smelting.)
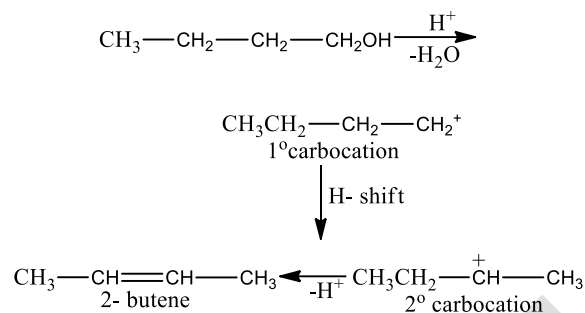
79 (c)
$Zn + 2NaOH \longrightarrow Na_2ZnO_2 + H_2$
$\therefore$ Zn liberates hydrogen with hot conc. alkali.

80 (d)
But-2-ene and but-1-yne do not have same molecular formula, thus are not isomers
$CH_3 - CH = CH - CH_3 \quad CH_3 - CH_2 - C \equiv CH$
But-2-ene $\qquad\qquad$ but-1-yne
$(C_4H_8) \quad (C_4H_6)$

81 (b)
Ethanol cannot undergo dehydrohalogenation as it does not contain any halogen.

82 (a)
$C_6H_5O^-$ is a weaker nucleophile than $C_2H_5O^-$. Therefore, the better nucleophile, $ie, C_2H_5O^-$ will attack C_6H_5I to form diethyl ether.

$\underset{\substack{\text{stronger}\\\text{nucleophile}}}{C_6H_5OH} + \underset{}{C_2H_5O^-} \longrightarrow \underset{\substack{\text{Weak}\\\text{nucleophile}}}{C_6H_5O^-} + C_2H_5OH$

$C_2H_5O^- + CH_3\overset{+\delta}{-}\overset{-\delta}{CH_2}-I \longrightarrow \underset{\text{diethyl ether}}{CH_3CH_2-O-CH_2CH_3} + I^-$

83 (b)
The dehydration of 1-butanol gives 2-butene as the main product because 2-carbocation is stabler than1°.

$CH_3-CH_2-CH_2-CH_2OH \xrightarrow[-H_2O]{H^+}$

$\underset{1°\text{carbocation}}{CH_3CH_2-CH_2-CH_2^+}$

$\downarrow$ H- shift

$\underset{\text{2- butene}}{CH_3-CH=CH-CH_3} \xleftarrow[-H^+]{} \underset{2°\text{ carbocation}}{CH_3CH_2-\overset{+}{CH}-CH_3}$

85 (a)
Grabriel's synthesis : Phthalimide is reacted with KOH to form potassium phthalimide. The potassium salt is treated with an alkyl halide. The product N-alkyl phthalimide is put to hydrolyse with hydrochloric acid, then primary amine is formed.

86 (a)
Secondary nitroalkanes can be converted into ketones by using aqueous HCl.

$2 \underset{R}{\overset{R}{>}}CHNO_2 + HCl \longrightarrow 2 \underset{R}{\overset{R}{>}}C=O + N_2O + H_2O$

89 (a)
ABS is acrylonitrile-butadiene-styrene rubber which is obtained by copolymerisation of acrylonitrile, 1, 3-butadiene and styrene.

$\underset{\text{acrylonitrile}}{\underset{\substack{|\\CN}}{CH_2=CH}} + \underset{\text{1,3-butadiene}}{\underset{\substack{|\\CH=CH_2}}{CH_2=CH}} + \underset{\text{styrene}}{CH_2=CHC_6H_5} \longrightarrow$

$\left[-CH_2-\underset{\substack{|\\CN}}{CH}-CH_2CH=CHCH_2-CH_2-CH_2-\underset{\substack{|\\C_6H_5}}{CH}-\right]$
ABS rubber

90 (a)
Heroin is not a tranquillizer, it is a narcotic analgesic

91 (c)
Phylogenetic system involves the classification of plants, according to the envolutionary and genetic affinities. This system of classification was proposed by **Engler** in 1886, by **Hutchinson** in 1926 and by **Tippo** in 1942.

92 (c)
Taxonomy is applicable for both plants and animals.

93 (c)
Hooker proposed the concept of genus.

