

SOLUTIONS

PHYSICS

1. (a) : Angular velocity, $\omega = \frac{d\theta}{dt} = 6t^2$
 at $t = 2$ sec
 $\omega = 6 \times 4 = 24$ rad/sec.

2. (d) : Let the body be projected at an angle θ with initial speed u .

Then the maximum height attained by the body is given by

$$0 = u^2 \sin^2 \theta - 2gH$$

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

And the range of the projectile

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

Now given

$$R = 3H \Rightarrow \frac{2u^2 \sin \theta \cos \theta}{g} = \frac{3 \times u^2 \sin^2 \theta}{2g}$$

$$\Rightarrow \frac{\sin \theta}{\cos \theta} = \tan \theta = \frac{4}{3}$$

$$\Rightarrow \theta = \tan^{-1} \left(\frac{4}{3} \right) = 53^\circ 8'$$

3. (a) : The angular velocity is given by

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

$$\therefore [\omega] = [T^{-1}] = [M^0 L^0 T^{-1}]$$

4. (b) : As the water falls freely from a height 19.6 m, so the velocity of water at the turbine is

$$v = \sqrt{2gh} = \sqrt{2 \times 9.8 \times 19.6} = 19.6 \text{ m/s}$$

5. (c) : Let the mass of the bullet be m and that of the rifle be M . Initially both are at rest. Hence the total linear momentum of the system = 0.

Now, after the bullet is fired, let the velocity of the bullet be v and the recoil speed of the rifle be V , then from law of conservation of linear momentum,

$$mv - MV = 0$$

$$\Rightarrow V = \frac{mv}{M}$$

The KE of the rifle is

$$KE_r = \frac{1}{2} MV^2 = \frac{1}{2} M \frac{m^2 v^2}{M^2}$$

$$= \frac{m}{M} \frac{1}{2} mv^2$$

$$= \frac{m}{M} (KE_b)$$

$$\therefore m < M$$

$$\therefore KE_r < KE_b$$

\(\therefore\) Kinetic energy of the rifle is less than that of the bullet.

6. (c)

7. (b) : The focal length of the objective is greater than that of the eye piece so that the image formed by the objective lie in the focal plane of the eye piece. Then the eye piece forms a magnified virtual image of this image.

8. (d) : We know that the radii of different orbits of the hydrogen atom are given by

$$r_n = n^2 a_0 \text{ where } a_0 = \text{radius of the ground state orbit}$$

$$\therefore r_n \propto n^2$$

\(\therefore\) When the hydrogen atom is in first excited state (*i.e.*, $n = 2$), its radius is 4 times.

9. (d) : Given : time period $T = 2$ sec

$$\text{amplitude of pendulum } A = 50 \text{ mm} = 0.05 \text{ m}$$

We know that the velocity of a simple pendulum undergoing SHM is given by

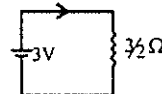
$$v = \omega \sqrt{A^2 - x^2} = \frac{2\pi}{T} \sqrt{A^2 - x^2}$$

\(\therefore\) $v_{\max} = \frac{2\pi}{T} \sqrt{A^2 - 0^2}$ (\therefore maximum velocity occurs at $x = 0$)

$$\therefore v_{\max} = \frac{2\pi}{T} \times 0.05 = 0.16 \text{ m/s}$$

10. (d) : As R_2 , R_3 and R_4 are in series, their equivalent resistance is $R_2 + R_3 + R_4 = 6 \Omega$. Now the 6Ω resistance is in parallel with $R_1 = 2 \Omega$ whose equivalent resistance will be

$$\frac{2 \times 6}{2 + 6} = \frac{3}{2} \Omega$$



\(\therefore\) The current through the circuit, $i = \frac{3}{3/2} = 2 \text{ A}$

11. (a), (c), (d) : The stopping potential, work function of the surface and maximum kinetic energy of photoelectrons do not depend upon the intensity of light used.

12. (c) : Let the area be A

The separation between the plates $d = 5 \text{ mm} = 0.005 \text{ m}$

We know capacitance $C = \frac{\epsilon_0 A}{d}$

$$\begin{aligned} \Rightarrow A &= \frac{Cd}{\epsilon_0} \\ &= 4\pi \times 3 \times 0.005 \times 9 \times 10^9 \\ &= 1.69 \times 10^9 \text{ m}^2 \end{aligned}$$

13. (d) : Force applied $F = 10 \text{ N}$

Stretching in the spring $x = 1 \text{ mm} = 0.001 \text{ m}$

$$\therefore \text{spring constant } k = \frac{F}{x} = \frac{10}{0.001} = 10^4$$

Now the spring is stretched through a distance

$$\begin{aligned} x_1 &= 40 \text{ mm} \\ &= 0.04 \text{ m} \end{aligned}$$

The force required to stretch it through x_1 is $F_1 = kx_1$

\therefore The work done by this force

$$\begin{aligned} W &= \frac{1}{2} kx_1^2 \\ &= \frac{1}{2} \times 10^4 \times 0.04 \times 0.04 \\ &= \frac{1}{2} \times 16 = 8 \text{ J} \end{aligned}$$

14. (c)

15. (c) : We know from first law of thermodynamics that $\Delta Q = \Delta U + \Delta W$ where ΔQ is the heat supplied, ΔU the increase in the internal energy and ΔW is the work done by the gas. Now at constant temperature *i.e.* in isothermal process, $\Delta U = 0$. Hence $\Delta Q = \Delta W$, that maximum work done is possible in isothermal expansion.

16. (a)

17. (a) : Radioactive decay constant $\lambda = 1.07 \times 10^{-4} / \text{year}$

$$\begin{aligned} \therefore \text{Half life } T_{1/2} &= \frac{0.693}{\lambda} = \frac{0.693}{1.07 \times 10^{-4}} \\ &= 6.476 \times 10^3 \text{ years} \end{aligned}$$

18. (c) : The kinetic energy of a body of mass m and velocity v is $E = \frac{1}{2} mv^2 = \frac{p^2}{2m}$ where $p = mv =$ momentum of the body

$$\begin{aligned} \therefore \frac{p^2}{E} &= 2m = \text{constant} \quad \therefore m = \text{constant} \\ \therefore \frac{p_1^2}{E_1} &= \frac{p_2^2}{E_2} \end{aligned}$$

Now, $E_2 = 4E_1$

$$\therefore \frac{p_1^2}{p_2^2} = \frac{1}{4} \Rightarrow \frac{p_1}{p_2} = \frac{1}{2} \Rightarrow p_2 = 2p_1$$

19. (d) 20. (a)

21. (b) : Given, mass of body $m = 5 \text{ kg}$

radius of circle $r = 1 \text{ m}$

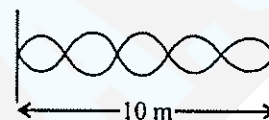
angular velocity $\omega = 2 \text{ rad/s}$

$$\begin{aligned} \therefore \text{The centripetal force } F_C &= m\omega^2 r \\ &= 5 \times 1 \times 2^2 = 20 \text{ N} \end{aligned}$$

22. (a) : At absolute zero of temperature, all translational motion of molecules cease.

