SOLUTIONS

PHYSICS

1. (b) : Velocity of photons (c) = $\upsilon \lambda \propto \upsilon$. Therefore velocity ($c$) is proportional to frequency (υ).

2. (b)

3. (b) : In an inelastic collision, the kinetic energy is not conserved but linear momentum is conserved. In this sort of a collision there is loss in K.E. of the system.

4. (a)

5. (c) : Given: Initial temperature of metal rod (T_1) = 150°C = 423 K; Rate of radiated energy (E) = 20 W and final temperature (T_2) = 300°C = 573 K. We know from the Stefan's law $E \propto T^4$ or $\frac{E_1}{E_2} = \left(\frac{T_1}{T_2}\right)^4 = \left(\frac{423}{573}\right)^4$ = 0·293. Therefore final radiated energy

$$(E_2) = \frac{E_1}{0\cdot293} = \frac{20}{0\cdot293} = 68\cdot3 \text{ W.}$$

6. (d)

7. (d) : Given:Charge (Q) = $50e = 50 \times (1\cdot6\times10^{-19})$ C; Distance of proton from nucleus (r) = 10^{-12} m and charge on proton (e) = $1\cdot6 \times 10^{-19}$ C. We know that potential

$$(V) = \frac{1}{4\pi\varepsilon_0} \times \left(\frac{Q}{r}\right) = 9 \times 10^9 \times \frac{50\times1\cdot6\times10^{-19}}{10^{-12}}$$
$$= 7\cdot2 \times 10^4 \text{ V.}$$

8. (d) : According to Bohr's principle, the radius of orbit

$$(r) = \frac{\varepsilon_0 n^2h^2}{\pi\ mZe^2} \propto n^2$$

where n = principal quantum number.

9. (d)

10. (a) : Given: Internal resistance of the cell (r) = 0·1 Ω; E.M.F. of the cell (E) = 2 V and external resistance (R) = 3·9 Ω. We know that voltage (V) = $E - Ir$

$$= E - \frac{E}{R+r}\cdot r = 2 - \frac{2}{3\cdot9+0\cdot1}\times0\cdot1 = 1\cdot95 \text{ V.}$$

11. (a)

12. (b) : When one α-particle is absorbed and one neutron is emitted then the balance equation shows that resulting nucleus will be carbon. The balance equation is

$${}_4Be^9 + {}_2He^4 \rightarrow {}_0n^1 + {}_6C^{12}.$$
(α-particle) (neutron)

From this equation, we find that atomic weight is 12 and atomic mass number is 6. Since both these values are meant for carbon (C), therefore resulting nucleus will be, ${}_6C^{12}$.

13. (c) : The output of the given logic circuit is

$$Y = \overline{\overline{A} + B + \overline{C}}$$
$$\Rightarrow \overline{Y} = \overline{A} + B + \overline{C}$$

So, applying De Morgan's theorem,

$$\overline{\overline{Y}} = \overline{\overline{A}}\,.\,\overline{B}\,.\,\overline{\overline{C}}$$
$$\Rightarrow Y = A\,\overline{B}\,C$$

∴ The given circuit will perform the logic operation $A\,\overline{B}\,C$.

14. (a) : Given: No. of wires = 10 and resistance of each wire = 1 Ω. We know that relation for equivalent resistance of wires connected in parallel

$$\frac{1}{R_{eq}} = \underbrace{\frac{1}{1}+\frac{1}{1}+\frac{1}{1}+\cdots\cdots+\frac{1}{1}}_{10 \text{ terms}}$$

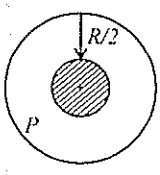
$$\therefore R_{eq} = \frac{1}{10} = 0\cdot1\,\Omega.$$

15. (b)

16. (c) : Given: Weight of the body on the earth's surface (W) = 50 N and depth $(d) = \frac{R}{2}$. We know that weight of the body at a distance (d) from the surface of the earth = $W\left(1-\frac{d}{R}\right) = 250\times\left(1-\frac{R/2}{R}\right) = 250\times\frac{1}{2}$ = 125 N.