94 (d)
In fungi, vegetative reproduction occurs by fragmentation, budding, fission, sclerotia and rhizomophs

95 (a)
The bacillariophycean members (diatoms) are microscopic, eukaryotic, unicellular or colonial coccoid algae. These algae are sexually reproduced by the formation of auxospores in most cases. Homocysts are formed by few cyanobacteria.

96 (b)
Cycads possess top-shaped, multiciliate male gametes and he mature seed, which bears only one embryo with two cotyledons.

97 (d)
In flowering plants, a cross section of the developing anther displays four chambers. These chambers are called pollen sacs. Each pollen sac is filled with cells containing large nuclei. As the anther grows each of these cells goes through two meiotic divisions, forming a tetrad. These cells are called microspores. Each one of these microspores eventually becomes a pollen grain and in carpel meiosis takes place at the time of megaspore from megaspore mother cell

98 (b)
Holozoic nutrition is the ingestion of food in solid or liquid form.

99 (d)
Frogs have three types of pigmentations or chromatophores (melanophores, iridophores and xanthophores). These chromatophores are controlled by the frog's central nervous system and hormones.

100 (a)
The metamorphosis of frog is controlled by the thyroid hormones that contains **iodine** element. Thus, addition of I_2 element in water speeds up the metamorphosis in frog tadpole.

101 (b)
Maize is a monocotyledonous plant, whereas China rose, mango and sunflower are dicotyledonous plants.

102 (d)
Thalamus or receptacle.
The flower is a reproductive unit in the angiosperms. It is meant for sexual reproduction. A typical flower has four different kinds of whorls arranged successively on the swollen end of the stalk or pedicel called thalamus or receptacle

103 (b)
Anthocyanin pigment present in vacuole is responsible for the bright colour of petal.

104 (b)
If gynoecium is situated in the centre and other parts of the flower are located on the rim of the thalamus almost at the same level, it is called perigynous flower, the ovary here is said to be half inferior, *e.g.*, plum, rose, peach.

105 (a)
The cambium lies in vascular bundles of dicot and gymnosperm stem in between phloem and xylem

106 (a)
Each stoma is composed of two bean-shaped cells known as **guard cells**. These are modified ground tissue. They have the chlorophylls and performs photosynthesis. The outer walls of guard cells (away from the stomatal pore) are thin and inner wall (toward the stomatal pore) are highly thickened

107 (c)
Prey is captured by the frog by the use of its bilobed tongue. The tongue is sticky and attached by its anterior end. The prey is entirely swallowed without mastication

109 (d)
Prosthetic groups are organic compounds and are distinguished from other co-factors (non-protein constituents bound to the enzymes) in that they are tightly bound to the apoenzyme (protein portion of the enzymes). For example, in peroxidase and catalase, which catalyze the breakdown of H_2O_2 to H_2O and O_2, haeme is the prosthetic group and it is the part of active site of the enzyme.

110 (d)
Membrane proteins that speed the movement of solute across a membrane by facilitating diffusion are called transporters or **permeases.**

111 (c)
Inulin (Dahlia starch) is a polymer of **fructose**. It consists of 30 fructose units linked by β1 — 2 linkage.

112 (a)
$CH_3(CH_2)_{14}COOH$ is the chemical formula of **palmitic acid**. It is a saturated fatty acid.

113 (c)
In metaphase if mitosis, spindle fibres attach to kinetochore of chromosomes.

Chromosomes are moved to spindle equator and get alligned along metaphasic plate through spindle fibres to both pole.

114 (d)

In zygotene of prophase-I, homologous chromosomes pair up. This process is called **synapsis**. One chromosome of the pair is from the male parent and other from the female parent.

115 (b)

The cell will decrease in size due to exosmosis.

116 (b)

In 1980, **Julius von Sachs**, a German botanist, demonstrated for the first time that plants could be grown to maturity in a defined nutrient solution in complete absence of soil. This technique of growing plants in a nutrient solution is known as **hydroponics**. These methods require purified water and mineral nutrient salts.