23. (d)

24. (a) : As standing waves are produced in the string and the string is vibrating in 5 segments, it can be shown as



$$\therefore 5 \frac{\lambda}{2} = 10$$

$$\Rightarrow \lambda = 4 \text{ m}$$

Given, the velocity of the wave $v = 20 \text{ m/s}$

$$\therefore \text{Frequency } \nu = \frac{v}{\lambda} = \frac{20}{4} = 5 \text{ s}^{-1} = 5 \text{ Hz}$$

25. (c) : The kinetic energy of the electron, accelerated in the potential of 100 V is

$$\begin{aligned} E &= 100 \text{ eV} \\ &= 100 \times 1.6 \times 10^{-19} \text{ J} = 1.6 \times 10^{-17} \text{ J} \end{aligned}$$

26. (b) 27. (a) 28. (b)

29. (b) : Considering the mass to be undergoing SHM, the time period of oscillation is given by

$$T = 2\pi \sqrt{\frac{m}{K}}$$

In the first case $m = M$

$$\therefore T = 2\pi \sqrt{\frac{M}{K}}$$

In the second case $m = 4M$

$$\therefore T' = 2\pi \sqrt{\frac{4m}{K}} = 2 \times 2\pi \sqrt{\frac{M}{K}} = 2T$$

30. (b) 31. (c)

32. (b) : We have $\frac{C}{100} = \frac{F - 32}{180}$ where

C = temperature in centigrade scale. F = temperature in $^{\circ}\text{F}$

Now if $F = 140^{\circ}$ then

$$C = \frac{100}{180} \times (140 - 32) = 60^\circ$$

The boiling point of water is 100°C

\therefore The fall in temperature = $100^\circ\text{C} - 60^\circ\text{C} = 40^\circ\text{C}$

33. (a)

34. (d) : Given that standard vapour pressure at 12°C
 $= 0.016 \times 10^5 \text{ Pa}$.

The partial pressure of water vapour at 12°C is
 $= 0.012 \times 10^5 \text{ Pa}$

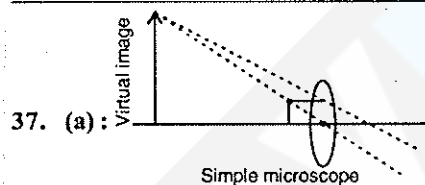
\therefore R.H. = $\frac{\text{Vapour pressure of air}}{\text{SVP at the same temperature}}$

$$= \frac{0.012 \times 10^5}{0.016 \times 10^5}$$

$$= 0.75 = 75\%$$

35. (a) : Heat travels through vacuum by radiation.

36. (a) : Rocket propulsion is based on the principle of Newton's third law, that is every action has equal and opposite reaction.



A simple microscope produces an enlarged and exact but virtual image of the object.

38. (a) : Mirage is a phenomenon observed due to the total internal reflection of light when light travels from a denser medium to a rarer medium. When the angle of incidence of light is more than the critical angle for the two adjacent media, the light gets totally internally reflected.

39. (d) : The rate of diffusion is faster in gases as compared to solids and liquids.

40. (a) : A transformer has got one primary coil, the change of current in which produces an induced emf in the secondary coil. Hence it is based on the principle of mutual induction.

41. (b) : As the person goes up and up above the earth's surface, the acceleration due to gravity decreases. That's why the reading on the spring balance will go on decreasing.

42. (b) : The body temperature during winter is more than the surrounding temperature of our atmosphere. And so the temperature of the wood or the metal

surface is at a lower temperature than the body. Now when we touch the wood or the metal surface, because of the temperature difference, heat flow will take place from our body to wood or metal surface. As the metal surface has got a high thermal conductivity than wood, the heat flow from our body to metal surface is faster and so we feel colder to touch the metal surface than a wooden one.

43. (c) : Wool being a bad conductor of heat due to the presence of the air gaps in it and so it does not let our body temperature decrease through conduction. That's why it keeps our body warm.

44. (a) 45. (d)

46. (a) : We know that the flux is given by

$$\phi = 4\pi I$$

$$= 4\pi \times 100 = 1256 \text{ lumen}$$

47. (a) : We know that the time period of a simple pendulum is given by $T = 2\pi\sqrt{\frac{l}{g}}$, which is independent of the mass of the bob.

Therefore if we replace the metal bob of the simple pendulum with a wooden bob, the time period of the pendulum remains the same.

48. (b) : Because of surface tension, a liquid surface tends to have the minimum area possible. And as for a given volume the surface of a sphere has got the minimum area, the rain drops take a spherical shape.

49. (c) 50. (d) 51. (b)

52. (c) : A laser is a highly monochromatic and near-perfect parallel beam of light, due to which the beam can be focussed by a converging lens to a very small spot. As the intensity of the beam is too high, it can drill holes through a metal sheet even if the power is 0.2 W. But even a torch-light of 1000 W power cannot drill holes in such a metal sheet, because the light is less intense and the beam is not parallel.

53. (b) : A body can have acceleration even if its velocity is zero. We can see it as follows -

By definition, acceleration $a = \frac{dv}{dt}$

$$\Rightarrow dv = a dt$$

$$\Rightarrow \int dv = \int a dt$$

$$\Rightarrow v = at + C$$

where C is a constant

Now we can have a constant C in such a way that

$$at + C = 0$$

$$\text{or } a = -\frac{C}{l}$$

That is, we can have velocity $v = 0$ at an instant when the acceleration is non-zero.

54. (c) : It is not necessary that virtual images are possible only by diverging lenses.

55. (d) : The ratio $\frac{C_p}{C_v}$ is given by,

$$\gamma = \frac{C_p}{C_v} = 1 + \frac{2}{n}$$
 where n is the number of degrees of freedom. Since the number of degrees of freedom for monatomic gas (3) is less than that of diatomic gas (5), $\gamma_{\text{monatomic}} > \gamma_{\text{diatomic}}$.

56. (d)

57. (b) : As radio waves are electromagnetic waves, they can be polarized.

58. (a) : For resonance to occur, the net reactance of the circuit should be zero. Hence in that condition $X_C - X_L = 0$

$$\therefore \frac{1}{\omega C} - \omega L = 0$$

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

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

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

Hence resonance occurs at a single frequency and at resonance the inductive reactance is equal and opposite to the capacitive reactance.

59. (c)

60. (a) : According to Newton's corpuscular theory of light, Newton explained refraction as being due to the attraction of the light particles by the particles of the medium making the light ray bend in the boundary. But if this were the case, the velocity of light in a denser medium should have been more than that in a rarer medium. But this is not actually so. The velocity of light in air is more than that in water.

CHEMISTRY

61. (a) : According to Le-Chatelier principal, if a system at equilibrium is subjected to change of concentrations, pressure or temperature, the equilibrium shifts in the direction that tends to undo the effect. So the equilibrium constant of reaction can be calculated.

62. (b) : Sulphur and phosphorus are nonmetals they have very low electropositivity. As aluminium have got one extra-nuclear charge than Mg, it has lesser electropositive character than Mg [due to greater pull exerted by Nucleus on e^-].

63. (a) : According to Aufbau principle, the subshell with minimum energy is filled up first and when this obtains maximum quota of electrons, then the next subshell of higher energy starts filling. So subshell with lowest $(n + l)$ value is filled first. Sequence comes out to be : $1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s, 4f$ etc.

64. (c) : Hydrogen is present as hydride ion in these molecules *i.e.* Oxidation state is -1 .

65. (c) : For H-bonding, hydrogen must be bonded to highly electronegative element *e.g.* O, F, N etc.