Aliter : Given: Weight of the body on the surface of the earth

mg = 250 N



When we move down a distance $R/2$ towards the earth's centre, the value of acceleration due to gravity decreases. First let's calculate the value of acceleration due to gratvity at a depth $R/2$ below the surface. What we have to remember here is that the whole mass of the earth is not going to be effective at a depth of $R/2$. Let, ρ be the uniform mass density of the earth. Then the effective mass of earth at a depth $R/2$ below is

$$M' = \frac{4}{3}\pi\left(\frac{R}{2}\right)^3 \times \rho = \frac{4}{3}\pi R^3\rho \times \frac{1}{8} = \frac{M}{8}$$

Where M = mass of earth on the surface

Now $$g' = \frac{GM'}{\left(\frac{R}{2}\right)^2} = 4\,\frac{GM'}{R^2} = 4 \times \frac{GM}{8R^2} = \frac{g}{2}$$

$$\Rightarrow mg' = \frac{mg}{2} = \frac{250}{2} = 125 \text{ N}$$

17. (d) : If a current I in a conductor is uniformely distributed over the area of cross-section (A) of the conductor, then the ratio I/A is called the current density at any point on the area. It is represented by joule. Its unit is amp/m^2 and it is a vector quantity.

18. (a)

19. (b) : Crystalline solids have regular periodic arrangements of particles. They are anisotropic and have different properites in different directions.

20. (a) : Given: Mass of the disc = M and radius = R. We know that moment of inertia of a disc about diameter = $\frac{1}{4}MR^2$. And from the theorem of parallel axes, the required moment of inertia = $\frac{1}{4}MR^2 + MR^2$

$$= \frac{5}{4}MR^2.$$

21. (c)

22. (a) : Given: Initial temperature (T_1) = 273 K; Initial volume (V_1) = V; Final volume (V_2) = 81 V and γ = 1·25. We know that under adiabatic condition $T_1V_1^{\gamma-1} = T_2V_2^{\gamma-1}$ or $\frac{273}{T_2} = \left(\frac{V_2}{V_1}\right)^{\gamma-1} = \left(\frac{81V}{V}\right)^{1\cdot25-1} = (81)^{0\cdot25} = 3$ or $T_2 = \frac{273}{3} = 91$ K = – 182°C (where T_2 is the final temperature of the gas).

23. (d) : This is a case of balanced wheatstone bridge. Since the resistances in upper and lower arms are in series, therefore equivalent resistance in upper arm (R) = $R_1 + R_2$ = 20 + 20 = 40 Ω and equivalent resistant of lower arm R' = $R_3 + R_4$ = 20 + 20 = 40 Ω. Now the equivalent resistances R and R' are in parallel. Therefore their resultant resistance

$$R'' = \frac{40 \times 40}{40 + 40} = \frac{1600}{80} = 20\ \Omega.$$

24. (d) : Given: Wavelength (λ) = 10^{-10} m and atomic spacing (d) = 2 × 10^{-10} m. We know from the Bragg's law, $2d\sin\theta = 2\lambda$ or $\sin\theta = \frac{\lambda}{d} = \frac{10^{-10}}{2\times10^{-10}} = 0\cdot5$. Therefore $\theta = \sin^{-1} 0\cdot5 = 30°$.

25. (a)

26. (c) : Given: Power of heater (P) = 100 W and time (t) = 2 min = 120 sec. We know that work done to produce heat (W) = $P \times t$ = 100 × 120 = 12000 J

$$= \frac{12000}{4\cdot2\times1000} = 2\cdot8 \text{ kcal.}$$

27. (d)

28. (b) : Given: Power of first lens (P_1) = + 1·5 D and power of second lens (P_2) = + 1·0 D. We know that power of the combination (P) = $P_1 + P_2$ = 1·5 + 1·0 = 2·5 D.

29. (d)

30. (b) : Given: Temperature (T_1) = 1000 K; Wavelength at maximum radiation $\lambda = \lambda_m$ and final temperature (T_2) = 2000 K. We know from the Wein's displacement law $\lambda_m \times T$ = constant. Therefore when the temperature is doubled, the peak will shift to half the original value.

31. (d) : On an artificial satellite orbiting the earth the acceleration is given by $\frac{GM}{R^2}$ towards the centre of the earth. Now for a body of mass m on the satellite the graviational force due to earth is $\frac{GMm}{R^2}$ towards the centre of the earth. Let the reaction force on the surface of the satellite be N, then

$$\frac{GMm}{R^2} - N = m\left(\frac{GM}{R^2}\right)$$

$$\Rightarrow N = 0$$

That is on the satellite there is a state of weightlessness or g = 0

$\therefore$ The time period of the simple pendulum,

$$T = 2\pi\sqrt{\frac{I}{g}} = \infty$$

32. (d) : Given: Time period (T) = 4 sec and displacement $(y)=\frac{a}{2}$ or $\frac{y}{a}=\frac{1}{2}$. We know that displacement equation $(y)=a\sin\frac{2\pi}{T}t$ or $\frac{y}{a}=\sin\frac{2\pi}{T}t$ or $\frac{1}{2}=\sin\frac{2\pi}{T}t$ or $\frac{2\pi}{T}t=\sin^{-1}\frac{1}{2}=\frac{\pi}{6}$ or $t=\frac{T}{12}=\frac{4}{12}=\frac{1}{3}$ sec (where t is the interval of time).

