

THOMASTutorials

JEE (FINAL)

Date:

PCM

Time: 03 HRS

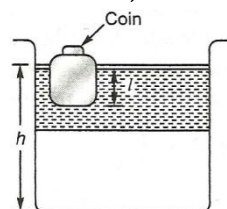
MARKS: 360

Single Correct Answer Type

- The dimensions of universal gravitational constant are
a) $M^{-2}L^2T^{-2}$ b) $M^{-1}L^3T^{-2}$ c) $ML^{-1}T^{-2}$ d) ML^2T^{-2}
- The dimensions of $\frac{a}{b}$ in the equation $P = \frac{a-t^2}{bx}$, where P is pressure, x is distance and t is time, are
a) MT^{-2} b) M^2LT^{-3} c) ML^3T^{-1} d) LT^{-3}
- A point initially at rest moves along x -axis. Its acceleration varies with time as $a = (6t + 5)\text{ms}^{-2}$. If it starts from origin, the distance covered in 2 s is
a) 20 m b) 18 m c) 16 m d) 25 m
- A tachometer is a device to measure
a) Gravitational pull b) Speed of rotation
c) Surface tension d) Tension in a spring
- An object is projected at an angle of 45° with the horizontal. The horizontal range and maximum height reached will be in the ratio
a) 1:2
b) 2:1
c) 1:4
d) 4:1
- A point mass m is moving along inclined plane with acceleration a with respect to smooth triangular block. The triangular block is moving horizontally with acceleration a_0 . The value of a is
a) $g \sin \theta + a_0 \cos \theta$ b) $g \sin \theta - a_0 \cos \theta$
c) $g \cos \theta - a_0 \sin \theta$ d) None of these
- A body of mass 10 kg slides along a rough horizontal surface. The coefficient of friction is $1/\sqrt{3}$. Taking $g = 10 \text{ m/s}^2$, the least force which acts at an angle of 30° to the horizontal is
a) 25 N b) 100 N c) 50 N d) $\frac{50}{\sqrt{3}} \text{ N}$
- If a body of mass 200 g falls from a height 200 m and its total P.E. is converted into K.E. at the point of contact of the body with earth surface, then what is the decrease in P.E. of the body at the contact ($g = 10 \text{ m/s}^2$)
a) 200 J b) 400 J c) 600 J d) 900 J
- A uniform disk of mass M and radius R is

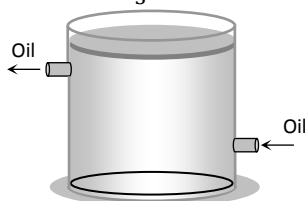
mounted on a fixed horizontal axis. A block of mass m hangs from a mass less string that is wrapped around the rim of the disk. The magnitude of the acceleration of the falling block (m) is

- $\frac{2M}{M+2m}g$
 - $\frac{2m}{M+2m}g$
 - $\frac{M+2m}{2M}g$
 - $\frac{2M+m}{2M}g$
- A ring of radius r and mass m rotates about an axis passing through its centre and perpendicular to its plane with angular velocity ω . Its kinetic energy is
a) $mr\omega^2$ b) $mr\omega^2/2$ c) $mr^2\omega^2$ d) $\frac{mr^2\omega^2}{2}$
 - If v_e and v_o represent escape velocity and orbital velocity of a satellite corresponding to a circular orbit of radius R , then
a) $v_e = v_o$
b) $\sqrt{2}v_o = v_e$
c) $v_e = v_o/\sqrt{2}$
d) v_e and v_o are not related
 - A copper wire and a steel wire of the same diameter and length are connected end to end and a force is applied, which stretches their combined length by 1 cm. The two wires will have
a) Different stresses and strains
b) The same stress and strain
c) The same strain but different stresses
d) The same stress but different strains
 - Surface tension of a soap solution is able of 2.0 cm diameter will be
a) $7.6 \times 10^{-6} \pi \text{ J}$ b) $15.2 \times 10^{-6} \pi \text{ J}$
c) $1.9 \times 10^{-6} \pi \text{ J}$ d) $1 \times 10^{-4} \pi \text{ J}$
 - A wooden block, with a coin placed on its top, floats in water as shown in the figure. The distance h and l are shown there. After sometime, the coin falls into the water, then



- a) both l and h increase
- b) both l and h decrease
- c) l decrease and h increase
- d) l increase and h decrease

15. The top of insulated cylindrical container is covered by a disc having emissivity 0.6 and thickness 1 cm. The temperature is maintained by circulating oil as shown in figure. If temperature of upper surface of disc is 127°C and temperature of surrounding is 27°C , then the radiation loss to the surroundings will be (Take $\sigma = \frac{17}{3} \times 10^{-8} \text{ W/m}^2 \text{ K}^4$)



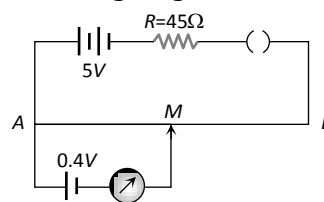
- a) $595 \text{ J/m}^2 \times s$
 - b) $595 \text{ cal/m}^2 \times s$
 - c) $991.0 \text{ J/m}^2 \times s$
 - d) $440 \text{ J/m}^2 \times s$
16. If for hydrogen $C_p - C_v = m$ and for the nitrogen $C_p - C_v = n$, where C_p, C_v refer to specific heats per unit mass respectively at constant pressure and constant volume, the relation between m and n is
- a) $m = 14n$
 - b) $n = 7n$
 - c) $m = 7n$
 - d) $n = 14n$
17. The latent heat of vaporization of water is 2240 J/g . If the work done in the process of expansion of 1 g is 168 J , then increase in internal energy is
- a) 2408 J
 - b) 2240 J
 - c) 2072 J
 - d) 1904 J
18. The graph which represents the variation of mean kinetic energy of molecules with temperature $t^\circ\text{C}$ is
- a)

b)
- c)

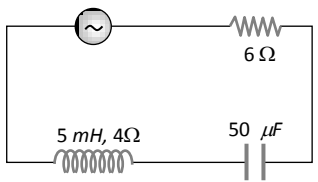
d)
19. The velocity of simple pendulum is maximum at
- a) Extremes
 - b) Half displacement
 - c) Mean position
 - d) Every where
20. A particle executes simple harmonic oscillation with an amplitude a . The period of oscillation


is T . The minimum time taken by the particle to travel half of the amplitude from the equilibrium is

- a) $\frac{T}{4}$
 - b) $\frac{T}{8}$
 - c) $\frac{T}{12}$
 - d) $\frac{T}{2}$
21. A train moves towards a stationary observer with speed 34 ms^{-1} . The train sounds a whistle and its frequency registered by the observer is f_1 . If the train's speed is reduced to 17 ms^{-1} , the frequency registered is f_2 . If the speed of sound is 340 ms^{-1} , then the ratio f_1/f_2 is
- a) $\frac{18}{19}$
 - b) $\frac{1}{2}$
 - c) 2
 - d) $\frac{19}{18}$
22. What is not true for equipotential surface for uniform electric field
- a) Equipotential surface is flat
 - b) Equipotential surface is spherical
 - c) Electric lines are perpendicular to equipotential surface
 - d) Work done is zero
23. There is 10 units of charge at the centre of a circle of radius 10 m . The work done in moving 1 unit of charge around the circle once is
- a) Zero
 - b) 10 units
 - c) 100 units
 - d) 1 unit
24. A $10 \mu\text{F}$ capacitors and a $20 \mu\text{F}$ capacitor are connected in series across a 200 V supply line. The charged capacitors are then disconnected from the line and reconnected with their positive plates together and negative plates together and no external voltage is applied. The potential difference across each capacitor is
- a) $\frac{400}{9} \text{ V}$
 - b) $\frac{800}{3} \text{ V}$
 - c) 400 V
 - d) 200 V
25. Two cells having the internal resistance 0.2Ω and 0.4Ω are connected in parallel. The voltage across the battery terminal is 1.5 V . the emf of first cell is 1.2 V . the emf of second cell is
- a) 2.7 V
 - b) 2.1 V
 - c) 3 V
 - d) 4.2 V
26. In given figure, the potentiometer wire AB has a resistance of 5Ω and length 10 m . The balancing length AM for the emf of 0.4 V is

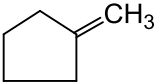
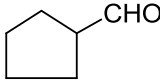
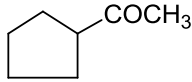
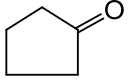


- a) 0.4 m
- b) 4 m
- c) 0.8 m
- d) 8 m

27. Which of the following is not a correct statement
- Resistivity of electrolytes decreases on increasing temperature
 - Resistance of mercury falls on decreasing its temperature
 - When joined in series a 40 W bulb glows more than a 60 W bulb
 - Resistance of 40 W bulb is less than the resistance of 60 W bulb
28. The magnetic field at the point of intersection of diagonals of a square wire loop of side L carrying a current I is
- $\frac{\mu_0 I}{\pi L}$
 - $\frac{2\mu_0 I}{\pi L}$
 - $\frac{\sqrt{2}\mu_0 I}{\pi L}$
 - $\frac{2\sqrt{2}\mu_0 I}{\pi L}$
29. The magnetic susceptibility is
- $\chi = \frac{I}{H}$
 - $\chi = \frac{B}{H}$
 - $\chi = \frac{M}{V}$
 - $\chi = \frac{M}{H}$
30. A frog can be levitated in magnetic field produced by a current in a vertical solenoid placed below the frog. This is possible because the body of the frog behaves as
- Paramagnetic
 - Diamagnetic
 - Ferromagnetic
 - Anti-ferromagnetic
31. Fleming's left and right hand rule are used in
- DC motor and AC generator
 - DC generator and AC motor
 - DC motor and DC generator
 - Both rules are same, any one can be used
32. An emf is 15 V is applied in a circuit coil containing 5 H inductance and 10 Ω resistance. The ratio of currents at time $t = \infty$ and $t = 1$ s is
- $\frac{e^{1/2}}{e^{1/2} - 1}$
 - $\frac{e^2}{e^2 - 1}$
 - $1 - e^{-1}$
 - e^{-1}
33. In the circuit shown below, the ac source has voltage $V = 20 \cos(\omega t)$ volts with $\omega = 2000 \text{ rad/sec}$. The amplitude of the current will be nearest to
- 
- 2 A
 - 3.3 A
 - $2/\sqrt{5}$ A
 - $\sqrt{5}$ A
34. The energy of X-ray photon is 3.3×10^{-16} J. Its frequency is