66. (c) : Ideal gas equation is :

$$PV = nRT$$

P = Pressure of the gas; V = volume of gas

n = no. of molecules of gas; R = gas constant

T = temperature

67. (b) : For first order reaction

$$t = \frac{1}{K} \log \frac{a}{a-x}$$

$$t_{30\%} = \frac{1}{K} \times 2.303 \times \log \frac{100}{100-30}$$

$$t_{50\%} = \frac{1}{K} \times 2.303 \times \log \frac{100}{100-50}$$

$$\frac{30}{t_{1/2}} = \frac{\log \frac{10}{7}}{\log 2}$$

$$\frac{30}{t_{1/2}} = \frac{0.1549}{0.3010}$$

$$t_{1/2} = \frac{0.3010 \times 30}{0.1549} = 58.2 \text{ min}$$

68. (a) : In physical adsorption, gases are held on solid surfaces by weak van der Waal's forces. It is not specific and reversible also.

69. (b) : $K_3[(FeCN)_6]$ on ionisation gives 4 species ($3K^+$ and 1 $[Fe(CN)_6]^{3-}$) and $Al(NO_3)_3$ also gives 4 species ($1Al^{3+}$ and $3NO_3^-$), thus both will have same value of Van't Hoff factor.

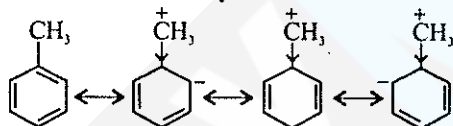
70. (a) : Anhydrous sodium sulphate absorbs moisture very efficiently.

71. (a) : Equivalent mass of an acid is defined as the number of parts by mass of it which contains 1.008 parts by mass of replaceable hydrogen or it in the quantity of the acid by mass that supplies one mole of H^+ ions.

$$\begin{aligned} \text{Eq. mass of acid} &= \frac{\text{Molecular mass of the acid}}{\text{Number of replaceable H atoms}} \\ &= \frac{\text{Molecular mass of the acid}}{\text{Basicity of the acid}} \end{aligned}$$

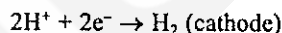
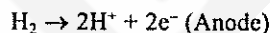
72. (b) : In sp^3 hybridisation, bond angle is $-109^\circ C$
In sp^2 hybridisation, bond angle is $-120^\circ C$
In sp hybridisation, bond angle is $-180^\circ C$

73. (d) : Methyl group is an electron releasing group due to which there is greater electron density in the ring, due to which electrophile attach is favoured.

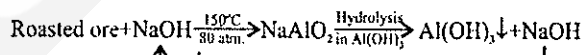
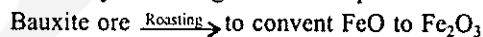


74. (d) : According to this law, the total enthalpy change is independent of intermediate steps involved in the change. It depends only on initial and final values of enthalpy change. So it can be used for the calculation of heat of formation, reaction or transition.

75. (d) : Hydrogen electrode is the primary standard electrode. The hydrogen electrode can act as cathode or anode with respect to other electrode.



76. (a) : Baeyer's process is mainly applied to bauxite ore containing ferric oxide as chief impurity. It can be represented by following reaction sequence.



77. (a) : As derivation in boiling point is given by :

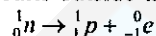
$$\Delta T = K_b \times \text{molality}$$

Putting the various values, we get :

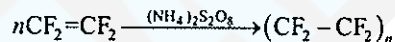
$$\begin{aligned} 100.52 - 100.00 &= 0.6 \times \frac{3/M}{200/1000} \\ \Rightarrow M &= 17.3 \text{ g mol}^{-1} \end{aligned}$$

78. (a) : Phosphorus trichloride is a chlorinating agent which converts acid to its corresponding acid chloride.

79. (b) : Neutron in free state immediately decomposes to proton and electron which makes its detection very difficult outside the nucleus.

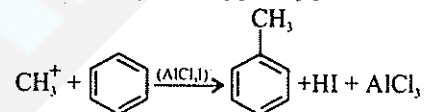
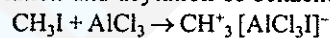


80. (b) : Polytetra fluoroethylene is prepared by polymerisation of tetra fluoroethylene.



This polymer is chemically inert and heat resistant polymer. It is very tough and electrical resistant.

81. (d) : Benzene reacts with methyl iodide in the presence of anhydrous $AlCl_3$ to form toluene. Reaction is called as Friedel-Crafts reaction. It is used for alkylation and acylation of benzene nucleus.



Electrophile

82. (b) : Energy of a photon is given by :

$$E = h\nu = \frac{hc}{\lambda}$$

$$\frac{E_1(3000^\circ A)}{E_2(6000^\circ A)} = \frac{hc/3000}{hc/6000} = \frac{2}{1}$$

Elements	%	At. mass	Relative No. of atom	Simplest ratio of atoms
C	18.5	12	$\frac{18.5}{12} = 1.542$	1
H	1.55	1	$\frac{1.55}{1} = 1.55$	1
Cl	55.04	35.5	$\frac{55.04}{35.5} = 1.55$	1
O	24.81	16	$\frac{24.16}{16} = 1.538$	1

Therefore, empirical formula of the compound is $CHClO$.

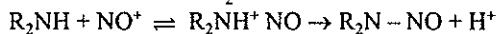
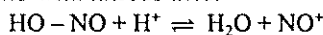
84. (d) : Let oxidation state of S be x.

$$\therefore 2 \times (+1) + 4x + 6 \times (-2) = 0$$

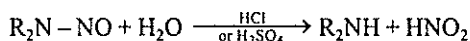
$$\Rightarrow 2 + 4x - 12 = 0 \Rightarrow x = \frac{+5}{2}$$

85. (d) : Nitrosoamines are prepared from secondary

amines with nitrous acid.

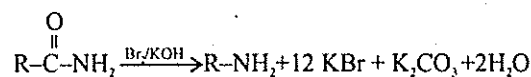


Nitrosoamines are readily hydrolysed to the amines by boiling with concentrated H_2SO_4 (or dil. HCl)

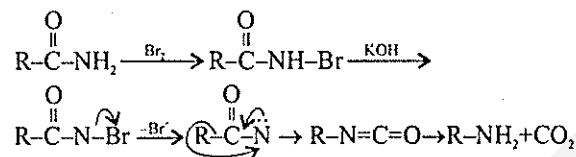


The above reaction is known as Liebermann's nitroso reaction and it is used for detection of secondary amine.

86. (a) : The reaction involved is called as Hoffmann's bromamide reaction.



Mechanism involved is :



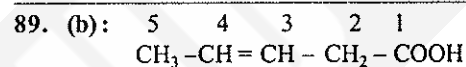
87. (a) : The product of H^+ and OH^- ions in water at a particular temperature is known as Ionic product of water. It is denoted as K_w .

$$K_w = [\text{H}^+][\text{OH}^-]$$

The value of K_w increase with the increase of temperature *i.e.* concentration of H^+ and OH^- ions increase with increase of temperature, but it still exists in the range of 10^{-14}

$$\begin{array}{ll} \text{e.g. } 25^\circ\text{C} & 1.00 \times 10^{-14} \\ & 100^\circ\text{C} & 7.50 \times 10^{-14} \end{array}$$

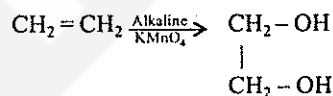
88. (c) : Ethanol : $\text{CH}_3\text{CH}_2\text{OH}$; Dimethyl ether : MeOMe there is extensive Hydrogen bonding in ethanol due to the presence of $-\text{OH}$ groups, while it is not possible in dimethyl ether (no $-\text{OH}$ group available) another Hydrogen bonding leads to greater boiling point.