117 (d)

Cohesion-tension theory for ascent of sap was originally proposed by **Dixon** and **Jolly** (1894) and greatly supported and elaborated by **Dixon** (1914, 1924). It is also called transpiration pull theory and is based on the assumptions of:

9. Continuous water column from rot hairs to the tip of the plant.

10. Cohesive and adhesive properties of water molecules.

11. Strong transpiration pull exerted by all the transpiring leaves on the stem.

118 (a)

Hydroponics were first demonstrated in the year 1860

119 (d)

Magnesium is at the centre of the porphyrin ring in chlorophyll. Structure of chlorophyll Structure of chlorophy II molecule can be shown as follows.
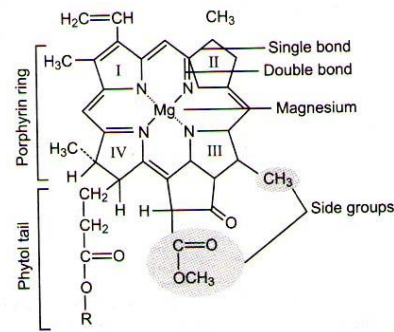
121 (a)

RuBP (Ribulose, 1-5 diphosphate) is the 5 carbon compound in which the ribose sugar is present

122 (a)

Strains of Saccharomyces cerevisiae (yeast) are extensively used for leavening of bread. During fermentation, the yeasts produce alcohol and carbon dioxide, which leave and the leavened bread becomes porous.

123 (a)

Glycolysis is a series of reactions that takes place in the cytoplasm of all prokaryotes and eukaryotes. The role of glycolysis is to produce energy (both directly and by supplying substrate for the citric acid cycle and oxidative phosphorylation) and to produce intermediates for biosynthetic pathway.

124 (a)

Conditions in which the duration of light is less than the critical period of time don't promote the flowering due to photoperiodism. (Response of plants to periods of day/light)

125 (c)

Growth is regarded as one of the most fundamental and conspicuous characteristics of a living being. Growth can be defined as the irreversible permanent increase in the size of an organ or its part or even of an individual cell. Generally growth is accompanined by metabolic process (both anabolic and catabolic), that occurs at the expanse of energy

126 (a)

Arithmetic Growth Rate The expression of arithmetic growth is exemplified by roots (or organ) elongating at constant rate. On plotting the length of an organ against time, a linear curve is obtained. Mathematically it is expressed as
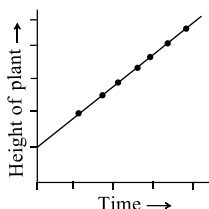
Constant linear growth, a plot of length L against time

$L_t = L_0 + rt$

L_t = Length of time 't'

L_0 = Length of time to

r = Growth rate or elongation per unit time

127 (c)

D is the hepatic portal vein and F is the hepatic vein.

128 (b)

In the wall of small intestine, lymphatic tissues are present called Peyer's patches. These are groups of lymph nodules that are most numerous in the ileum. They produce lymphocytes. Rugae are prominant folds found in empty stomach. Maceus membrane of small intestine is grown into many finger-like projections known as villi.

129 (b)

Apnea   – no breathing

Dyspnea   – painful breathing

Asphyxia – oxygen starvation due to low atmospheric oxygen

Hypoxia   – inadequate supply of oxygen to tissue

130 (c)

Ketoacidosis is a type of metabolic acidosis, which is caused by high concentrations of ketone bodies, formed by the breakdown of fatty acids and the deamination of amino acids.

132 (b)

The concentration of lead in blood averages about 25 μg/100 mL. Increase to 70 μg/100 mL is generally associated with clinical symptoms. Hence, a level of 30 μg/100 mL is considered alarming.

133 (a)

Glomerular area of adrenal cortex is responsible for water and electrolyte balance. Zona glomerulosa layer of adrenal cortex secretes hormones that influences the kidneys to excrete or retain sodium and potassium, depending on the needs of the body. These hormones and mineralocorticoids.

134 (b)

The expulsion of urine from the urinary bladder is called **micturition**.

135 (c)

Aldosterone causes the reabsorption of water and Na^+ from distal part of duct

136 (b)

Parallely arranged filament of muscle fibre. Each muscle fibre is lined by the plasma membrane called sarcolemma enclosing the sarcoplasm. Muscle fibre is a syncitium as the sarcoplasm contains many nuclei. The endoplasmic reticulum, *i.e.,* sarcoplasmic reticulum of the muscle fibres is the store house of calcium ions. A characteristic feature of muscle fibre is the presence of large number of parallely arranged filaments in the sarcoplasm called myofilaments or myofibrils

137 (d)

A fracture of the distal end of radius, in which the distal fragment displaced posteriorly is called **Colles' fracture**.