- $2 \times 10^{19} \text{ Hz}$
 - $5 \times 10^{18} \text{ Hz}$
 - $5 \times 10^{17} \text{ Hz}$
 - $5 \times 10^{16} \text{ Hz}$
35. An under water swimmer is at a depth of 12 m below the surface of water. A bird is at a height of 18 m from the surface of water, directly above his eyes. For the swimmer the bird appears to be a distance from the surface of water equal to (Refractive Index of water is $\frac{4}{3}$)
- 24 m
 - 12 m
 - 18 m
 - 9 m
36. How will the image formed by a convex lens be affected, if the central portion of the lens is wrapped in blank paper, as shown in the figure
- 
- No image will be formed
 - Full image will be formed but is less bright
 - Full image will be formed but without the central portion
 - Two images will be formed, one due to each exposed half
37. On introducing a thin film in the path of one of the two interfering beams, the central fringe will shift by one fringe width. If $\mu = 1.5$, the thickness of the film is (wavelength of monochromatic light is λ)
- 4λ
 - 3λ
 - 2λ
 - λ
38. X-rays are
- Stream of electrons
 - Stream of positively charged particles
 - Electromagnetic radiations of high frequency
 - Stream of uncharged particles
39. In an experiment on photoelectric emission from a metallic surface, wavelength of incident light is $2 \times 10^{-7} \text{ m}$ and stopping potential is 2.5 V. The threshold frequency of the metal (in Hz) approximately (charge on electron $e = 1.6 \times 10^{-19} \text{ C}$, Planck's constant $h = 6.6 \times 10^{-34} \text{ J-s}$)
- 12×10^{15}
 - 9×10^{15}
 - 9×10^{14}
 - 12×10^{13}
40. The ionisation potential of hydrogen atom is 13.6 eV. The energy required to remove an electron from the second orbit of hydrogen will be
- 27.4 eV
 - 13.6 eV
 - 3.4 eV
 - None of these

41. Half-life of a radioactive substance is 20 minutes. Difference between points of time when it is 33% disintegrated and 67% disintegrated is approximately
a) 10 min b) 20 min c) 30 min d) 40 min
42. In a sample of hydrogen like atoms all of which are in ground state, a photon beam containing photons of various energies is passed. In absorption spectrum, five dark lines, are observed. The number of bright lines in the emission spectrum will be (assume that all transitions takes place)
a) 5 b) 10
c) 15 d) None of these
43. A solid which is not transparent to visible light and whose electrical conductivity increases with temperature is formed by
a) Ionic bonding
b) Metallic bonding
c) Covalent bonding
d) Van der waal bonding
44. The cladding material of optical fibre has refractive index
a) Greater than that of core
b) Infinity
c) Equal of that of core
d) Less than that of core
45. Range of frequencies allotted for commercial UHF TV broadcast is
a) 470-960 kHz b) 47-960 MHz
c) 470-960 MHz d) 47-960 kHz
46. If two compounds have the same empirical formula but different molecular formulae, they must have
a) Different percentage composition
b) Different molecular weights
c) Same viscosity
d) Same vapour density
47. The mass of BaCO_3 produced when excess CO_2 is bubbled through a solution of 0.205 mole Ba(OH)_2 is,
a) 81 g b) 40.5 g c) 20.25 g d) 162 g
48. Increasing order (lowest first) for the values of e/m for electron (e), proton (p), neutron (n) and α -particles is
a) e, p, n, α b) n, α, p, e c) n, p, e, α d) n, p, α, e
49. The frequency of radiation emitted when the electron falls from $n=4$ to $n=1$ in a hydrogen atom will be (Given, ionisation energy of $\text{H} = 2.18 \times 10^{-18} \text{ J atom}^{-1}$ and $h = 6.625 \times 10^{-34} \text{ Js}$)
a) $1.54 \times 10^{15} \text{ s}^{-1}$ b) $1.03 \times 10^{15} \text{ s}^{-1}$
c) $3.08 \times 10^{15} \text{ s}^{-1}$ d) $2.00 \times 10^{15} \text{ s}^{-1}$
50. The formation of the oxide ion $\text{O}^{2-}(\text{g})$ requires first an exothermic and then an endothermic step as shown below
 $\text{O}(\text{g}) + e^- = \text{O}^-(\text{g}); \Delta H^\circ = -142 \text{ kJ mol}^{-1}$
 $\text{O}^-(\text{g}) + e^- = \text{O}^{2-}(\text{g}), \Delta H^\circ = 844 \text{ kJ mol}^{-1}$
This is because
a) O^- ion will tend to resist the addition of another electron
b) Oxygen has high electro affinity
c) Oxygen is more electronegative
d) O^- ion has comparatively larger size than oxygen atom
51. Which molecule has zero dipole-moment?
a) HF
b) HBr
c) H_2O
d) CO_2
52. Which of the following is not tetrahedral?
a) BF_4^- b) NH_4^+ c) CO_3^{2-} d) SO_4^{2-}
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. Which of the following is always negative for exothermic reaction?
a) ΔH b) ΔS
c) ΔG d) None of these
55. The heat atomisation of $\text{PH}_3(\text{g})$ is 228 kcal per mol and that of $\text{P}_2\text{H}_4(\text{g})$ is 335 kcal per mol. The energy of P – P bond is
a) 102 kcal/mol b) 31 kcal/mol
c) 26 kcal/mol d) 204 kcal/mol
56. Which of the following is a Lewis base?
a) NaOH b) NH_3
c) BCl_3 d) All of these
57. Oxidation number of P in HP_2O_7^- ion is
a) +5 b) +6 c) +7 d) +3
58. Which conversion is an oxidation?
a) $\text{SO}_4^{2-} \rightarrow \text{SO}_3^{2-}$ b) $\text{Cu}^{2+} \rightarrow \text{Cu}$
c) $\text{H}^+ \rightarrow \text{H}$ d) $\text{H}^- \rightarrow \text{H}$
59. Decomposition of H_2O_2 is prevented by
a) KOH b) MnO_2
c) Acetanilide d) Oxalic acid
60. Acidic solution of $\text{S}_2\text{O}_3^{2-}$ is converted to in presence of I_2
a) $\text{S}_4\text{O}_6^{2-} + \text{I}^-$ b) $\text{SO}_4^{2-} + \text{I}^-$

- c) $\text{SO}_3 + \text{I}^-$ d) $\text{S}_4\text{O}_6^{2-} + \text{I}_3^-$
61. Quartz watches contain
 a) Hands made of quartz
 b) Silica coating on the numbers
 c) A crystal of quartz as an essential component
 d) A coating of quartz on the outer body
62. Formula of felspar is
 a) $\text{K}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2$
 b) $\text{K}_2\text{O}_3 \cdot \text{Al}_2\text{O}_3 \cdot 6\text{Si}_2\text{O}_2 \cdot 2\text{H}_2\text{O}$
 c) $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$
 d) $3\text{MgO} \cdot 4\text{SiO}_2 \cdot \text{H}_2\text{O}$
63. Ethyl acetoacetate shows, which type of isomerism?
 a) Chain b) Optical
 c) Metamerism d) Tautomerism
64. The test for unsaturation is confirmed by the decolourisation of which of the following?
 a) Iodine water b) CuSO_4 solution
 c) Bromine water d) All of these
65.  on ozonolysis gives
 a)  b) 
 c)  + HCHO d) None of these
66. BOD is
 a) Biological oxygen deficit
 b) Biosphere oxygen demand
 c) Biological oxygen demand
 d) None of the above
67. Schottky defect generally appears in
 a) NaCl b) KCl
 c) CsCl d) All of these
68. Which of the following has highest value of energy gap?
 a) Aluminum b) Silver
 c) Germanium d) Diamond
69. How much of 0.1 M H_2SO_4 solution is required to neutralise 50 mL of 0.2 M NaOH solution?
 a) 50 mL b) 5.0 mL c) 0.50 mL d) 100 mL
70. 20 g of binary electrolyte (mol. wt. = 100) are dissolved in 500 g of water. The depression in freezing point of the solution is 0.74°C ($k_f = 1.86 \text{ K m}^{-1}$) the degree of ionisation of the electrolyte is

- a) 0% b) 100% c) 75% d) 50%
71. The hydrogen electrode is dipped in a solution of pH 3 at 25°C . The potential would be (the value of 2.303 RT/F is 0.059 V)
 a) 0.177 V b) 0.087 V c) 0.059 V d) -0.177 V
72. Which expression is wrong for first order reaction?
 a) $k = \frac{2.303}{t} \log \left(\frac{A_0}{A_t} \right)$
 b) $k = \frac{t}{2.303} \log \left(\frac{A_0}{A_t} \right)$
 c) $-k = \frac{t}{2.303} \log \left(\frac{A_t}{A_0} \right)$
 d) $\text{Rate} = k[A]$
73. The units of the rate constant of a second order reaction are
 a) $\text{mol}^{-1} \text{L}^{-1} \text{s}^{-1}$ b) $\text{mol}^{-1} \text{L s}^{-1}$
 c) $\text{mol}^{-1} \text{L s}$ d) $\text{mol L}^{-1} \text{s}^{-1}$
74. Which of the following is not correct?
 a) Milk is a naturally occurring emulsion
 b) Gold sol is a lyophilic sol
 c) Physical adsorption decreases with rise in temperature
 d) Chemical adsorption is unilayered
75. van-Arker method of purification of metals involves converting the metal to a
 a) Volatile stable compound
 b) Non-volatile stable compound
 c) Volatile unstable compound
 d) None of the above
76. When copper pyrites is roasted in excess of air, a mixture of $\text{CuO} + \text{FeO}$ is formed. FeO is present as impurities. This can be removed as slag during reduction of CuO . The flux added to form slag is
 a) SiO_2 which is an acid flux
 b) Lime stone, which is a basic flux
 c) SiO_2 , which is basic flux
 d) CaO , which is basic flux
77. A student accidentally splashes a few drops of conc H_2SO_4 on his cotton shirt, after a while, the splashed parts blacken and holes appear. This is happened because sulphuric acid
 a) Dehydrates the cotton with burning
 b) Causes the cotton react with air
 c) Heats up the cotton
 d) Removes the elements of water from cotton
78. Coinage metals show the properties of
 a) Inert elements b) Normal elements
 c) Typical elements d) Transitional elements

79. Which is the least soluble in water?
a) AgCl b) Ag₂S c) AgI d) AgBr
80. C₆H₁₄ has two tertiary carbons. The IUPAC name is
a) *n*-hexane b) 2-methylpentane
c) 3-methylpentane d) 2,3-dimethylbutane
81. The compound formed on heating chlorobenzene with chloral in the presence of concentrated sulphuric acid is
a) Gammexane b) DDT
c) Freon d) Hexachloroethane
82. Absolute alcohol is prepared by
a) Vacuum distillation
b) Azeotropic distillation
c) Steam distillation
d) None of the above
83. An organic compound C₃H₆O neither gives precipitate with semicarbazide nor reacts with sodium. It could be
a) CH₃CH₂CHO b) CH₃COCH₃
c) CH₂ = CHCH₂OH d) CH₂ = CHOCH₃
84. In the scheme given below, the total number of intramolecular aldol condensation products formed from "Y" is
-
- a) 1 b) 2 c) 3 d) 4
85. Reduction of aniline with acetyl chloride in presence of NaOH produce
a) Aniline b) Acetanilide
hydrochloride
c) *p*-chloroaniline d) A red dye
86. Which of the following compounds on treatment first with NaNO₂/HCl and then coupled with phenol produces *p*-hydroxyazobenzene ?
a) Nitrobenzene b) Azobenzene
c) Phenol d) Phenyl isocyanide
87. Charagaff's rule states that in an organism
a) Amount of adenine (A) is equal to that of thymine (T) and amount of guanine (G) is equal to that of cytosine (C)
b) Amount of adenine (A) is equal to that of guanine (G) and the amount of thymine (T) is equal to that of guanine (G)
c) Amount of adenine (A) is equal to that of cytosine (C) and the amount of thymine (T) is equal to that of guanine (G)
d) Amount of all bases are equal
88. Which one of the following is a chain growth

polymer?