Therefore, IUPAC name is

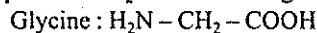
4-hydroxy-3-penten-1-oic acid.

90 (d) : Baeyer's reagent is alkaline KMnO_4 solution and it is used for oxidation at double bonds *e.g.*



This reaction is used as a test for unsaturated compounds.

91. (d) : Amino acids are the building blocks for proteins, chemically they consist of two functional groups *i.e.* $-\text{NH}_2$ and $-\text{COOH}$ groups. *e.g.*



92. (c) : Principle Quantum number (n) represent the name, size and energy of the shell to which the electron belongs. Higher the value of ' n ' greater is the distance of the shell from the nucleus.

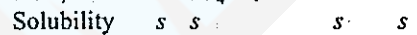
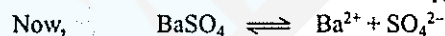
$$\begin{aligned} 93. (c) : & \frac{\text{mass of Hydrogen}}{\text{mass of copper}} \\ & = \frac{\text{Equivalent mass of Hydrogen}}{\text{Equivalent mass of copper}} \end{aligned}$$

$$\Rightarrow \frac{0.504}{\text{mass of copper}} = \frac{1}{63.5/2}$$

$$\Rightarrow \text{Mass of copper deposited} = 16.0 \text{ g}$$

94. (d) : Solubility of BaSO_4 in $\text{g L}^{-1} = 2.33 \times 10^{-3}$

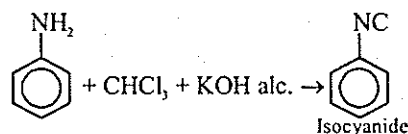
$$\begin{aligned} \text{mol L}^{-1} &= \frac{2.33}{233} \times 10^{-3} \\ &= 10^{-5} \end{aligned}$$



$$\therefore \text{Solubility Product} = [\text{Ba}^{2+}][\text{SO}_4^{2-}]$$

$$\begin{aligned} &= s^2 \\ &= (10^{-5})^2 \\ &= 10^{-10} \end{aligned}$$

95. (c) : 1° amines on heating with CHCl_3 and alcoholic KOH forms isocyanides (or carbylamine) which posses bad smell. This reaction is known as carbylamine reaction and used for detection of 1° amines.



96. (d) : Rate constant = $0.69 \times 10^{-2} \text{ min}^{-1}$

This unit (*i.e.* min^{-1}) is characteristics of first order reaction. For first order reaction, half life time is given as :

$$t_{1/2} = \frac{0.693}{k_1} = \frac{0.693}{0.69 \times 10^{-2}} = 1.004 \times 10^2 \text{ min.}$$

$$t_{1/2} = 100.4 \text{ min} = 6024$$

97. (c) : According to ideal gas equation,

$$PV = nRT$$

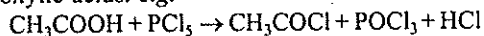
Putting the standard conditions, *i.e.* $P = 1 \text{ atm}$,

$$n = 1 \text{ mole}, R = 0.0821 \text{ L atm K}^{-1}, \text{mol}^{-1}, T = 273 \text{ K}$$

$$V = \frac{nRT}{P} = \frac{1 \text{ mole} \times 0.0821 \text{ L atm K}^{-1} \text{ mol}^{-1} \times 273 \text{ K}}{1 \text{ atm}}$$

$$V = 22.4$$

98. (c) : Acid halides are formed when PCl_5 reacts with carboxylic acids. e.g.



99. (d) : $4\text{Fe} + 3\text{O}_2 \rightleftharpoons 4\text{Fe}^{3+} + 6\text{O}_2^{2-}$

In this redox reaction, Iron is acting as a reducing agent (as it is giving out electrons) i.e. $\text{Fe} \rightarrow \text{Fe}^{3+} + 3e^-$

As Fe is readily converted to Fe^{3+} therefore it is oxidised.

100. (d) : $2\text{C}(s) + 2\text{H}_2 \rightarrow \text{C}_2\text{H}_4(g); \Delta H_1 = 52 \text{ KJ/mole} \dots(1)$

$\text{C}(s) + \text{O}_2(g) \rightarrow \text{CO}_2(g), \Delta H_2 = -394 \text{ KJ/mole} \dots(2)$

$\text{H}_2(g) + \frac{1}{2}\text{O}_2(g) \rightarrow \text{H}_2\text{O}(l), \Delta H_3 = -286 \text{ KJ/mole} \dots(3)$

The combustion of C_2H_4 can be written as :

$\text{C}_2\text{H}_4(g) \rightarrow 2\text{C}(s) + 2\text{H}_2, \Delta H_1 = -52 \text{ KJ/mole}$

$2\text{C}(s) + 2\text{O}_2(g) \rightarrow 2\text{CO}_2(g), \Delta H_2 = -2 \times 394$

$2\text{H}_2(g) + \text{O}_2(g) \rightarrow 2\text{H}_2\text{O}(l), \Delta H_3 = -2 \times 286$

$\Rightarrow \Delta H = -52 - 2 \times 394 - 2 \times 286 = -1412 \text{ KJ/mole}$

101. (b) : Molecular mass = $2 \times$ vapour density
 $= 2 \times 30 = 60$

Empirical mass = $12 + 2 + 16 = 30$

$$\Rightarrow n = \frac{60}{30} = 2$$

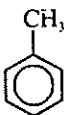
\Rightarrow Molecular formula is $(\text{CH}_2\text{O})_2 \equiv \text{C}_2\text{H}_4\text{O}_2$

102. (a) : $2\text{H}_2\text{S}(g) \rightleftharpoons 2\text{H}_2(g) + \text{S}_2(g)$

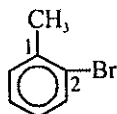
Equilibrium constant is,

$$K = \frac{[\text{H}_2]^2 [\text{S}_2]}{[\text{H}_2\text{S}]^2} = \frac{[0.1]^2 [0.4]}{[0.5]^2} \\ = 0.016 \text{ mol L}^{-1}$$

103. (a) : Toluene is methyl benzene



\therefore 2-bromo toluene is



104. (d) : According to Boyle's law,

$$P_1 V_1 = P_2 V_2$$

Putting values here, we get;

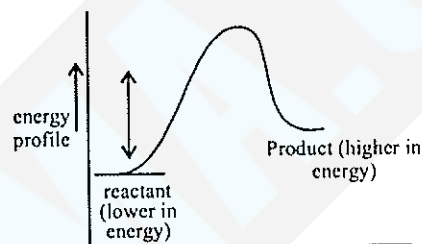
$$100 \times 720 = P_2 \times 84$$

$$\Rightarrow P_2 = 857.14 \text{ mm}$$

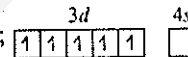
105. (c) : Lanthanides and Actinides are called as the inner-transition metals. Lanthanide series consists of 4f-metals while actinides series consists of 5f-metals.

106. (c) : In an endothermic reaction, enthalpy for the product is higher than that of reactants.

$$\therefore \Delta H = \Delta H(\text{products}) - \Delta H(\text{reactant}) = +ve$$



107. (c) : $[\text{Fe}(\text{CN})_6]^{3-}; \text{Fe}^{3+};$



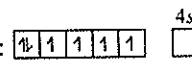
Due to strong ligand i.e. cyanide ion, 3d electrons pair up.