33. (b)

34. (d) : Given: Mass of body (m) = 5 kg; Height of the body (h) = 10 m and force (F) = 170 N. We know that work done by the force = $F \times h = 170 \times 10 = 1700$ J and potential energy = $mgh = 5 \times 10 \times 10 = 500$ J. Now kinetic energy of the body (K.E.) = 1700 – 500 =1200 J. Therefore if the velocity of the body is v, then kinetic energy $1200 = \frac{1}{2}mv^2 = \frac{1}{2}\times 5\times v^2$ or $v^2 = \frac{1200\times 2}{5} = 480$ or $v = \sqrt{480} \cong 22$ m/s.

35. (c) : We know that the resolving power of a microscope is given by

$R=\frac{2\mu\sin\theta}{\lambda}$ Where μ = the refractive index of the medium between the object and the objective

θ = angle subtended by the radius of the objective on any one object

λ = wavelength of light used

$\therefore$ for greater accuracy, wavelength of light used should be smaller, or conversely, the frequency of the light should be higher.

36. (d) : Given: Mass of star = M and radius of the star = R. We know that escape angular velocity of the star

$$(\omega_e)=\frac{v_e}{R}=\frac{1}{R}\sqrt{\frac{2GM}{R}}=\sqrt{\frac{2GM}{R^3}}.$$

$$\left(\text{where escape velocity } (v_e)=\sqrt{\frac{2GM}{R}}\right).$$

37. (d) : When light of suffciently high energy (greater than the work function) falls an a metal, there is a chance that photoelectric effect takes place, *i.e.*, an electron might come out of the metarial surface. Now the energy of the electron that comes out will depend upon how much energy it loses in the process of collision inside the metarial surface. The kinetic energy of the electron is given by

$K.E. = h\upsilon - h\upsilon_0$ – (Energy loss due to internal collisions)

Now in the most ideal case, if the energy loss is 0 then $K.E.$ is $K.E._{max}$ *i.e.*

$K.E._{max} = h\upsilon - h\upsilon_0$

And in the worst case, Energy loss = $hv - hv_0$, then $K.E. = 0$

Hence, the photo electrons coming out of the cathode have an energy spread with an upper limit.

38. (b) : If two charges are of the same sign, they repel each other. Thus if two electrons are brought closer, some work is done against the force of repulsion. Therefore the electric potential energy of the system increases.

Aliter : 

Mathematically, the potential due to one electron at the position of the other electron is $\frac{-Ke}{r}$ and hence the potential of the other electron $=-\frac{Ke(-e)}{r}=\frac{Ke^2}{r}$, where r is the distance between the two electrons. Now if r decreases, $P.E.$ increases.

39. (a)

40. (a) : Given: Frequency of fundamental note when tube is closed (n_1) = 512 Hz. We know that frequency of fundamental note for closed organ pipe (n_2) = $\frac{v}{2l}$ and for open pipe (n_1) = $\frac{v}{4l}$ or $n_2 = 2n_1 = 2 \times 512 = 1024$ Hz.

41. (b) : Phosphorous is pentavalent and silicon is tetravalent. Therefore when it is doped with pentavalent impurity, it forms a n-type semiconductor.

42. (b) : Given: Initial number of cells (n_1) = 10; Potential of each cell = E; Internal resistance of each cell = r and final number of cells (n_2) = 3. We know from the Ohm's law, total voltage of ten cells = $10\times E=10E$ and total resistance in ten cells = $10 \times r = 10r$. Therefore current in the circuit (I) = $\frac{10E}{10r}=\frac{E}{r}$ or potential difference across three cells = $I \times 3r = \frac{E}{r}\times 3r = 3E$.

(Since the voltmeter is ideal, therefore it will read $3E$).

43. (d) : Given: Inductance (L) = 0·01 H and frequency (n) = 50 Hz. We know that the reactance (X_L) = ωL = $2\pi n \times L = 2 \times \pi \times 50 \times 0{\cdot}01 = 3{\cdot}14\ \Omega$.