- a) Starch b) Nucleic acid
c) Polystyrene d) Protein
89. In the reaction sequence,
-
- (X) is
a) Cyclohexanone
b) Caprolactum
c) HO(CH₂)₆NH₂
d) Hexamethylenediisocyanate
90. A drug that is antipyretic as well as analgesic is
a) Chlorpromazine hydrochloride
b) *para*-acetamidophenol
c) Chloroquin
d) Penicillin
91. A group of inbreeding plant or animals is
a) Order b) Species
c) Family d) Genus
92. Select the correct statement from the following statements
I. Increase in mass and increase in number of individuals are twin characteristics of growth
II. Metabolic reactions can also be demonstrated outside the body in isolated cell-free systems
III. 'Response to stimuli' is a defining property of living organisms
a) I and II b) II and III c) I and III d) I, II and III
93. One of the most important functions of botanical garden is
a) One can observe tropical plants there
b) They allow *ex situ* conservation of germplasm
c) They provide the natural habitat for wildlife
d) They provide a beautiful area for recreation
94. Arrange the following in correct sequence with reference to sexual reproduction in *Rhizopus*.
I. Formation of germ tube
II. Formation of zygothores
III. Formation of warty wall layer of zygospore
IV. Secretion of trisporic acid
a) IV, III, II and I b) IV, II, III and I
c) II, I, IV and III d) I, III, II and IV
95. Which of the following diseases are caused by bacteria?

I. Flu II. Cholera
III. Typhoid IV. Tetanus

Codes

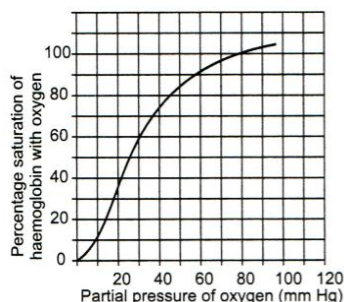
- a) I, II and III b) II, III and IV
c) I, III and IV d) I, II, III and IV
96. The moss plant is
a) Sometimes gametophyte and sometimes sporophyte
b) Predominantly gametophyte with sporophyte attached to it
c) Gametophyte d) Sporophyte
97. Alginic acid is found in the cell wall of
a) *Gigartina* b) *Laminaria*
c) *Gelidium* d) *Scytonema*
98. The dioecious animal is
a) Liver fluke b) Hook worm
c) Tapeworm d) Earthworm
99. Which of the following is not true regarding phylum-Coelenterata?
a) They are diploblastic animals
b) They have cellular level of organisation
c) They have nematocyte cells present on the tentacles
d) The gastro-vascular opening is called the hypostome
100. The level of organisation in Platyhelminthes is
a) Cellular level
b) Tissue level
c) Organ level
d) Organ-system level
101. Which is correct to saprophytic angiosperm?
a) They secrete enzyme outside the body and absorb nutrients
b) They have mycorrhiza with fungi
c) They take food and then digest it
d) They are photosynthetic
102. Inflorescence in jowar is
a) Corymb b) Spike c) Panicle d) Head
103. The fruit of Solanaceae is
a) Berry of capsule b) Pome
c) Legume of pod d) Drupe
104. Keel is characteristic of the flowers of
a) Gulmohur b) *Cassia*
c) *Calotropis* d) Bean
105. Which of the following is the region of cell division?
a) Root cap
b) Meristematic region
c) Root hair zone
d) None of these
106. I. Protection of internal tissue

II. Prevention of entry of any harmful organism
III. Minimising surface transpiration
IV. Protection against excessive heating up
These are the functions of which of the following?

- a) Epidermis b) Cortex
c) Hypodermis d) Cuticle
107. The type of tissue lining present on the ducts of salivary gland and pancreas is
a) Columnar epithelium b) Cuboidal epithelium
c) Compound epithelium d) Glandular epithelium
108. The common species of frog found in India is
a) *Rana temporaria* b) *Rana catesbeiana*
c) *Rana tigrina* d) *Rana mandelica*
109. Meselson and Stahl experiment proved
a) DNA is a genetic material
b) Central dogma
c) transformation
d) Semi-conservative DNA replication
110. Read the given statements and select the correct option
I. In Golgi complex, the cisternae have *cis* face and *trans* face
II. The *cis* face and *trans* face of Golgi complex are called forming face and maturing face respectively
a) Statement I is correct b) Both statements are correct and statement II is incorrect
c) Both are correct but statement II is the correct explanation of statement I d) Both are correct, but statement II is not the correct explanation of statement I
111. The 'lock' and 'key' model of enzyme action illustrates that a particular enzyme molecule
a) May be destroyed and resynthesised several times
b) Interacts with a specific type of substrate molecule
c) Reacts at identical rates under all conditions
d) Forms a permanent enzyme-substrate complex
112. Select the correct constituents of protein
a) Carbon, hydrogen, oxygen and nitrogen
b) Carbon, hydrogen, nitrogen and sulphur
c) Carbon, hydrogen, nitrogen, oxygen and

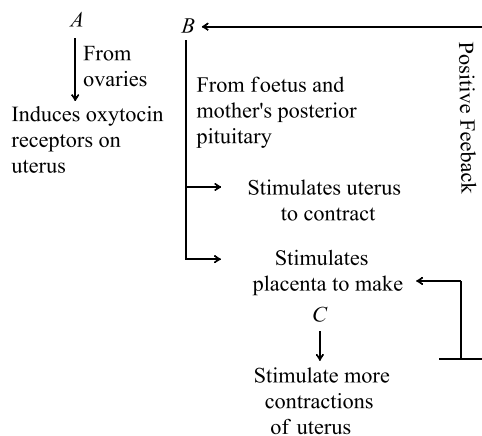
- sulphur
d) Carbon, hydrogen and oxygen
113. The sequence of events by which a cell duplicates its genome, synthesizes the other constituents of the cell and eventually divides into two daughter cells is termed as
a) Cell division b) Cell cycle c) Cell growth d) Cell duplication
114. Choose the correct sequence of two main events in mitosis
a) Karyokinesis followed by cytokinesis
b) Cytokinesis followed by karyokinesis
c) Karyokinesis followed by separation of the daughter cells
d) Cytokinesis followed by separation of the daughter cells
115. Why the transport of organic food through phloem is bidirectional?
a) Roots serve as source while leaves are the sink region
b) Source and sink region are irreversible
c) The relationship between the two region (source and sink) is variable and is dependent on season and plant needs
d) Translocation of organic solute is regulated by energy
116. The sugarcane plant has
a) Dumb bell-shaped guard cells
b) Pentamerous flowers
c) Reticulate venation
d) Capsular fruits
117. The rupture and fractionation do not usually occur in the water column in vessels/tracheids during the ascent of sap because of
a) Lignified thick walls
b) Cohesion and adhesion
c) Weak gravitational pull
d) Transpiration pull
118. Humus is essential for plant growth because
a) It is rich in nutrients and increases the water holding capacity of soil
b) It increases aeration of soil
c) It increases porosity of soil
d) All of the above
119. In the final phase of mineral absorption ions are taken up

- a) Slowly
b) Rapidly
c) Very fastly
d) Fluently
120. The form of pigment which promotes germination is
a) P_{760} b) P_{730} c) P_{650} d) All of these
121. Which one is essential for the respiration as well as photosynthesis?
a) Rubisco b) Plastocyanin
c) Ubiquinone d) Cytochrome
122. Phase common in aerobic and anaerobic respiration is
a) TCA cycle b) Glycolysis
c) Glycogenolysis d) ETS
123. Decarboxylation is involved in
a) Electron transport system
b) Glycolysis
c) Krebs' cycle
d) Lactic acid fermentation
124. The shedding of leaves, flowers or fruits due to change in the hormonal balance in plants, is referred as
a) Senescence b) Abscission
c) Photoperiodism d) vernalization
125. With respect to photoperiodism, these are long day plants.
a) Wheat, oat, soybean
b) Wheat, *Xanthium*, paddy
c) Wheat, poppy, soybean
d) Wheat, poppy, beet
126. Examples of plants which require vernalisation is/are
a) Pea b) Beet
c) Cabbage d) All of these
127. Deamination occurs in
a) Kidney b) Liver
c) Nephron d) Both (a) and (b)
128. What is the correct dental formula of rat?
a) $I \frac{2}{2} C \frac{1}{1} PM \frac{2}{2} M \frac{3}{3}$ b) $I \frac{2}{1} C \frac{1}{1} PM \frac{2}{2} M \frac{3}{3}$
c) $I \frac{1}{2} C \frac{2}{1} PM \frac{2}{2} M \frac{3}{3}$ d) $I \frac{1}{1} C \frac{2}{2} PM \frac{2}{2} M \frac{3}{3}$
129. Shifting of the curve to right takes place in the case



- a) Raise in ρCO_2 b) Fall in pH
c) Raise in temperature d) All of these
130. Asthama is caused by
a) Infection in the lungs
b) Infection in the trachea
c) Infection of the glottis
d) Spasm in the bronchioles and bronchi
131. Coronary heart disease is due to the inadequate blood supply to
a) Heart ventricle b) Heart auricle
c) Heart volume d) Heart muscles
132. Lymphocytes (20-25%) are of two major types, B and T forms. They are responsible for
a) Blood coagulation b) Thickness of blood
c) Immune responses d) All of these
133. Loop of Henle is associated with
a) Excretory system b) Respiratory system
c) Reproductive system d) Digestive system
134. If one liter of water is introduced in human blood, then
a) BMR increases
b) RBC collapses and urine production increases
c) RBC collapses and urine production decreases
d) BMR decreases
135. Renal portal system is
a) Present in all vertebrates
b) Present in all chordates
c) Absent in mammals
d) Present in all mammals
136. In frog, the vertebra with an anterior convex surface (*i.e.*, double convexities) is
a) Atlas b) Urostyle
c) 8th vertebra d) 9th vertebra
137. Decreased level of oestrogen in human body leads to
a) Myasthenia gravis b) Muscular dystrophy
c) Osteoporosis d) Gout
138. The membrane sarcolemma is found over
a) Heart b) Muscle fiber
c) Both (a) and (b) d) Nerve fiber
139. Which of the following is known as the site of