138 (b)

Lower part of forelimb has two bones, an inner radius and an outer ulna. The ulna is longer and thicker. At the elbow joint, which projects beyond the radius as an olecranon process that has a deep subterminal sigmoid notch for articulation with trochlea of humerus by a hinge joint.

139 (d)

The motor nerve endings secrete acetycholine, which activates nicotinic receptors of the muscle fibre membrane. Curare inhibits the nicotinic receptors and blocks neuromuscular transmission.

140 (a)

A-Sense organ B-Sensory nerve

C-Dorsal horn D-Interneuron

E-Ventral horn F-Motor nerve

GvEffector

141 (a)

Follicles

142 (c)

Sulphur is essential for formation of insulin

143 (a)

True. When both the sexes are present on the same organism called hermaphrodite, *e. g.,* Earthworm, leech, etc

144 (a)

As we know that oviparous individuals lay eggs outside the body hence, further development takes place outside.

But, the process of fertilization takes place inside their body

145 (d)

A-Stigma - Landing ground for pollen grains
B-Style - Passage for pollen tube
C-Ovary - Embryos sac/fruit
D-Ovules – Formation of seed
E-Thalamus – Receptakle for ovary

146 (b)

In most cases, the mature embryo sac contains 7 cells and 8 nuclei, *i.e,* egg apparatus with two haploid synergid cells and one haploid egg cell at micropylar end, two haploid polar nuclei in a single central cell (which later fuse to form diploid secondary nucleus) at the middle and three haploid antipodal cells at the chalazal pole.

147 (a)

Both *Bryophyllum* and *kalanchoe are* propagated by leaf pieces.

148 (b)

Athenospermia is the condition where the motility of sperms is highly reduced.

The condition of presence of completely non-motil sperms in human semen is known as **necrospermia.**

The condition when less number of sperms is found in semen is termed as **oligospermia.** The penetration of many sperms into an ovum simultaneously is termed as **polyspermy.**

149 (b)

In ovulatory phase, release of ova occurs due to the rapid increase in LH called LH surge. It last for maximum two days

150 (a)

Bulbourethral gland secretes mucus, which lubricate penis during intercourse. This reduces the friction during the process. Bulbourethral gland is also called Cowper's gland

151 (c)

In birds and other polylecithal egg containing animals, cleavage (division) are restricted to a small part of cytoplasm and nucleus in animal pole of egg. Such type of cleavage is termed as 'meroblastic cleavage'.

152 (d)

Intra Uterine Devices (IUDs) for contraception
(i) There devices are inserted by the doctors into the uterus through vagina.
(ii) *There are three types of IUDs*

Non-medicated IUDs They increases the phagocytosis of the sperm within the uterus, *e. g.,* Lippes loop

Copper Releasing IUDs Along with phagocytosis of the sperms, the copper ions released, suppresses the sperm motility and the fertilizing capacity of the sperm. *e. g.,* Cu-T, Cu-7, multiload-375

Hormone Releasing IUDs They makes the uterus unsuitable for implantation and the cervix hostile to the sperms, *e. g*, progestasert, LNG-20

154 (a)

Mendel's hybridization strategy was use of two plants differing in a pair of contrasting character in case of monohybrid cross and two pair of contrasting characters in dihybrid cross

155 (c)

Aneuploidy is the variations in individual chromosomal number. Actually, loss or gain of individual chromosomes upsets the balance and, hence normal development is not possible.

156 (c)

A-Two, B-Chromosomal, C-Mutation

157 (c)

In absence of lactose, **promoter gene** is responsible for suppressing the activity of the operator gene.

158 (a)

Actually, both S and R have several sub-types like S I, S II, S III, R I, R II, R III, etc. Griffith used S III and R II strains

159 (a)

A-Evening primrose, B-Mutations, C-Minor variation, D-Directionless, E-Directional

160 (d)

Synthetic or modern theory includes
(i) gene mutation
(ii) changes in chromosomal structure and number
(iii) genetic recombination
(iv) natural selection
(v) reproductive isolation

161 (d)

Neurasthenia is mental inability to concentrate on or enjoy things.