$[\text{Fe}(\text{CN})_6]^{3-} \rightarrow$



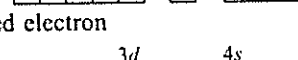
so only one unpaired electron.

$[\text{Fe}(\text{CN})_6]^{4-}; \text{Fe}^{2+};$



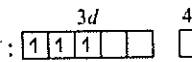
Due to strong ligand CN, e^- pair up

$[\text{Fe}(\text{CN})_6]^{4-} \rightarrow$



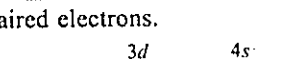
\therefore No unpaired electron

$[\text{Cr}(\text{H}_2\text{O})_6]^{3+}; \text{Cr}^{3+};$



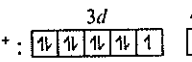
As H_2O is weak ligand, no pairing of electron takes place.

$[\text{Cr}(\text{H}_2\text{O})_6]^{3+} \rightarrow$



\therefore Three unpaired electrons.

$[\text{Cu}(\text{H}_2\text{O})_6]^{2+}; \text{Cu}^{2+};$



only one unpaired electron.

108. (c) : We know that

$$\text{specific conductance} = \text{Cell constant} \times \text{conductance}$$

$$\Rightarrow \text{Cell constant} = \text{Resistances} \times \text{sp. conductance}$$

$$= 55 \times 0.0112$$

$$= 0.616 \text{ cm}^{-1}$$

109. (d) : Planck's constant, $h = 6.63 \times 10^{-34} \text{ Js}$

Also, $E = h\nu$

$$\Rightarrow h = \frac{\text{Energy}}{\text{frequency}}$$

$$= \frac{\text{Energy} \times \text{time}}{L \times T}$$

$$= MLT^{-2} \times L \times T = ML^2T^{-1}$$

Angular momentum, $L = mvr$

$$= M \times LT^{-1} \times L = ML^2 T^{-1}$$

Therefore both has same dimension.

110. (d) : Alkenes are reactive due to the presence of double bond. The π -electrons are loosely held and are therefore, easily polarisable. So more the number of e^- releasing alkyl group on the double bond, lesser is the stability.

111. (a) : Principal quantum number (n) represent the name, size and energy of shell to which the electron belongs. Higher is the value of ' n ', greater is the distance of the shell from the nucleus and hence greater is the energy.

112. (d) : A process is called adiabatic if no heat enters or leaves the system during any step of the reaction. So temperature does not remain same.

113. (a) : According to Aufbau principle, the unfilled shell with lowest ($n + l$) value will be filled first. Therefore, 4s orbital is filled first then 3d orbital.

for 4s - orbital, $(n + l) = 4 + 0 = 4$

for 3d - orbital, $(n + l) = 3 + 2 = 5$

114. (b) : The ideal gas equation is

$$PV = nRT \text{ where; } P = \text{pressure}$$

$$V = \text{volume; } T = \text{temperature}$$

$$R = \text{universal gas constant}$$

$$n = \text{no. of moles}$$

$$\text{Now if } T = \text{constant, then; } PV = \text{constant}$$

115. (a) : In an isothermal expansion, temperature is maintained constant so internal energy change is zero. ($\Delta E = 0$).

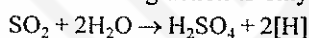
According to first law of thermodynamic,

$$\Delta E = q + w; \quad q = \text{heat, } w = \text{work done}$$

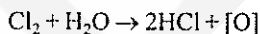
$$\Rightarrow q = -w$$

This shows that work is done by the system at the expense of heat absorbed.

116. (c) : SO_2 in presence of moisture acts as a bleaching agent. This is due to the reducing nature of SO_2 . But bleaching action is only temporary.



Similarly, Cl_2 in presence of moisture give out nascent, oxygen and cause bleaching.



here bleaching action is permanent.

117. (c) : The hydrolysis of sucrose by boiling with a mineral acid (HCl), produces a mixture of equal molecules of D-glucose and D-fructose. Sucrose

solution is dextrorotary, specific rotation = + 66.5°. But on hydrolysis, it becomes laevorotary. The specific rotation of D - glucose is + 52° and of D - fructose is -92°. Therefore, the net specific rotation of an equimolar mixture of both is :

$$\frac{+52^\circ - 92^\circ}{2} = -20^\circ \quad \therefore \text{laevorotary}$$

118. (a) : The N_2 molecule contains a triple bond $N \equiv N$ with a short bond length of 1.09 Å. This bond is very stable and the dissociation energy is very high (946 KJ mol^{-1}). This N_2 is inert at room temperature.

119. (d) : Bond order is the half of the difference between bonding and anti-bonding electrons. i.e.

$$B.O. = \frac{1}{2} \left[\left(\text{Number of } e^- \text{ in bonding M.O.} \right) - \left(\text{Number of } e^- \text{ in antibonding M.O.} \right) \right]$$

Greater the order, greater is the stability in the molecule.

120. (a) : Alkali metals have very low value of Ionisation energy as compared to other metals. So alkali metals easily get excited and impart to flame.

BIOLOGY

121. (c) : At high light intensity, high O_2 and high temperature, the mesophyll cells in the leaves of all C_3 plants exhibit high rates of photorespiration. C_3 plants, however, exhibit low rates of photorespiration. Phosphoglycolic acid is formed from RuBP in chloroplasts and it is then converted to glycolic acid. Glycolic acid translocates to a peroxisome. Within this cytoplasmic organelle, glycolic acid is oxidized to produce glyoxylic acid and hydrogen peroxide (H_2O_2). The glyoxylic acid is converted to the amino acid glycine with the liberation of O_2 . Two glycine molecules react to produce serine and CO_2 . In a mitochondrion the serine is metabolized to carbohydrates or incorporated into proteins.

122. (d) : In *Selaginella*, reduction division (meiosis) takes place both in microspore mother cell and megaspore mother cell, which forms haploid microspores and megaspores, respectively.

123. (a) : The term chromatophore is coined by Schmitz. This is one type of chromoplast found in some purple and non-purple photosynthetic bacteria.

Plastids \rightarrow Chromoplastids \rightarrow Chromatophore.

124. (d) : The sphere of living matter together with water, air and soil on the surface of earth is called biosphere. Atmosphere is the gaseous envelope surrounding a planet. Hydrosphere is the part of the

earth composed of water and lithosphere is the crust and mantle (solid portion) of earth.

125.(d) : Carcinoma is a malignant neoplasm of epithelial origin. It is a tumor that arises in the tissues that line the body's organ like nose, colon, breast, prostate, urinary bladder or ureter.

Leukaemias are cancers of the blood or blood forming organs. Sarcoma are tumors that originate in mesodermal tissue like bone, connective tissue, muscle, cartilage or fat. Lymphomas affect the lymphatic system, a network of vessels and nodes that acts as the body's filter.

126.(c) : *Recombination* is the process by which a recombinant chromosome is formed from two different parental cells. Three processes that lead to the formation of recombinant chromosomes are known to occur in bacteria. *Transformation* is the transfer of genetic information through the agency of free DNA. *Transduction* is the transfer of a portion of the DNA from one bacterium or makes physical contact with a female or recipient bacterium and transforms genetic elements into it.

Translation is not concerned with the bacterial genetic recombination. It is a step in protein synthesis.