- information processing and control?
a) CNS b) PNS
c) Both (a) and (b) d) Neurons
140. Which is a part of spinal cord?
a) Central canal b) Ventricle
c) Ventral canal d) Enterocoel
141. Intracellular receptors are mostly
a) Cytoplasmic receptors
b) Membrane receptors
c) Nuclear receptors
d) ER receptors
142. Pineal gland of human brain secretes melatonin concerned with
a) Anger b) Body temperature
c) Colouration of skin d) Sleep
143. In grafting scion forms:
a) Shoot system b) Root system
c) New plant d) Hybrid plant
144. In oviparous individuals the fertilized egg is covered by
a) Calcareous shell
b) Phosphorus cell
c) Both (a) and (b)
d) Hard shell
145. In embryo sac the number of → synergid → egg cell → central cell → antipodal cell follows the order
a) 1-1-2-3
b) 2-1-3-2
c) 2-1-2-3
d) 3-2-1-2
146. Orthotropous ovule belongs to
a) *Urtica* b) *Polygonum*
c) *Peperomea* d) All of these
147. Micropyle helps in
a) Germination of pollen grain
b) Growth of pollen tube
c) Coming out of pollen tube from pollen grain
d) Allowing entry of pollen tube
148. Name A, B, C hormones in the given figure



- a) A-Prostaglandin, B-Oxytocin, C-Oestrogen
 b) A- Oestrogen, B-Oxytocin, C- Prostaglandin
 c) A- Oestrogen, B- Prostaglandin, C- Oxytocin
 d) A-Prostaglandin, B- Oestrogen, C- Oxytocin
149. Most of the organs are formed during of development
 a) 1st month
 b) 2nd month
 c) 3rd month
 d) 4th month
150. In rabbit, head of epididymis present at the head of the testis is called
 a) Vas deferens
 b) Cauda epididymis
 c) Gubernaculum
 d) Caput epididymis
151. Eggs which have yolk in the centre surrounded by cytoplasm are called
 a) Centrolecithal
 b) Homolecithal
 c) Microlecithal
 d) Alecithal
152. Reproductive health is the well-being of
 a) Physical aspects
 b) Emotional and behavioural aspects
 c) Social aspects
 d) All of the above
153. Copper-T prevents:
 a) Ovulation
 b) Fertilization of egg
 c) Implantation
 d) Both (B) and (C)
154. Mr. Sidd is suffering from hypertrichosis and phenylketonuria. His father is heterozygous for phenylketonuria. The probability of Sidd's sperm having one recessive autosomal allele and holandric gene is
 a) $\frac{1}{2}$
 b) $\frac{1}{8}$
 c) $\frac{1}{10}$
 d) $\frac{1}{4}$
155. Genes of which of the following disorder are present exclusively on the X-chromosome in humans or concerned with
 a) Baldness
 b) Red-green colour blindness
 c) Facial hair/moustaches in males
 d) Night blindness
156. If a cross between two individuals produces offspring with 50% dominant character (A) and 50% recessive character (a), then the genotypes of parents are
 a) Genic interactions controlling a character
 b) Multiple genes controlling a character
 c) Expression of many characters by a single gene
 d) Alternative forms of a gene at a given locus
157. Lightly stained part of chromatin which remains loosely packed as
 a) Euchromatin
 b) Heterochromatin
 c) Chromatosome
 d) Chromonemata
158. Diploid content of human DNA is
 a) 3.3×10^6 bp
 b) 3.3×10^9 bp
 c) 4.6×10^6 bp
 d) 6.6×10^9 bp
159. Atavism is
 a) Appearance of ancestral traits
 b) Loss of existing traits
 c) Modification of existing characters
 d) Loss of new characters
160. Evolutionary history of an organism is known as
 a) Genetics and interpretation
 b) Biogenesis
 c) Recapitulation
 d) evolution
161. HIV was reported in 1981 and isolated by
 a) Pasteur
 b) Mantagnier
 c) Robert Hook
 d) Hansen
162. Proliferation of cancer cells is not limited because of
 a) Differing surface proteins
 b) Differing cholesterol level
 c) Deficiency of steroids
 d) Aberrant chromosomal complement
163. Malaria is caused by
 a) *Plasmodium vivax*
 b) *Plasmodium malariae*
 c) *Plasmodium falciparum*
 d) All of these
164. Bee wax is a product of importance
 a) Industrial
 b) Domestic
 c) Medicinal

- d) All of these
165. Some common marine fishes are
 a) Hilsa b) Mackerel
 c) Pomfrets d) All of these
166. Stramonium is a drug obtained from the plant species of
 a) *Datura* b) *Ocimum*
 c) *Rauwolfia* d) *Asphodelus*
167. Wonder wheat is new wheat variety developed by
 a) Mexico's international Wheat and Maize Improvement center
 b) Indian National Botanical Research Institute
 c) Australian Crop Improvement Center
 d) African Crop Improvement Center
168. Inducible/lac operon system operates in:
 a) Catabolic pathway
 b) Anabolic pathway
 c) Intermediate metabolism
 d) All the above
169. The mobile genetic element is
 a) Transposons b) Mutation
 c) Endonuclease d) Variation
170. In plant biotechnology, PEG is used in
 a) Protoplast isolation
 b) Cell culture preparation
 c) Protoplast fusion
 d) Hardening
171. Satellite DNA is useful tool in
 a) Organ transplantation
 b) Sex determination
 c) Forensic science
 d) Genetic engineering
172. A kind of biotechnology involving manipulation of DNA is
 a) DNA replication b) Genetic engineering
 c) Denaturation d) Renaturation
173. If natality is represented by $-B$
 If mortality is represented by $-D$
 If immigration is represented by $-I$
 If emigration is represented by $-E$
 If population density is represented by $-N$
 Then population density at time $t+1$ is represented by
 a) $N_{t+1} = N_t - [(B + I)] - [(D + E)]$
 b) $N_{t+1} = N_t + [(B + I)] - [(D + E)]$
 c) $N_{t+1} = N_t + [(B + I)] + [(D + E)]$
 d) $N_{t+1} = N_t - [(B + I)] + [(D + E)]$
174. An interaction favourable to both population, but no obligatory to either is
 a) Proto-cooperation b) Mutualism
 c) Commensalism d) Parasite
175. Biological equilibrium is found among the
 a) Producers, consumers and decomposers
 b) Producers and consumers
 c) Producers and decomposers
 d) None of the above
176. The living organisms present in an ecosystem forms
 a) Abiotic components
 b) Biotic components
 c) Physical components
 d) Chemical components
177. The endangered largest living lemur *Idri idri* is inhabitant of
 a) Madagascar b) Mauritius
 c) Sri Lanka d) India
178. Wildlife conservation aims at
 I. maintaining the ecological process
 II. to enrich the wildlife diversity with exotic species
 III. preventing migration of the species
 IV. maintaining the diversity of life
 Select the correct answer using the codes given below
 a) I and II b) II and III c) III and IV d) I and IV
179. Limit of BOD prescribed by Central Pollution Control Board for the discharge of industrial and municipal waste water into natural surface water, is
 a) < 3.0 ppm b) < 10 ppm
 c) < 100 ppm d) < 30 ppm
180. Which of the following gases are the contributor to the greenhouse effect?
 I. Carbon dioxide
 II. Methane gas
 III. Nitrous oxide
 IV. Chlorofluorocarbon
 a) I, II and III b) II, III and IV
 c) I, III and IV d) I, II, III and IV

Mukesh Sir's Group Tuitions

IIT JEE(MAINS)/NEET

Date : 07/08/2016

Time : 03:00:00

Marks : 720

TEST ID: 212

PCB

: ANSWER KEY :

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

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PCB

: HINTS AND SOLUTIONS :

Single Correct Answer Type

1 (b)

$$F = \frac{Gm_1m_2}{d^2} \Rightarrow G = \frac{Fd^2}{m_1m_2}$$

$$\therefore [G] = \frac{[MLT^{-2}][L^2]}{[M^2]} = [M^{-1}L^3T^{-2}]$$

2 (a)

$$[a] = [T^2] \text{ and } [b] = \frac{[a-t^2]}{[P][X]} = \frac{T^2}{[ML^{-1}T^{-2}][L]}$$

$$\Rightarrow [b] = [M^{-1}T^4]$$

$$\text{So } \left[\frac{a}{b}\right] = \frac{[T^2]}{[M^{-1}T^4]} = [MT^{-2}]$$

3 (b)

$$\text{Given, } a = \frac{dv}{dt} = 6t + 5$$

$$\text{Or } dv = (6t + 5) dt$$

Integrating, we get

$$\int_0^v dv = \int_0^t (6t + 5) dt$$

$$\text{Or } v = \left(\frac{6t^2}{2} + 5t\right)$$

$$\text{Again } v = \frac{ds}{dt}$$

$$\therefore ds = \left(\frac{6t^2}{2} + 5t\right) dt$$

Integrating again, we get

$$\int_0^s ds = \int_0^t \left(\frac{6t^2}{2} + 5t\right) dt$$

$$\therefore s = \frac{3t^3}{3} + \frac{5t^2}{2}$$

$$\text{When, } t = 2 \text{ s, } s = 3 \times \frac{2^3}{3} + \frac{5 \times 2^2}{2} = 3 \times \frac{8}{3} + \frac{5 \times 4}{2}$$

$$= 8 + 10 = 18 \text{ m}$$

5 (d)

$$\text{Horizontal range, } R = \frac{u^2 \sin^2 45^\circ}{2g} = \frac{u^2}{g}$$

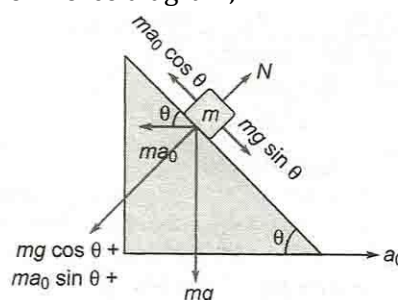
$$\text{Maximum height, } H = \frac{u^2 \sin^2 45^\circ}{g} = \frac{u^2}{4g}$$

$$\therefore \frac{R}{H} = \frac{4}{1}$$

6 (b)

For discussion of motion of the point mass m , we assume that observer is situated at the triangular block. The force diagram of point mass m is shown in figure

From force diagram,



$$mg \sin \theta - ma_0 \cos \theta = ma$$

$$\therefore a = g \sin \theta - a_0 \cos \theta$$

7 (c)