162 (d)

T-lymphocytes are involved in cell mediated immunity. T-cells largely recognize proteins that have been processed within antigen presenting cells and presented on the cell surface in a form that is bound to a molecule known as **MajorHistocompatiblityComplex**(MHC).

163 **(a)**
A carcinogen is any substance, radionuclide, or radiation that is directly involved in causing cancer

164 **(a)**
The management of animals for milk and its products for human consumption is called dairying. Milk yield here is dependent primarily on the quality of breeds

166 **(c)**
The natural method of pest and pathogen control involving use of viruses, bacteria and other insects is called biocontrol or biological control. For example, lady bird Bettle Feeds on aphids while dragonflies prey upon mosquitoes

167 **(d)**
Antibiotics are chemical substances produced by some microorganism, which can kill or retard the growth of other disease causing microorganisms. Penicillin, discovered by Alexander Flemming, is the first antibiotic discovered. While working on *Staphylococcus aureus* bacteria, Flemming observed growth of mould around, which the bacteria did not grow. It was found to be a chemical, penicillin, produced by *Penicillium notatum.* The function of penicillin as an antibiotic was established by Ernst Chain and Howard Florey

169 **(d)**
In gel electrophoresis a molecule of DNA can be cut into fragments by the enzyme restriction endonuclease. DNA fragments move towards the anode according to their molecular size through the agarose gel
The separated DNA fragments can be observed only after staining them with a solution of ethidium bromide. The bright orange coloured bands of DNA can be seen only under UV light. These bands of DNA fragments are cut out from the gel and extracted by using convenient technique. This step is called elution

170 **(c)**
A single-stranded DNA or RNA joined with a radioactive molecule (probe) is allowed to hybridise to its complementary DNA in a clone of cells. It is followed by the detection using autoradiography

171 **(a)**
Food production can be increased by applying biotechnology is the following ways
(i) Agrochemicals based agriculture
(ii) Organic agriculture
(iii) Genetically engineered crop base agriculture
Fish farming in isolated water bodies is called pisciculture

172 **(d)**
Polyethylene glycol (PEG) is a hydrocarbon solvent that attacks cell membranes and is widely used in the induction of cell fusion between plant protoplasts and in the production of animal cell hybridoma. It is used for gene transfer without a vector.

173 **(c)**
In exploitation, one species harms the other by making its direct or indirect use for support, shelter or food. In contrast with parasite which derives nourishment form its host without killing, a predator is free living which catches and kills another species for food.

174 **(a)**
$$\frac{dN}{dt} = rN$$
$$\frac{dN}{dt} = 0.01 \times 300$$
$$\frac{dN}{dt} = 3$$

175 **(c)**
The term 'niche' was for the first time used by **Grinnel** (1971) to explain micro-habitats. According to him 'niche' is the ultimate distributional unit, within which each species is held by its structural and instinctive limitation. Actually niche is the complete account of how an organism uses its environment. Thus, plant lice (aphids) and leaf is the pair correctly representing the organism and its ecological niche.

176 **(a)**
Small phytoplanktons → Free floating angiosperms → Rooted hydrophytes → Sedges → Grasses → Trees

177 **(c)**
The relationship between the species richness and the area for a wide variety of taxa, appears as a rectangular hyperbola

178 **(b)**

The world Summit on sustainable Development was held in South Africa.
The World Summit on Sustainable Development was held in Johannesburg, South Africa in 2002 in which 190 countries pledged to reduce the current rate of biodiversity loss at global, regional and local levels by 2010. Regarding the same the Biodiversity ACt was passed in India in the year 2002

179 **(d)**

Ultraviolet (UV) light is electromagnetic radiation with a wavelength shorter than that of visible light but longer than X-rays. It is classified as non-ionising radiation, and can cause inactivation of protein, pigments and nucleic acids.

180 **(b)**

Freon and other chlorofluorocarbon (CFC) compounds are used in refrigerators, air conditioners and as filling agent in aerosol, also cause pollution.CFCs do not degrade easily in the troposphere due to which they rise into the stratosphere, where they are broken by UV light. These are mainly responsible for ozone depletion.