127.(a) : The loss or excretion of water in the form of liquid droplets from the leaves and other parts of an uninjured or intact plant is called guttation. Guttation takes place through special structures called hydathodes.

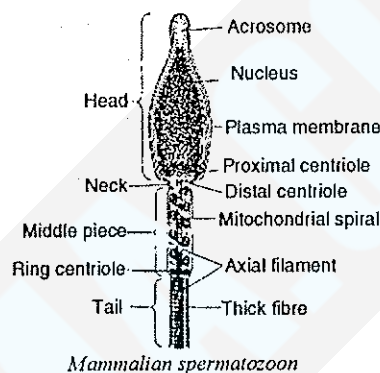
128.(b) : Moderate rainfall during summer produces grasslands. In desert, the rainfall is less than 10 inches which is very less for any type of vegetation. In tropical as well as temperate regions, the rainfall is suitable for grassland formation. In scrub forest, summer is dry and rainfall occurs in winter. In deciduous forest, leaves are fallen only once yearly.

129.(a) : Industrial melanism is an adaptation where the moths living in the industrial areas developed melanin pigments to match their body with the surroundings. It provides an excellent instance of operation of selection in natural conditions (natural selection). It first occurred in Britain.

130.(c) : Apospory is a phenomenon in which a somatic cell in the nucellus directly forms a gametophyte (*i.e.* embryosac) without-meiosis. Such gametophytes are diploid.

131.(c) : Middle piece of a mammalian sperm contains mitochondria. It is well-developed and numerous.

Nucleus is present at the sperm head or acrosome. Centriole is present at the neck region.

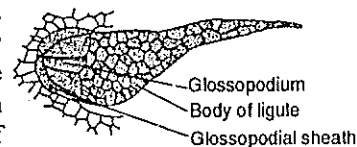


132.(a) : The black pigment in the eye, which reduces the internal reflection is known as retina. It is the innermost coat of the eyeball and it is a thin, light sensitive nervous layer. The external coat of the eyeball is known as sclerotic but in front of the sclerotic, there is a transparent connective tissue called cornea. Iris is the pigmented part present in front of choroid.

133.(a) : The placenta of human beings belongs to the category of *haemo-chorialis*. In this, maternal blood baths foetal chorionic villi directly. In *syndesmo-chorialis* placenta, the foetal and maternal components are fused so intimately as to result in a destruction of the uterine epithelium. In *endothelio-chorialis* placenta, the uterine mucosa is reduced and the chorionic epithelium comes in contact with the endothelial wall of maternal (uterine) blood vessel. *Epithelio-chorialis* type of placenta is of most primitive type.

134.(c) : Antiserum contains antibodies. The term antiserum is applied to materials prepared in animals. Antiserum is a serum containing antibodies with affinity for a specific antigenic determinant. They may result in cross-reactivity with recipient.

135.(d) : Ligule is a membranous, narrow outgrowths from the base of the leaves on the adaxial surface of



some Lycopphyta *e.g.* *Selaginella kraussiana* passing through the sheath. Ligule is usually inserted by a comparatively stout foot, the glossopodium in a definite socket, the ligular pit. Trichocysts are found in a member of dinoflagellates. Heterocyst is found in blue green algae, whose function

is to fix atmospheric nitrogen. Rhizophore is a leafless branch, intermediate in character between root and stem, which bears the roots, e.g. *Selaginella*.

136.(d) : Snails perform pollination in *Arisaema* (snake or cobra plant) and some arum lilies. Entomophily is the most common type of zoophily in which the pollen grains of ripe anthers of one flower are transferred to a mature stigma of another flower through the agency of insects like moths, butterflies, wasps, bees, beetles etc. Ornithophily is the mode of allogamy (cross pollination) performed by birds. Chiropterophily is cross pollination performed by bats.

137.(a) : *t*RNA is meant for transferring amino acids to ribosomes for synthesis of polypeptides. There are different *t*RNAs for different amino acids. Some amino acids can, however, be picked up by 2-6 *t*RNA. *m*RNA brings instructions from the DNA for the formation of a particular type of polypeptide. *r*RNAs help *t*RNA and *m*RNA in the synthesis of proteins over the ribosomes.

138.(a) : The stomata are found in the capsule of mosses. Each stoma leads into an air space below called the substomatal cavity.

139.(c) : In blue green algae (cyanophyta), filament consisting uniseriate or multiseriate chain of cells called as trichomes. Mycelium is a collective term used for mass of hyphae that constitutes vegetative part of a fungus. Hypha is filament of a fungus thallus colonies are formed by aggregation of many individuals.

140.(d) : Secretion of posterior pituitary is under neurosecretory nerve axons. Neurosecretory neurons are glandular, unmyelinated secretory cells with two functions. One of which is to synthesize and release neurohormones either directly into the general circulation (as in the case of neurosecretory neurons of the pars nervosa) or into a portal system.

141.(a) : Sensation of stomach pain is due to interoceptors which receive stimuli from inside of the body. Exteroceptors, such as the eye, ear, taste and cutaneous receptors, receive stimuli from outside the body. Proprioceptors measure the position of the limbs or the force of muscle contraction, receive stimuli from within the body. Teloreceptor is a sensory nerve terminal which is sensitive to stimuli originating at a distance, such nerve endings exist in the eyes, nerves and nose.

142.(a) : Addison's disease results from hyposecretion of adrenal. Addison's disease is a severe or total

deficiency of the hormones made in the adrenal cortex, caused by a destruction in the adrenal cortex. Classical Addison's disease results from a loss of both cortisol and aldosterone secretion due to the almost total destruction of both adrenal glands.

143.(c) : Galapagos islands are a chain of 14 islands in the Pacific ocean on the west coast of South America. Charles Darwin visited these islands during his famous voyage on HMS Beagle (name of his ship) in 1835. The flora and fauna of these islands resemble with those of the South American mainland with which the Galapagos islands were once connected. However birds of Galapagos islands (also called as Darwin's finches) do not resemble the birds of South America.

144.(d) : Pacinian corpuscles occur in the skin of certain parts of the body in mammals. There are encapsulated pressure receptors. Pacinian corpuscles are very rapid adapting pressure receptors in subcutaneous adipose tissue of both hairy and hairless vertebrate skin. They are also found in joint capsules, tendons etc.

145.(d) : Excess of pollen causes allergic reactions in several human beings. The common reactions are also collectively called *hay fever*. The important allergic pollen belong to *Amaranthus spinosus*, *Chenopodium album*, *Cynodon*, *Dactylon*, *Ricinus communis*, *Sorghum vulgare*, *Prosopis chilensis*.

146.(c) : Sympathetic nerves in mammals arise from thoraco-lumbar region. Nerves of the sympathetic system originate within the spinal cord of the thoracic and lumbar segments, but beyond the vertebrae each departs from the cord and turns ventrally in a short, white ramus to enter a sympathetic ganglion.

147.(c) : Nucleolus is a naked, round or slightly irregular structure which is attached to the chromatin at a specific region called nucleolar organiser region. Plasmids are additional rings of DNA in bacteria which can replicate independently. Karyolymph or nucleoplasm is a transparent, semifluid and colloidal substance which fills the nucleus.

148.(b) : The first pesticide was discovered by Millardet in 1882. It is known as Bordeaux mixture. In 1878 Millardet of the university of Bordeaux, France, found that downy mildew of grape-vine orchards was absent in areas where the plants were sprayed with copper sulphate alone or mixed with lime to prevent pilferage.