Let P force is acting at an angle 30° with the horizontal

For the condition of motion $F = \mu R$

$$P \cos 30^\circ = \mu(mg - P \sin 30^\circ)$$

$$\Rightarrow P \frac{\sqrt{3}}{2} = \frac{1}{\sqrt{3}} \left(100 - P \frac{1}{2}\right) \Rightarrow \frac{3P}{2} = \left(100 - \frac{P}{2}\right)$$

$$\Rightarrow 2P = 100 \therefore P = 50 \text{ N}$$

8 (b)

$$\Delta U = mgh = 0.2 \times 10 \times 200 = 400 \text{ J}$$

$$\therefore \text{Gain in K.E.} = \text{decrease in P.E.} = 400 \text{ J}$$

9 (b)

$$\text{Using } a = \frac{g}{1 + \frac{I}{mR^2}}$$

$$a = \frac{g}{1 + \frac{MR^2}{2mR^2}} \left[I = \frac{1}{2} MR^2 \right]$$

- $\Rightarrow a = \frac{2m}{M + 2m}g$
- 10 **(d)**
 $K_R = \frac{1}{2}I\omega^2 = \frac{1}{2}mr^2\omega^2$
- 11 **(b)**
 $v_e = \sqrt{2gR}$ and $v_0 = \sqrt{gR} \therefore \sqrt{2}v_0 = v_e$
- 12 **(d)**
 $\text{Stress} = \frac{\text{Force}}{\text{area}}$
 In the present case, force applied and area of cross-section of wires are same, therefore stress has to be the same
 $\text{Strain} = \frac{\text{Stress}}{Y}$
 Since the Young's modulus of steel wire is greater than the copper wire, therefore, strain in case of steel wire is less than that in case of copper wire
- 13 **(b)**
 Work done = surface tension \times increase in area
 $= 1.9 \times 10^{-2} \times (4\pi R^2) \times 2$
 $= 1.9 \times 10^{-2} \times 4 \times \pi (1 \times 10^{-2})^2 \times 2$
 $= 15.2 \times 10^{-6} \pi \text{ J}$
- 14 **(b)**
 l Will decrease because the block moves up. h will decrease because the coin will displace the volume (V_1) of water equal to its own volume when it is in water whereas when it is on the block it will displace the volume of water (V_2) whose weight is equal to weight of coin and science density of coin is greater than the density of water,
 $\therefore V_1 < V_2$
- 15 **(a)**
 Rate of heat loss per unit area due to radiation *i. e.* emissive power $e = \epsilon\sigma(T^4 - T_0^4)$
 $= 0.6 \times \frac{17}{3} \times 10^{-8} \times [(400)^4 - (300)^4]$
 $= 3.4 \times 10^{-8} \times (175 \times 10^8) = 3.4 \times 175$
 $= 595 \text{ J/m}^2 \times s$
- 16 **(a)**
 Here, for hydrogen $C_p - C_v = m = \frac{R}{2}$
 Or $R = 2m$
 And for nitrogen, $C_p - C_v = n = \frac{R}{28}$ or $R = 28n$
 $\therefore 2m = 28n$
 $m = 14n$
- 17 **(c)**
 $\Delta Q = \Delta U + \Delta W \Rightarrow \Delta U = \Delta Q - \Delta W = 2240 - 168$
 $= 2072 \text{ J}$
- 18 **(c)**

Mean kinetic energy of gas molecule

$$E = \frac{f}{2}kT = \frac{f}{2}k(t + 273) = \left(\frac{f}{2}k\right)t + \frac{f}{2} \times 273k;$$

Comparing it with standard equation of straight line

$$y = mx + c. \text{ We get } m = \frac{f}{2}k \text{ and } c = \frac{f}{2}273k$$

So the graph between E and t will be straight line with positive intercept on E -axis and positive slope with t -axis

- 20 **(c)**
 Let displacement equation of particle executing SHM is

$$y = a \sin \omega t$$

As particle travels half of the amplitude from the equilibrium position, so $y = \frac{a}{2}$

$$\text{Therefore, } \frac{a}{2} = a \sin \omega t \Rightarrow \sin \omega t = \frac{1}{2} = \sin \frac{\pi}{6}$$

$$\Rightarrow \omega t = \frac{\pi}{6} \Rightarrow t = \frac{\pi}{6\omega} \Rightarrow t = \frac{\pi}{6\left(\frac{2\pi}{T}\right)} \left(\text{As } \omega = \frac{2\pi}{T}\right)$$

$$\Rightarrow t = \frac{T}{12}$$

Hence, the particle travels half of the amplitude from the equilibrium in $\frac{T}{12} \text{ s}$

- 21 **(d)**
 Here, $v_{s_1} = 34 \text{ ms}^{-1}$,

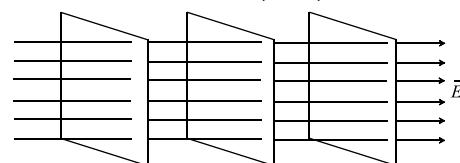
$$v = 340 \text{ ms}^{-1}$$

$$f_1 = \frac{v \times n}{v - v_{s_1}} = \frac{340 \times n}{340 - 34} = \frac{340}{306}n$$

$$f_2 = \frac{v \times n}{v - v_{s_2}} = \frac{340 \times n}{(340 - 17)} = \frac{340n}{323}$$

$$\frac{f_1}{f_2} = \frac{323}{306} = \frac{19}{18}$$

- 22 **(b)**
 An equipotential surface is a surface with a constant value of potential at all points on the surface. For a uniform electric field, say, along the x -axis, the equipotential surfaces are planes normal to the x -axis, *i. e.*,



Plane parallel to the $y - z$ plane on equipotential surface, potential at all points is constant, this means that on equipotential surface work done in moving a test charge from one point to other

point is zero

23 (a)

The work done in moving a charge on equipotential surface is zero

24 (a)

$$C_s = \frac{10 \times 20}{10 + 20} = \frac{200}{30} = \frac{20}{3} \mu\text{F}$$

$$Q = C_s V$$

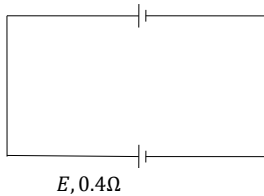
$$Q = \frac{20}{3} \mu\text{F} \times 200\text{V}$$

$$Q = \frac{4000}{3} \mu\text{C}$$

$$\text{Now, } V = \frac{4000 \mu\text{C}}{3 \times 30 \mu\text{F}} = \frac{4000}{90} \text{V} = \frac{400}{9} \text{V}$$

25 (a)

Given that, the resultant voltage across the battery combination = 1.5V



Let I be the current in the circuit then total resistance = 0.6Ω

$$\text{Hence, } V = IR$$

$$\Rightarrow 1.5 = I \times 0.6$$

$$\Rightarrow I = \frac{1.5}{0.6} \Rightarrow I = \frac{5}{2} \text{A}$$

Now, applying Kirchhoff's second law in the circuit

$$0.4I + 0.2I + 1.2 - E = 0$$

$$0.6 \times \frac{5}{2} + 1.2 = E$$

$$\Rightarrow E = 2.7\text{V}$$

26 (d)

$$E = \frac{e}{(R + R_h + r)} \cdot \frac{R}{L} \times l \Rightarrow 0.4$$

$$= \frac{5}{(5 + 45 + 0)} \times \frac{5}{10} \times l$$

$$\Rightarrow l = 8 \text{m}$$

27 (d)

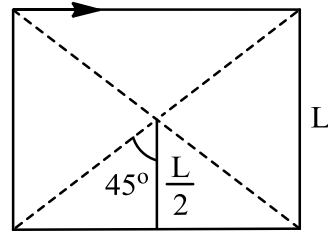
The resistance of 40 W bulb will be more and 60 W bulb will be less

28 (d)

$$B = 4 \left[\frac{\mu_0}{4\pi} \frac{I}{\left(\frac{1}{2}\right)} (\sin 45^\circ + \sin 45^\circ) \right]$$

$$= \frac{\mu_0}{4\pi} \frac{2I}{L} \cdot \frac{2}{\sqrt{2}}$$

$$B = \frac{\mu_0}{\pi} \frac{2\sqrt{2}I}{L}$$



30 (b)

Frog is levitated in magnetic field produced by the current in vertical solenoid below the frog due to repulsion, so body of frog behaves as diamagnetic substance.

31 (c)

DC motor is a device which converts electrical energy into mechanical energy. It employs Fleming's left hand rule.

DC generator converts mechanical energy into electrical energy in from of DC. It employs Fleming's right hand rule.

32 (b)

Here, $i = i_0$ at $t = \infty$. Let i be the current at $t = 1$ s

$$\text{From } i = i_0 \left(1 - e^{-\frac{R}{L}t} \right)$$

$$= i_0 \left(1 - e^{-\frac{10}{5} \times 1} \right) = i_0 \left(1 - \frac{1}{e^2} \right)$$

$$\therefore \frac{i_0}{i} = \frac{e^2}{e^2 - 1}$$

33 (a)

$$R = 6 + 4 = 10\Omega$$

$$X_L = \omega L = 2000 \times 5 \times 10^{-3} = 10\Omega$$

$$X_C = \frac{1}{\omega C} = \frac{1}{2000 \times 50 \times 10^{-6}} = 10\Omega$$

$$\therefore Z = \sqrt{R^2 + (X_L - X_C)^2} = 10\Omega$$

$$\text{Amplitude of current} = i_0 = \frac{V_0}{Z} = \frac{20}{10} = 2\text{A}$$

34 (c)

$$v = E/h = 3.3 \times 10^{-6} / 6.6 \times 10^{-34} = 5 \times 10^{17} \text{Hz}$$

35 (a)

$$\mu = \frac{h'}{h} \Rightarrow h' = \mu h = \frac{4}{3} \times 18 = 24 \text{cm}$$

36 (b)

Only the light-gathering power is reduced

37 (c)

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

$$\Rightarrow t = \frac{\lambda}{(\mu - 1)} = \frac{\lambda}{(1.5 - 1)} = 2\lambda$$

39 (c)

$$eV_0 = h\nu - h\nu_0$$

∴ Threshold frequency,

$$\begin{aligned} \nu_0 &= \nu - \frac{eV_0}{h} \\ &= \frac{c}{\lambda} - \frac{eV_0}{h} \end{aligned}$$

$$\begin{aligned} \therefore \nu_0 &= \frac{3 \times 10^8}{2 \times 10^{-7}} - \frac{1.6 \times 10^{-19} \times 2.5}{6.6 \times 10^{-34}} \\ &= 9.0 \times 10^{14} \text{ Hz} \end{aligned}$$

40 (c)

The potential energy of hydrogen atom

$$E_n = \frac{13.6}{n^2} \text{ eV}$$

So, the potential energy in second orbit is

$$E_2 = -\frac{13.6}{2^2} \text{ eV}$$

$$E_2 = -\frac{13.6}{4} \text{ eV} = -3.4 \text{ eV}$$

Now, the energy required to remove an electron from second orbit to infinity is

$$U = E_\infty - E_2 \text{ [From work-energy theorem and } E_\infty = 0]$$

$$\Rightarrow U = 0 - (-3.4) \text{ eV}$$

$$\text{Or } U = 3.4 \text{ eV}$$

Hence, the required energy is 3.4 eV.

41 (b)

$$\lambda = \frac{0.693}{T_{1/2}} = \frac{0.693}{20} = 0.03465$$

$$\text{Now time of decay } t = \frac{2.303}{\lambda} \log \frac{N_0}{N}$$

$$\Rightarrow t_1 = \frac{2.303}{0.03465} \log \frac{100}{67} = 11.6 \text{ min}$$

$$\text{and } t_2 = \frac{2.303}{0.03465} \log \frac{100}{33} = 32 \text{ min}$$

Thus time difference between points of time

$$= t_1 - t_2 = 32 - 11.6 = 20.4 \text{ min} = 20 \text{ min}$$

42 (c)

Number of lines in absorption spectrum = $(n - 1)$

$$\Rightarrow 5 = n - 1 \Rightarrow n = 6$$

∴ Number of bright lines in the emission spectrum

$$= \frac{n(n-1)}{2} = \frac{6(6-1)}{2} = 15$$

43 (c)

A solid is not transparent to visible light if the value of wavelength of light is greater than the bond length (covalent bonds) between the atom/molecules/ions of material. Conductivity depends upon the number of free charge carriers present in the substance at a given temperature or resistance of that material at that temperature.