44. (d) : Given: Wavelength (λ_0) = 720 nm and refractive index (μ) = 1·5. Since the velocity of light in a medium is given by $C = n\lambda$ and n remaining same for different media we have,

$$n = \frac{c}{\lambda} = \frac{c'}{\lambda'}$$

$$\therefore \lambda' = \frac{c'\lambda}{c}$$

Again $c' = \frac{c}{\mu}$

Hence $\lambda' = \frac{\lambda}{\mu}$

c = speed is vacuum

c' = speed in medium

μ = refractive index of the medium

Therefore, wavelength of the ray in glass

$(\lambda) = \frac{\lambda_0}{\mu} = \frac{720}{1{\cdot}5} = 480$ nm.

45. (b) : Given: Half-life $(T)_{1/2}$ = 20 years; Initial mass of element (N_0) = 10 g and final mass of element (N) = 2·5 g. Let the number of half-lives needed for the material to bring it down to 2 g from 10 g be n. We know that the final mass of element is given by

$$N = N_0\left(\frac{1}{2}\right)^n$$

$$\Rightarrow \frac{N}{N_0} = \left(\frac{1}{2}\right)^n \Rightarrow \frac{2{\cdot}5}{10} = \left(\frac{1}{2}\right)^n$$

$$\Rightarrow \left(\frac{1}{2}\right)^2 = \left(\frac{1}{2}\right)^n \Rightarrow n = 2$$

Therefore time taken to disintegrate the element from the block (t) = $(T)_{1/2} \times n$ = 20 × 2 = 40 years.

46. (a) : Given: Initial temperature (T_1) = 27°C = 300 K; Final temperature (T_2) = 327°C = 600 K and initial average kinetic energy (E_1) = E. We know that average kinetic energy (E) = $\frac{3}{2}kT \propto T$. Therefore $\frac{E_1}{E_2} = \frac{T_1}{T_2}$ = $\frac{300}{600} = \frac{1}{2}$ or $E_2 = 2E_1 = 2E$ (where E_2 is final kinetic energy).

47. (b) : Strain = $\frac{\text{Extension in length}}{\text{Original length}} = \frac{[L]}{[L]} = [L^0]$.

Therefore strain is a dimensionless quantity.

48. (a) : Given: Initial tension in the piano wire (T_1) = 10 N; Initial frequency of note (n_1) = n and final frequency of the note (n_2) = $2n$. We know that frequency (n) = $\frac{1}{2\pi}\sqrt{\frac{T}{m}} \propto \sqrt{T}$. Therefore $\frac{n_1}{n_2} = \sqrt{\frac{T_1}{T_2}}$ or $\left(\frac{n}{2n}\right)^2 = \frac{10}{T_2}$. Therefore final tension $\frac{1}{4} = \frac{10}{T_2}$ or T_2 = 10 × 4 = 40 N.

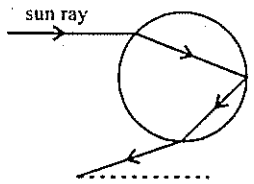
49. (c) : Given : Initial temperature (T_1) = 27°C = 300 K; Final temperature (T_2) = 627°C = 900 K and initial volume (V_1) = 4 m^3. We know from the Charle's law

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \text{ or } V_2 = V_1 \times \frac{T_2}{T_1} = 4 \times \frac{900}{300} = 12 \text{ m}^3.$$

50. (a) : Gravitationalconstant(G)

$$= \frac{(\text{Force})(\text{Distance})^2}{(\text{Mass})^2} = \frac{[MLT^{-2}][L^2]}{[M]^2}\ [M^{-1}L^3T^{-2}].$$

51. (a) : The rainbow is seen during or after raining as there are lot of water droplets suspended in the air at that time. As the rainbow is caused by the total internal reflection of the sunlight from the droplets, the final ray is in the backward direction and so one always sees a rainbow in a direction opposite to the sun.



52. (b) : During sunrise and sunset, the ray of light from the sun has to travel a longer distance to reach the eyes. As only longer wavelengths can reach the eyes, the angle subtended by the rays of light on the retina is greater than that during the day. That's why the sun looks bigger during sunrise and sunset.

53. (a)

54. (b) : The human eye has the capacity to suitably adjust the focal length of the eye and is done with the help of the cilliary muscles. These muscles get relaxed when we see an object at a distance. And they get strained when we view close by. But these muscles cannot get strained more than a certain limit and that's why we cannot see an object clearer if it is closer than a certain minimum distance from the eye known as the 'least distance for clear vision'.