149.(b) : Totipotency or cellular totipotency is the ability of a living somatic nucleated cell to form the complete organism. Theoretically all somatic cells should be totipotent since they carry the full gene complement of the individual. Tissue culture is the technique of maintaining and growing plant cells, tissues or organs aseptically on artificial medium in suitable containers under controlled environmental conditions.

150.(d) : The relationship in an ecosystem can be depicted in pyramid of energy, pyramid of biomass, pyramid of numbers etc. *Pyramid of number* depicts the number of individual organisms at different trophic levels of food chain. The biomass of the members of the food chain present at any one time forms the *pyramid of biomass*. When production is considered in terms of energy, the pyramid indicates the amount of energy flow at each level. This is called *pyramid of energy*.

151.(a) : Cellobiose is the repeating disaccharide unit of cellulose having the glycosidic linkage β (1 \rightarrow 4); its full name is thus 4-O- β -D-glucopyranosyl D- α -glucopyranose.

152.(b) : Milk of coconut or coconut water (liquid endosperm) may be widely used in culture medium because it contains several plant growth substances. It can be extracted easily.

153.(a) : Phloem is a complex plant tissue which transports organic food inside the body of the plant.

154.(b) : Phytotron is building in which plants can be grown on a large scale in a range of rigidly controlled conditions of light, temperature of air and soil, humidity and composition of air water and nutrient content of soil etc. Individual controlled environment chambers, a common feature of most botanical laboratories, provide more limited, small scale control of environment. Both types of facility can be of immense value in experimental investigations of plant growth.

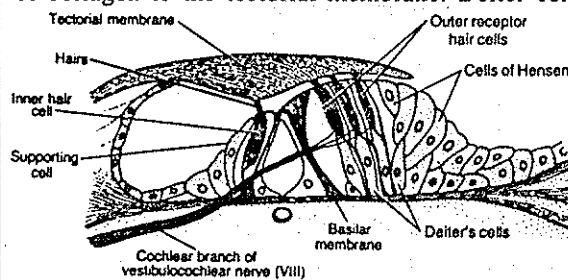
155.(c) : *mRNA* is messenger RNA which brings coded information from DNA and takes part in its translation by bringing amino acids in a particular sequence during the synthesis of polypeptide. However, the codon of *mRNA* are not recognised by amino acids but by anticodons of their adaptor molecules (*tRNA* \rightarrow aa-*tRNAs*). Translation occurs over the ribosomes. The same *mRNA* may be used again and again. In the form of polysome, it can help in synthesis of a number of copies simultaneously.

156.(c) : The root knot nematodes, *Meloidogyne sppare* are the most dominant group of plant parasitic nematodes in almost every vegetable field and cause enormous losses every year in the nursery. The common species are *Meloidogyne arenaria*, *M. incognita* and *M. javanica*. The pathogen responsible for smut of Bajra is *Tolyposporium penicillariae*. *Ustilago hordei* causes covered smut of barley and *Ustilago nuda* causes loose smut of Barley. The causal organism of late blight of potato is *Phytophthora infestens*.

157.(d) : Passive immunity is defined as immunity achieved through the sera of other animals enriched in antibodies. It is resistance, based on antibodies preformed in another host. Administration of antibody against diphtheria, tetanus, botulism etc. makes large amounts of antitoxin immediately available to neutralize the toxins. The main advantage of this is the prompt availability of large amount of antibody. e.g. Tetanus, rabies, hepatitis etc.

158.(d) : The structure, which remains unchanged during metamorphosis in frog's tadpole, is nervous system. Metamorphosis in frog is a thyroxin mediated process during which changes occur in the structure of lung, heart and intestine, but there is no such a severe change in nervous system. Only, brain acquires its normal shape and size.

159.(c) : Cells of deiter occur in organ of Corti. These are the supporting cells present in three rows in organ of corti. It also appears to contribute lesser amount of collagen to the tectorial membrane. Deiter cells



Organ of Corti

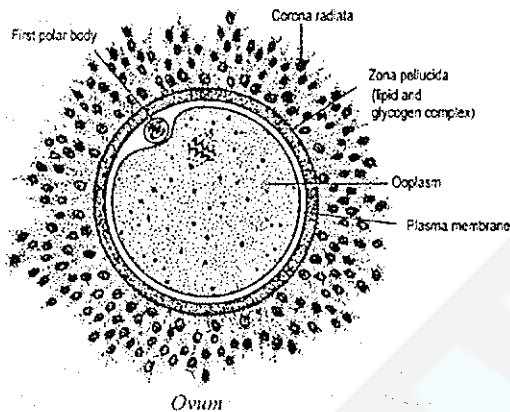
present towards the cochlea forms the rods of corti. Its main function is to hold the organ of corti together.

160.(a) : The cells named podocytes occur in glomerulus of kidney. Podocytes play an important role in glomerular differentiation. The podocyte forms the filtration barrier in the glomerulus. In addition podocytes have a role in the characteristic arrangement

of cytoskeletal proteins and intermediate filaments in the formation of foot processes.

161.(d) : Organophosphates are organic esters of phosphoric acid and its derivatives. The important organophosphates used as pesticides include malathion, parathion and fenitrothion. Malathion is an ingredient of finit (flit).

162.(c) : Just after ovulation, the layer forms around the ovum is called corona radiata. It is formed by the granulosa cells of cumulus oophorus. It probably increases the likelihood that the ovum will be picked up in the uterine tube.



163.(b) : Treatment with "Alloxan" destroys β cells of islets of Langerhans.

Alloxan induces damage and death of pancreatic islet cells thus causing insulin dependent diabetes mellitus. Alloxan leads to the formation of reactive oxygen species, targeting the plasma membrane, mitochondria and DNA. The exposure of cells to alloxan together with a reducing agent created cellular oxidative stress through extracellular formation of superoxide anion radicals.

164.(b) : Distance between two linked genes upon a chromosome is measured in cross over units, or the cross over value. Cross over unit is the percentage of meiotic products that are recombinant in an organism heterozygous at each of two linked loci. In diploid organisms, most easily measured method is by crossing the double heterozygote to the double recessive. The percentage can never exceed 50%. This value gives the map distance between the two loci, used in chromosome mapping.

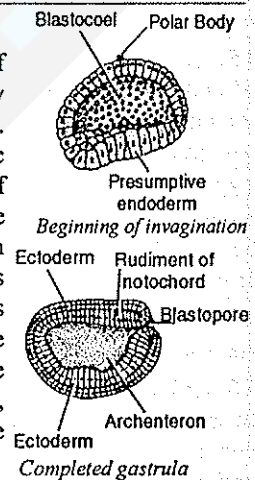
165.(b) : The genes present on the differential region of Y-chromosome are called holandric genes. They

are passed directly from male parent to male offspring. Gene which has undergone mutation within the particular stock of organisms is called mutant gene. Chromosome which is not a sex chromosome is called autosomal chromosome. Sex-linked genes are genes having special distribution with reference to sex as a result of being carried on the X-chromosome.

166.(c) : Eggs having yolk in their centre of cytoplasm in peripheral layer, are called *centrolecithal*. It is found in some insect and Hydrozoa. In *microlecithal* eggs, the amount of yolk is so little that it is found scattered almost uniformly throughout the egg cytoplasm. Such eggs with evenly distributed yolk in ooplasm is called *isolecithal*. *Microlecithal* eggs are with very small amount of yolk and *telolecithal* eggs have a polarised distribution of yolk.