44 (d)

In optical fibre, the core (refractive index μ_1) is surrounded by cladding (refractive index μ_2) made up of transparent glass or plastic such that $\mu_2 < \mu_1$,

45 (c)

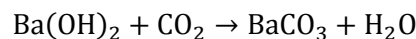
For commercial UHF, TV broadcasts, the range allotted is 470-960 MHz

46 (b)

Since, the molecular formula is n times the empirical formula, therefore, different compounds having the same empirical formula must have different molecular weights.

47 (b)

Given, moles of $\text{Ba(OH)}_2 = 0.205$



∴ 0.205 moles of $\text{Ba(OH)}_2 \equiv 0.205$ moles of BaCO_3

∴ Mass of $\text{BaCO}_3 = \text{moles of } \text{BaCO}_3 \times \text{molecular mass of } \text{BaCO}_3$

$$= 0.205 \times 197.3$$

$$= 40.5 \text{ g}$$

48 (b)

$$\begin{aligned} \frac{e}{m} \text{ for electron (e)} &= \frac{1.6 \times 10^{-19}}{9.1 \times 10^{-28}} \\ &= 1.758 \times 10^8 \end{aligned}$$

$$\begin{aligned} \frac{e}{m} \text{ for proton (p)} &= \frac{1.6 \times 10^{-19}}{1.672 \times 10^{-24}} \\ &= 9.56 \times 10^4 \end{aligned}$$

$$\frac{e}{m} \text{ for neutron (n)} = \frac{0}{1.675 \times 10^{-24}} = 0$$

$$\frac{e}{m} \text{ for } \alpha \text{ - particle} = \frac{2}{4} = 0.5$$

Hence, the increasing order of $\frac{e}{m}$ is as

$$n < \alpha < p < e$$

49 (c)

Ionisation energy of H

$$= 2.18 \times 10^{-18} \text{ J atom}^{-1}$$

∴ E_1 (Energy of 1st orbit of H-atom)

$$= -2.18 \times 10^{-18} \text{ J atom}^{-1}$$

$$\therefore E_n = \frac{-2.18 \times 10^{-18}}{n^2} \text{ J atom}^{-1}$$

$Z = 1$ for H - atom

$$\Delta E = E_4 - E_1$$

$$= \frac{-2.18 \times 10^{-18}}{4^2} - \frac{-2.18 \times 10^{-18}}{1^2}$$

$$= -2.18 \times 10^{-18} \times \left[\frac{1}{4^2} - \frac{1}{1^2} \right]$$

$$\Delta E = h\nu = -2.18 \times 10^{-18} \times -\frac{15}{16}$$

$$= +2.0437 \times 10^{-18} \text{ J atom}^{-1}$$

$$\therefore \nu = \frac{\Delta E}{h} = \frac{2.0437 \times 10^{-18} \text{ J atom}^{-1}}{6.625 \times 10^{-34} \text{ Js}}$$

$$= 3.084 \times 10^{15} \text{ s}^{-1} \text{ atom}^{-1}$$

50 (a)

The addition of second electron in an atom or ion is always endothermic as the incoming electron experience the greater force of repulsion

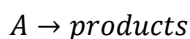
- 52 (c) In CO_3^{2-} ion the C-atom undergoes sp^2 -hybridisation. It has triangular planar structure. While BF_4^- , NH_4^+ and SO_4^{2-} have tetrahedral structure.
- 53 (c) According to Graham's law of diffusion
- $$\frac{r_{\text{O}_2}}{r_{\text{He}}} = \sqrt{\frac{M_{\text{He}}}{M_{\text{O}_2}}}$$
- or $= \sqrt{\frac{4}{32}} = \frac{1}{2.83}$
- $$\therefore r_{\text{O}_2} = 0.35 r_{\text{He}}$$
- 55 (b) **Step 1.** P – H bond energy from bond dissociation energy of $\text{PH}_3(\text{g})$ containing 3 such P – H bonds $= \frac{228}{3} = 76 \text{ kcal/mol}$
- Step 2.** The structure of P_2H_4 is
- $$\begin{array}{c} \text{H} & & \text{H} \\ & \diagdown & / \\ & \text{P} - \text{P} & \\ & / & \diagdown \\ \text{H} & & \text{H} \end{array}$$
- ie, it contains 4 P – H bonds and one P – P bond, so P – P bond energy can be calculated by $4 \times \text{P} - \text{H} + \text{P} - \text{P} = \text{bond dissociation energy } \text{P}_2\text{H}_4$
- $$\therefore \text{P} - \text{P} \text{ bond energy} = 335 - 4(76) = 31 \text{ kcal per mol}$$
- 56 (b) The species which can donate a lone pair of electron, are called Lewis base *e.g.*, NH_3 , H_2O , Cl^- etc.
- 57 (b) $\text{HP}_2\text{O}_7^{-2}$
 $+ 1 + 2x - 2 \times 7 = -1$
 $x = +6$
- 58 (d) Loss of an electron or increase in oxidation number is oxidation process.
i. e., $\text{H}^- \rightarrow \text{H} + e^-$
- 59 (c) Pure hydrogen peroxide is an unstable liquid and decomposes into water and oxygen either upon standing or heating.
- $$2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2; \quad \Delta H = -196.0 \text{ kJ}$$
- To prevent decomposition of H_2O_2 , phosphoric acid, acetanilide or glycerol are added. These acts
- as negative catalyst.
- 60 (a) Thiosulphate ($\text{S}_2\text{O}_3^{2-}$) is oxidised to tetrathionate ($\text{S}_4\text{O}_6^{2-}$) ion by iodine.
- $$\text{I}_2 + 2\text{S}_2\text{O}_3^{2-} \rightarrow \text{S}_4\text{O}_6^{2-} + 2\text{I}^-$$
- 62 (a) Felspar is an ore of Al. Its composition is KAlSi_3O_8 or $\text{K}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2$.
- 63 (d) Ethyl acetoacetate shows tautomerism.
- $$\begin{array}{c} \text{O} \\ || \\ \text{CH}_3 - \text{C} - \text{CH}_2 \cdot \text{COOC}_2\text{H}_5 \\ \text{Keto form} \end{array}$$
- $$\begin{array}{c} \text{OH} \\ | \\ \leftrightarrow \text{CH}_3 - \text{C} = \text{CH} \cdot \text{COOC}_2\text{H}_5 \\ \text{enol form} \end{array}$$
- 64 (c) By adding bromine water to a solution, if the colour of bromine water decolourise then the compound is unsaturated. This is a confirmatory test for unsaturation.
- 67 (d) Schottky defect arises when equal number of a cations and anions are missing from their sites. This defect is generally found in ionic compounds like NaCl, KCl, CsCl, etc.
- 68 (d) Diamond has the highest value of energy gap as it is an insulator.
- 69 (a) For complete neutralisation,
m. wq of $\text{H}_2\text{SO}_4 = \text{m. eq. of NaOH}$
 $0.1 \times 2 \times V = 50 \times 0.2 \times 1$
 $(\because 0.1M \text{ H}_2\text{SO}_4 = 0.2N \text{ H}_2\text{SO}_4)$
 $V = 50\text{mL}$
- 70 (a) $\Delta T = \frac{1000 \times k_f \times w}{m \times 500}$
 $0.74 = \frac{1000 \times 1.86 \times 20}{m \times 500}$
 $m = 100$
Actual molecular mass = 100
 \therefore The degree of ionisation of the electrolyte is 0%.
- 71 (d) $\text{pH} = 3, [\text{H}^+] = 10^{-3}$
 $E = E_{\text{red}}^\circ + 0.059 \log (\text{ion})$

$$E = 0 + 0.059 \log (10^{-3})$$

$$E = + 0.059 (-3) = - 0.177 \text{ V}$$

72 (b)

The rate for first order reaction is expressed as



$$\text{Rate} = - \frac{d[A]}{dt}$$

$$\text{Rate} = k[A]$$

And the rate constant (k) is given as

$$k = \frac{2.303}{t} \log \frac{[A_0]}{[A_t]}$$

$$\text{or } -k = \frac{t}{2.303} \log \frac{[A_t]}{[A_0]}$$

73 (b)

$$\frac{dx}{dt} = k[A]^2$$

$$k = \frac{dx}{dt[A]^2}$$

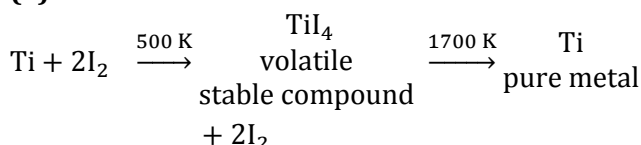
$$= \frac{\text{mol}(L)^2}{L \times s \times (\text{mol})^2}$$

$$\text{mol}^{-1} \text{L s}^{-1}$$

74 (b)

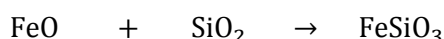
Gold is a lyophobic sol.

75 (a)



76 (a)

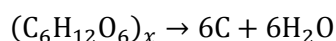
The compounds which combine with impurities present (at high temperature) and remove them as a fls substance (slag) are known as flux. When basic impurities are present, an acidic flux is used and *vice - versa*



Basic impurity acidic flux slag

77 (d)

Concentrated H_2SO_4 has dehydrating property. When cellulose comes in contact with conc H_2SO_4 , it removes water from cotton leaving only black carbon in the form of charred particles



Charred particles

78 (d)

Coinage metals (Cu, Ag, Au) shows the properties of transitional elements as in their common oxidation states they possess partially filled *d*-subshells

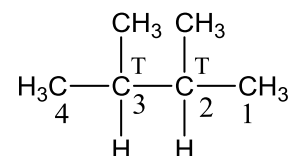
79 (b)

The solubility order is $\text{AgF} > \text{AgCl} > \text{AgBr} > \text{AgI} > \text{Ag}_2\text{S}$

80 (d)

The carbon atom which is attached to three carbon atoms is called tertiary carbon atom.

C_6H_{14} has two tertiary carbons hence, its structure is as



2,3-dimethyl butane

82 (b)

Absolute alcohol is 100% pure ethanol. The fractional distillation of aqueous solution of ethanol gives a constant boiling azeotropic mixture which contains 95% ethanol. To get 100% ethanol, a small amount of benzene is added with azeotropic mixture and then distilled. It is called azeotropic distillation.

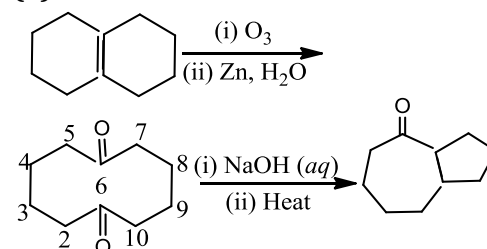
83 (d)

Alcohols ($-\text{OH}$) react with sodium and carbonyl

compounds $\left(\begin{array}{c} \diagup \\ \text{C}=\text{O} \\ \diagdown \end{array} \right)$ give precipitate with semicarbazide.

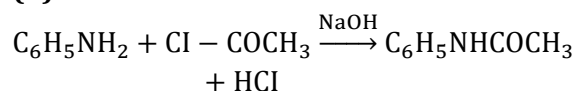
Since, the compound with molecular formula, $\text{C}_3\text{H}_6\text{O}$ does not give precipitate with semicarbazide and does react with sodium, it is neither a carbonyl compound nor an alcohol. Hence, it must be an ether, *i.e.*, $\text{CH}_2 = \text{CHOCH}_3$

84 (a)



For aldol condensation C-5 and C-7 can attack to C-1 similarly C-2 and C-10 can attack to C-6 but all give same product.

85 (d)



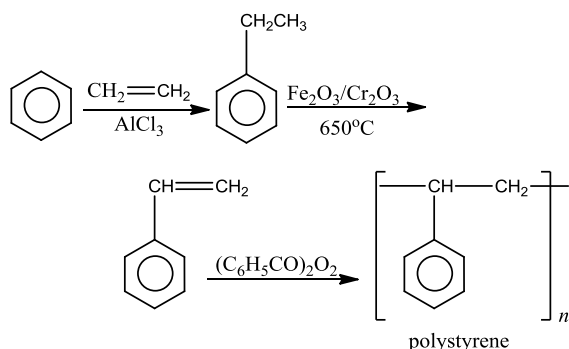
aniline acetyl chloride acetanilide

88 (c)

Chain growth polymerization requires an initiator (such as organic peroxides) to produce a free radical to which the monomers are added in a chain fashion. Initiators are added in a very small quantities and are decomposed by heat, light or oxidation-reduction reaction to produce reactive

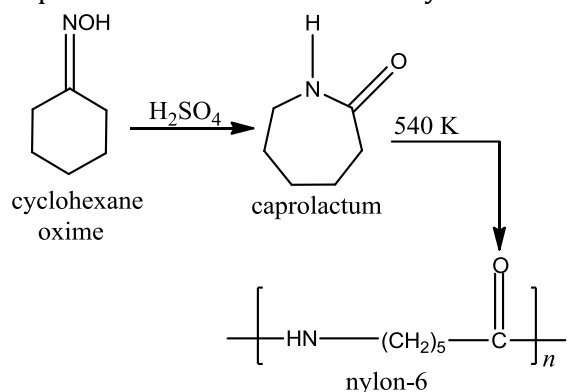
species. *e.g.*, free radical.

Polystyrene is an example of chain growth polymer because in it styrene molecules are associated in the form of monomer.



89 (b)

Caprolactam is the monomer of nylon-6.



91 (b)

According to Ernst Mayr species are group of interbreeding natural populations that are reproductively isolated from other such groups. It contains most similar organisms

92 (d)

Increase in mass and increase in number of individuals are considered twin characteristics of growth, metabolic reaction can also be demonstrated *in vitro* and consciousness is considered as a determining property of living

93 (b)

Botanical garden allows *ex situ* conservation of germplasm.

94 (b)

During sexual reproduction in *Rhizopus*, (+) and (-) strains of mycelia simulate each other through pheromone like trisporic acid to form zygothecia. Zygothecia of two strains come in contact to form progametangia then coenogametangia. Then after gametangial copulation, zygospores with warty wall layer are formed which germinate in favorable conditions and form a germ tube.

95 (b)

Cholera, typhoid and tetanus.

Bacteria are helpful in making curd from milk, production of antibiotic, fixing nitrogen in legume roots, etc. Some bacteria are pathogens, causing damage to human being, crops, farm animals and pets. Cholera typhoid, tetanus, citrus canker are well known diseases caused by different bacteria

96 (b)

The haploid gametophyte is dominant, long lived, green and independent whereas the diploid sporophyte is short lived and dependent upon the gametophyte

97 (b)

Alginic acid or alginate is found in the middle lamella and primary cell walls of sea weeds such as, *Laminaria*, *Macrocystis*, *Ascophyllum*, etc.

98 (b)

Hoodworm (*Ancylostoma*) is a dioecious animal.

99 (b)

Phylum-Coelenterata or Cnidaria have tissue level of organisation. Cellular level of organisation is only present in phylum-Porifera

100 (c)

Organ level of organisation is present in Platyhelminthes. The animals belonging to this phylum are bilaterally symmetrical, triploblastic and acoelomate

101 (a)

Saprophytic organism (Saprophytes Gre; *Sapro*=putrid and *troph*=feeder) break down dead organic matters by secreting digestive enzymes and then they absorbing the nutrient molecules.

102 (c)

In jowar (*Sorghum vulgare*), inflorescence is usually compact panicle, sometime loose and spreading panicle.

103 (a)

In family-Solanaceae, the fruits are berry or bacca. They have a thin Epicarp, fleshy mesocarp and a thin endocarp. They usually develop from a superior ovary and their seeds get detached from the placenta at maturity.

104 (d)

The bean or legume family is one of the most common plant families. Bean-family flowers typically have their two bottom petals grown together along one side forming a structure a bit like a narrow but deep scoop. This special Bean-family kind of two-in-one petal is called the keel,

- like the keel of a boat. Bean blossoms with this configuration are said to be papilionaceous.
- 105 **(b)**
Meristematic region is the region of cell division, which situated below the root cap.
- 106 **(a)**
The various function of the epidermis are
(i) Protection of internal tissues
(ii) Prevention of entry of harmful organisms
(iii) Minimising surface transpiration by having thick cuticle
(iv) Exchange of gases through stomata
(v) Protection against excessive heating up and sudden changes in temperature with the help of hair (as in sunflower)
- 107 **(c)**
Compound epithelium is made of multilayered cells. Their main function is to provide protection against chemical and mechanical stresses. They covers the dry surface of skin, the moist surface of buccal cavity, the inner lining of ducts of, salivary glands and pancreatic ducts
- 108 **(c)**
Rana tigrina is the common species of frog found in India
- 109 **(d)**
Meselson and **Stahl** (1958) verified the semiconservative nature of DNA replication in a series of elegant experiments using isotopically labelled DNA and a form of isopycnic density gradient centrifugation.
- 110 **(d)**
The saccules or cisternae are frequently curved to give a definite polarity to the Golgi apparatus. One face of the apparatus is convex while the other is concave. The convex side is called forming (*cis* face) face while the concave side of the apparatus is known as maturing face (*trans* face)
- 111 **(b)**
Emil Fisher (1894) proposed 'lock and key theory' for the mechanism of enzyme action, according to which the active sites of enzyme have a specific geometric shape wherein the substrate molecules fit in just like a key in a particular lock. In other words, it illustrates that a particular enzyme molecule interacts with a specific type of substrate molecule.
- 112 **(c)**
The proteins are composed of carbon, hydrogen, oxygen, nitrogen and sulphur. Certain proteins may contain phosphorous, iron or other elements also
- 113 **(b)**
Cell cycle was described by **Howard** and **Pelc** in 1953. The sequence of events by which a cell duplicates its genome, synthesizes the other constituents of the cell and eventually divides into two daughter cells is termed as **cell cycle**
- 114 **(a)**
There are two main events in mitosis, karyokinesis or duplication of the nucleus, followed by division of the cytoplasm called cytokinesis. This is followed by the separation of the daughter cells
- 115 **(c)**
Long distance transport of the substances takes place through bulk flow system. Organic nutrients are supplied over long distance transport by phloem tissue from source to sink region. The direction of transport of these organic nutrients can be upward or downward, *i.e.*, bidirectional. This is due to the variable relationship between synthesis region or source site and sink or utilisation region
- 116 **(a)**
Sugarcane (*saccharum officinarum*) is a monocot plant of family-Poaceae. In grasses (Poaceae), the guard cells are dumb bell-shaped and their cell walls are thickened only in the middle.
- 117 **(b)**
The vertical conduction of water from root to aerial parts of plant is called **ascent of sap**. The water molecules remain joined to each other due to a force of attraction called **cohesion force**. Attraction between water molecules and the walls of xylem is due to adhesion force. These factors help to ensure the continuity of water column in xylem.
- 118 **(d)**
Humus is the dark-colored amorphous colloidal material that constitutes the organic component of soil. It is formed by the decomposition of plant and animal remains and excrement and has a complex and variable chemical composition. Being a colloid, it can hold water therefore improves the water retaining properties of soil. It also enhance soil fertility and workability.

- 119 (a)
In the final phase, ions are taken up slowly
- 120 (c)
The seed germination is promoted by red wavelength (650 nm), this is due to the pigment phytochrome behaving in the following manner.
- 121 (d)
Cytochromes are iron containing pigments. These act as electron transporter or electron acceptor in respiration and photosynthesis both.
- 122 (b)
Glycolysis is an essential and first path of respiration. It is common in both aerobic and anaerobic respiration and occurs in the cytosol of all living cells of prokaryotes as well as eukaryotes
- 123 (c)
Decarboxylation occurs in Krebs' cycle.
- 124 (b)
Abscission the shedding of a body part, commonly refers to the process by which a plant intentionally drops one or more of its parts, such as a leaf, fruit, flower or seed.
- 125 (d)
The long day plants fail to flower, if the day length is shorter than the critical period, *e.g.*, sugarbeet, wheat, poppy, radish, maize, spinach, etc.
- 126 (d)
Common examples of plants requiring vernalisation are winter rye, winter wheat, winter barley, pea, beet, cabbage, henbane, viola, clover, *Chrysanthemum*, etc.
- 127 (b)
Deamination is the removal of an amino group ($-\text{NH}_2$) from a compound. It occurs in liver and important for protein metabolism especially their degradation.
- 128 (d)
Dental formula is the number of teeth one half of upper jaw divided by teeth one half of lower jaws.
Rat dental formula $\frac{1003}{1003} = 16$
- 129 (d)
The relationship between the $p\text{O}_2$ and the percent saturation of haemoglobin when represented on a graph is called as oxygen haemoglobin dissociation curve. It is sigmoid in shape. Rise in $p\text{CO}_2$, H^+ ions (fall in pH), temperature and diphosphoglyceric acid shifts the HbO_2 dissociation curve to the right. (As more O_2 dissociate from the oxyhaemoglobin)
- 130 (d)
Asthma is the difficulty in breathing causing wheezing due to the inflammation of bronchi and bronchioles
- 131 (d)
Coronary Circulation Circulation of the blood in the heart muscle is called coronary circulation. Coronary heart diseases occur due to the insufficient blood supply to the heart muscles
- 132 (c)
Agranulocytes are of two types
Lymphocytes (about 30%) They are smaller with large rounded nucleus. They are non-motile and non-phagocytic. They exist in two major forms: B and T lymphocytes. They produce antibodies, which are the key cells of immune response.
Monocytes (about 4%) They are the largest among all the type of leucocytes. They are motile and phagocytic in nature
- 133 (a)
Kidneys are excretory organs of vertebrates. They are consisted of numerous units called **nephrons**. Each nephron contains a U-shaped tube, which has an ascending and a descending limb. This U-shaped tube is known as loop of **Henle**. Thus, it is associated with excretory system. The loop of Henle works on the basis of counter current multiple system and thus, helps in regulating concentration of urine.
- 134 (b)
If one litre of water is introduced in human blood then RBCs absorb it (as water is hypotonic to their internal environment) swell up and burst. Besides of this, there is also increase in the urine production as more water is passed in the nephric filtrate.
- 135 (c)
Renal portal system is well developed in fishes and amphibians, reduced in reptiles and birds and is absent in mammals.
- 136 (d)
The 9th or sacral vertebra of frog is acoelous and highly specialised. The anterior face is convex for this give greater strength to them, it would be given if its anterior end are hollowed out, the transverse process are stout and downwardly

directed. The ileum of the pelvic girdle articulates with the transverse process of 9th vertebrae.