167.(d) : Arbor vitae is tree like disposition of the gray and white matter in the cerebellum.

168.(c) : Termination of gastrulation is marked by obliteration of blastocoel. Gastrulation is an embryonic process that ensembles of processes during post-cleavage early development which when completed has brought the cells that will form the various organs to the places where those organs are to be formed. At the termination of gastrulation, archenteron is formed at the place of blastocoel.

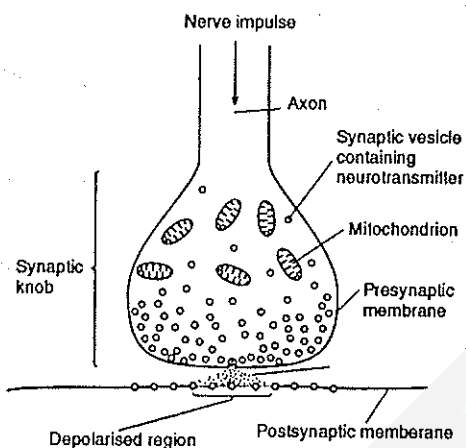


169.(c) : Mechanism of uric acid excretion in a nephron is secretion. As blood passes through the kidneys, the nephrons clear the plasma of some substances (e.g. urea/uric acid) while simultaneously retaining other, essential substances (water). Substances to be excreted are removed by glomerular filtration and renal tubular secretion and passed into the urine. Secretion refers to the transport of solutes from the peritubular capillaries to the tubular lumens.

170.(a) : Most primitive living mammals, which provide an evidence of organic evolution from geographical distribution are found in China.

171.(a) : Transmission of the nerve impulse across synapse is accomplished by neurotransmitter. Transmission across a synapse usually requires neuro-

transmitters because there is small space *i.e.* synaptic cleft separates one neuron from another. Most synaptic transmission is carried by a chemical called neurotransmitter. There are low molecular mass substances released in minute amounts at interneural,



Structure of a synapse

neuromuscular and neuroglandular substances. Most wide spread transmitter is acetylcholine.

172.(a) : All terrestrial mammals are air breathers. Because of terrestrial habitat, they have well developed lungs for air breathing. As external respiration takes place in terrestrial animals, three conditions are necessary for this purpose, (i) there should be a large vascular surface with thin blood capillaries, (ii) The membrane of the respiratory surface should be thin and should remain moist (iii) there should be a respiratory pigment and a respiratory medium. All these purposes are successfully served by lungs. Thus well developed lungs make the terrestrial animals air breathers.

173.(c) : There is no chance of transmission of malaria to man on the bite of a male *Anopheles* mosquito. The mouthparts of male mosquito is organised in such a manner that they can't suck the human blood. They feed mainly on the leaf and fruit juices. Thus spreading malaria through male *Anopheles* is next to impossible.

174.(c) : Thiamin deficiency results in beri-beri causing paralysis.

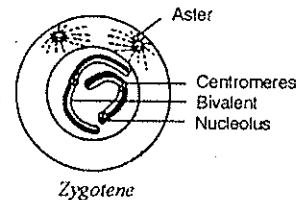
Thiamin or vitamin B₁ is an antineuritic vitamin. Its deficiency causes beri-beri which is characterised by loss of appetite and weight, retarded growth, degeneration of nerves and muscle atrophy, thus in acute cases leads to paralysis.

175.(d) : There are important roles of many minerals as the biologically active substances in the sodium, chlorine, potassium, calcium, phosphorus, iron, iodine, copper, zinc, cobalt etc.

As for example, deficiency of iron in some persons leads to anaemia. Deficiency of iodine leads to goitre and deficiency of fluorine leads to dental caries, thus each of the minerals perform specific role in the body. Their deficiency or excess may evolve several symptoms.

176.(c) : *Psophocarpus tetragonolobus* (winged bean) is a nitrogen fixing herbaceous bean found in tropical Asia. It is also called as Goa bean. All parts of the plant are edible and rich in protein. Ripe seeds are roasted and eaten like peanuts. They contain 34-40% protein and 18% oil. Their nutritive value is similar to that of soyabeans.

177.(b) : Meiosis is a double division which occurs in a diploid cell (or nucleus) and gives rise to four haploid cells (or nuclei), each having half the number of chromosomes as compared to the parent cell. While mitosis give rise to two daughter cells, which are identical to each other as well as to the parent cell. Meiosis gives rise to four daughter cells. These four cells, though resemble each other with respect to chromosome number, they differ, since paternal and maternal chromosomes would reassort during first division and these would give rise to new types due to exchange of chromosome segments. Synapsis occurs during zygotene of meiosis. The



two homologous chromosomes get attached to each other, and the process of attachment is known as synapsis. It produces a complex known as synaptonemal complex.

178.(a) : Apical dominance is the phenomenon by which presence of apical bud does not allow the nearby lateral buds (auxillary buds) to grow. When the apical bud is removed, the auxillary buds sprout.

179.(d) : Lysosomes are found in animal cells whereas photorespiration is the process occurs in plant cell. Lysosomes are small vesicles which are bounded by a single membrane and contain hydrolytic enzymes in the form of minute crystalline or semicrystalline granules of 5-8 nm. They are also called acid hydrolases because these digestive enzymes usually function in acidic medium or pH less than 7.

180.(a) : The fungi of endotrophic mycorrhiza invade the cells of the root cortex, with a portion lying externally as a loose mass of hyphae in the soil. These mycorrhizas are found in the families of Ericales, Orchidaceae and Gentiaceae. Mycorrhizas cause considerable stimulation to growth in nutrient deficient soils. The greatest stimulation occurs in the uptake of phosphates. Mycorrhizas can take up phosphate at that low concentrations at which they are unavailable to non-mycorrhizal roots.

GENERAL KNOWLEDGE

181.(b) : In 1927, the British government announced the appointment of a statutory commission. The purpose of which was to probe in functioning of the reforms to be introduced in India by the act of 1899.

182.(d)

183.(c) : 'JAVA' is a computer programming language which is very useful in computer networking.

184.(c)

185.(a) : 'Frank Worrell' was associated with cricket and he was playing from the West Indies side.

186.(c)

187.(a) : King Khalid International Airport outside Riyadh is the largest airport in the World.

188.(b)

189.(d) : Commonwealth games 1998 were hosted at Kuala Lumpur, the capital of Malaysia. The participants are the countries, who are the member of the common wealth, the erstwhile colonies of England.

190.(b)

191.(c) : 'Sambalpur' city is situated in Orissa and Mahanadi is the main river of Orissa. The largest dam of India is built on Mahanadi.

192.(b)

193.(c) : At present, eighth-five year plan has been completed. First five-year plan was started in 1951-1956 and the eight's plan was between 1992-97. The duration of sixth five year plan was between 1980-85.

194.(c)

195.(a) : Currencies of Turkey, Vietnam, Spain and Philippines are Lira, Dong Piastre, Peseta and Peso respectively.

196.(a)

197.(a) : Broken wing, Chitra, Gandevta and Great Tragedy was written by Sarojini Naidu, Rabinder Nath Tagore, Tara Shankar and Z.A. Bhutto respectively.

198.(a)

199.(d) : 'Ellora' is the biggest and one of the oldest evidence of ancient culture and traditions. It is situated near Aurangabad (Maharashtra).

200.(d)