137 (c)

Osteoporosis.

Osteoporosis Age-related disorder characterized by decreased bone mass and increased chances of fractures. Decreased level of oestrogen is a common cause of this disease

138 (b)

Sarcolemma is the tough elastic membrane formed by the modified plasma membrane over the **muscle fibres**.

139 (a)

CNS is the site of information processing and control.

The human neural system comprises of PNS and CNS both. PNS consists of all the nerves (cranial nerves and spinal nerves) associated with CNS. CNS is the site of information processing and control

140 (a)

Central canal is a part of spinal cord.

141 (c)

Intracellular receptors are mostly nuclear receptors.

Hormones produce their effects on target tissue by binding to specific proteins called hormone receptors which are located in the target tissue only. Hormone receptors present on the cell membrane of the target cells are called membrane bound receptors and receptors present inside the target cell are called intracellular receptors. Intracellular receptors are mostly nuclear receptors (present in the nucleus)

142 (d)

Pineal gland secretes two hormones – melatonin and serotonin. Melatonin concentration in the blood appears to follow a diurnal cycle.

144 (d)

As we know oviparous individuals lay eggs with white hard shell around it and this white hard shell is made up of calcium

145 (c)

2-1-2-3

Development of Female Gametophyte

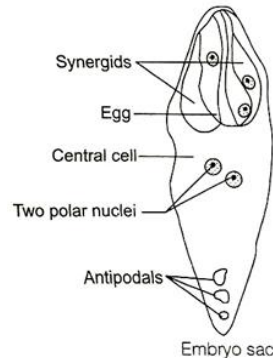
(i) Megaspore mother cell undergoes the reductional/meiotic division that give rise to four megaspores

(ii) Three of them die (in majority of plants) only one remains viable. This method of embryo sac formation is called monosporic development

(iii) The nucleus of the functional megaspore divides mitotically to form two nuclei, which move to the opposite poles forming two nucleate embryo sac

(iv) Two more sequential mitotic nuclear divisions results in the formation of four nucleate and later 8 nucleate stages of embryo sac

(v) After the 8 nucleate stage cell walls are laid down leading to the organization of typical female gametophyte



146 (d)

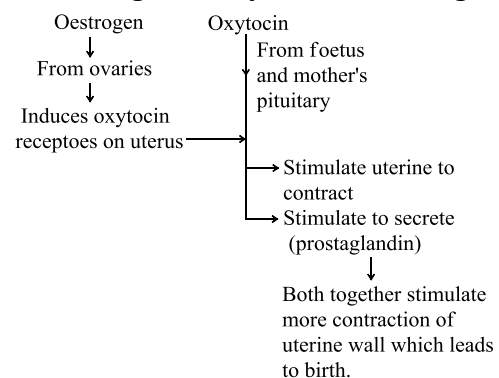
In **orthotropous ovule** (also called atropous or erect ovule), chalaza, micropyle and funicle lie in straight line, e.g., *Urtica*, *Polygonum* and *Peperomea*. This is a primitive type of ovule.

147 (d)

Micropyle is the narrow or passage left by the integuments at one end of the ovule. It allows the entry of pollen tube into the ovule. This phenomenon is known as porogamy, e.g., lily.

148 (b)

A- Oestrogen, B-Oxytocin, C- Prostaglandin.



149 (c)

3rd month.

Summary of important development changes in the human embryo

Time from Fertilisation	Organ Formed
Week 1	Fertilisation cleavage starts about 24 hours after fertilisation cleavage to form a blastocyst 4-5 days after fertilisation.

	More than 100 cells implantation 6-9 days after fertilisation
Week 2	The three primary germ layers (ectoderm, endoderm and mesoderm) develop
Week 3	Woman will not have a period. This may be the first sign that she is pregnant. Beginning of the backbone. Neural tube develops, the beginning of the brain and spinal cord (first organs)
Week 4	Heart, blood vessels, blood and gut start forming. Umbilical cord developing
Week 5	Brain developing, 'Limb buds', small swelling which are the beginning of the arms and legs. Heart is a large tube and starts to beat, pumping blood. This can be seen on an ultrasound scan
Week 6	Eyes and ears start to form
Week 7	All major internal organs developing. Face forming. Eyes have some colour. Mouth and tongue develop. Beginning of hand and feet
Week 12	Foetus fully formed, with all organs, muscles, bones toes and fingers. Sex organs well developed. Foetus is moving
Week 20	Hair beginning to grow including eyebrows and eyelashes. Fingerprints developed. Fingernails and toenails growing. Firm hand grip. Between 16 and 20 weeks baby usually

	felt moving for first time
Week 24	Eyelids open. Legal limit of abortion in most circumstances
By Week 26	Has a good chance of survival if born prematurely
By Week 28	Baby moving vigorously. Responds to touch and loud noises. Swallowing amniotic fluid and urinating
By Week 30	Usually lying head down ready for birth
40 Weeks	Birth

150 (d)

In rabbit head of epididymis present at the head of the testis is called caput epididymis.

151 (a)

In centrolecithal eggs, the yolk is surrounded by cytoplasm, *e.g.*, eggs of insects.

152 (d)

The term 'reproductive health' simply refers to healthy reproductive organs with normal functions. However, it has broader perspectives and includes emotional, physical and social aspects of reproduction also

154 (a)

In the gametogenesis meiosis occur. The diploid chromosome become haploid, so the probability of side is sperm lacking one recessive autosomal allele and holandric gene is half

155 (b)

Red-green colour blindness or colour blindness is a genetic disorder in which eyes fail to distinguish red and green colours.

156 (d)

Allelism refers to presence of alternative forms of a gene at a given locus. Alleles or allelomorphs are the two contrasting aspects of the same character present at a locus of homologous pair of chromosomes. Now –a-days, the same aspect in duplicate (TT or tt) of a character is also considered an allele.

158 (d)

Haploid content of human DNA is also called human genome (3.3×10^9 bp). Diploid content of human DNA has 6.6×10^9 bp

159 (a)

Atavisms

Example living whales with legs, newborn babies with tails. Anatomical atavisms are closely related conceptually to vestigial structures.

An atavism is the reappearance of a lost character specific to a remote evolutionary ancestor and not observed in the parents or recent ancestors of the organism displaying the atavistic character.

Atavisms have several essential features (i) presence in adult stages of life, (ii) absence in parents or recent ancestors and (iii) extremely rare in a population. For developmental reasons, the occasional occurrence of atavisms is expected under common descent if structures of functions are gradually lost between ancestor and descendant lineages

160 **(d)**

Descent with modification is the main theme of evolution.

161 **(b)**

HIV was first isolated by Montagnier *et. al* in the Pasteur Institute of Paris

162 **(a)**

Cancer cells do not respond to control mechanisms and do not show contact inhibition (differing surface proteins.). These cells proliferate in an unregulated manner and from clones of cells which can expand irregularly.

163 **(d)**

Different species of Plasmodium (*P. vivax*, *P. malariae*, *P. falciparum* and *P. ovale*) are responsible for different types of malaria

164 **(a)**

Bee wax is a product of industrial importance. It is used in the manufacture of cosmetics, shaving creams and polishes

165 **(d)**

The common marine fish varieties popularly consumed as food are hilsa, sardines, mackerel, tuna, pomfrets, eel, Bombay duck, etc.

166 **(a)**

The drug stramonium is obtained from *Datura*.

167 **(a)**

Wonder wheat is a new wheat variety with a yield of 18 tonnes per hectare. It has some 200 grains per stalk and has developed by Mexico's international wheat and maize improvement centre.

169 **(a)**

Mobile genetic element is broadly any genetic

element capable of moving itself, with or without duplication, from one site in a genome to another. Mobile genetic elements include plasmids, viruses, transposable genetic elements (transposons), short interspersed elements, pathogenicity islands and so on. The term 'transposon' was introduced by **RW Hedges** and **AE Jacob** in 1974, 'controlling elements' or jumping genes, discovered by **Barbara McClintock** (1950) in maize

170 **(c)**

Somatic hybridization involves the fusion of protoplasts of two different species which resulted in hybrid. Naked protoplasts are obtained by dissolution of their cell walls by the macerating enzymes such as pectinase and cellulase. Fusion of protoplasts from two different varieties can be enhanced by treating with polyethylene glycol (PEG) in presence of high voltage electric current.

172 **(b)**

In genetic engineering rDNA technology is applied to several biotechnological processes for obtaining particular biochemical improvement of genetic makeup of an organism and fighting genetic defects.

173 **(b)**

' N ' is the population density of time t then its density at time $t + 1$ is

$$N_{t+1} = N_t + [(B + I) - (D + E)]$$

We can see from the above equation that population density increases if the number of birth plus number of immigrants ($B + I$) is more than the number of death plus the number of emigrants ($D + E$)

174 **(a)**

Proto-cooperation is the interaction between two living organisms of different species in which both are mutually benefited but they can live without each other.

175 **(a)**

In an ecosystem, biological equilibrium or a balance is found between producers, consumers and decomposers. An ecosystem should always maintain this balance. If primary consumers in an ecosystem are absent, then producers will be increased in number and will create overcrowding. It results in competition and consequently number of producers will decrease

to near normal.

176 **(b)**

The living organisms present in an ecosystem forms biotic components. They are interconnected through food chain

177 **(a)**

The lemurs are the inhabitants of Madagascar and the Comoro islands. Endangered species are whose population have been reduced to a critical level. So, they are near to extinction in near future.

178 **(d)**

Ecologically managed wildlife provides food, shelter and some commercially useful products. One step towards the wildlife conservation is to preserve the earth's genetic diversity by protecting all threatened species of the plants and

animals

179 **(b)**

The Central Pollution Control Board prescribed the BOD limit for the discharge of industrial and municipal waste water as < 10 ppm.

180 **(d)**

CFFs, CO_2 , CH_4 , NO_2 are greenhouse gases. The phenomenon of keeping the earth warm due to presence of these gases in the atmosphere is called greenhouse effect