55. (a)

56. (c) : In case the circuit inside becomes faulty, an electric appliance might end with some charge. Because of which on touching the appliance, the user might

get a shock. The third pin provided is for grounding purpose so that all accumulated charges might get discharged to the ground and the appliance remains safe. Now appliances like heater, where there can be more charge accumulation than the electric bulb, grounding is a must. That's why, electric appliances with metallic body, such as heaters have three pin connections.

57. (c) : The buoyancy of an object is the resultant of all the contact forces that are present at the points of contanct of the body and the fluid and is perpedicular to the surface at that point. Hence the force of buoyancy depends upon the area of contact of the body with the fluid. The force of buoyancy is more in case of the needle than in the case of the ball. Now it might so happen that the force of buoyancy (B) is greater than the weight (mg) of the needle, in which case the needle might float. But in the case of the ball, $B < mg$, and so the ball sinks.

58. (a) : The third pin is used for grounding purposes so that it leaves the user safe while handling the appliance by making the extra charge on it get discharged.

59. (c) : Since the escape velocity on the surface of the moon is much less than that on earth, so the water molecules get evaporated faster.

60. (b)

CHEMISTRY

61. (a) : Charge = Current × time
$= 1 \times 60 = 60$ coulombs

Charge carried by one electron $= 1.6 \times 10^{-19}$C

No. of electrons $= \frac{60}{1.6\times10^{-19}} = 3.74 \times 10^{20}$

62. (d) : The black substance obtained is a mixture of mercury and mercuric aminochloride.

$$Hg_2Cl_2 + 2NH_4OH \longrightarrow \underbrace{Hg\begin{matrix}NH_2\\Cl\end{matrix}}_{\text{Black}} + Hg + NH_4Cl + H_2O$$

63. (d) : Applying the equation :

$$pH = \log\frac{[Salt]}{[Acid]} + pK_a$$

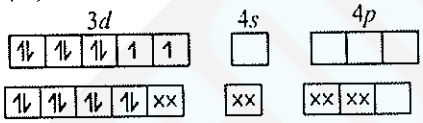
$\Rightarrow$ Here, $pH = pk_a + \log 1$, $pH = 4.75$

64. (c) : Oxygen is oxidised at anode while Cu^{2+} is reduced at cathode. Therefore copper deposits on cathode and oxygen is evolved at anode.

65. (a) : Corrosion or rusting is a surface phenomenon and thus Iron is protected by coating it with a thin film of Zn which is inert to moisture and air by a process called Electroplating.

66. (b) : According to Le-Chateliar Principle increase in pressure will favour the direction where there are lesser no. of species.

67. (a) : $Ni^{2+}(d^8)$:



$\therefore$ dsp^2 hybridisation and square planer structure.

68. (c) : Non-existence of PbI_4 can be explained on the basis of strong oxidising nature of Pb^{4+}. The I^- ions are reducing agents, i.e., in presence of this ion, Pb^{4+} ion is reduced to Pb^{2+} ion.

$Pb^{4+} + 2I^- \rightarrow Pb^{2+} + I_2$.

69. (b) : The Avogadro's law states that same volume of all gases at the same temperature and pressure, contain equal number of molecules. Hence ratio of volumes must be 1 : 1.

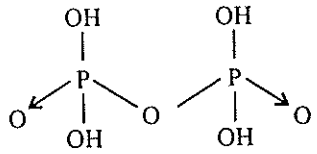
70. (c) : Pyrophosphoric acid : $H_4P_2O_7$

Let Oxidation state of P be x

$\Rightarrow 4 \times (+1) + 2x + 7 \times (-2) = 0$

$\Rightarrow 4 + 2x - 14 = 0$

$\Rightarrow x = +5$



basicity of acid is four.

71. (c) : As $K_p = K_c(RT)^{\Delta n}$

So if Δn = +ve then only, $K_p > K_c$

Where Δn is the difference in number of moles of gaseous products of gaseous reactants.

72. (a) : Nuclear fission is the break up of large unstable nuclei to give smaller more stable nuclei with the release of large amount of energy.

73. (a) : Cu (Z = 29) : $[Ar]4s^13d^{10}$

Cu^{2+} : $[Ar]3d^9$.

74. (b) : Dacron is formed by condensation of ethylene glycol and dimethyl terephthalate with the elimination of CH_3OH molecules.

$HOCH_2CH_2OH + CH_3OOC-C_6H_4-COOCH_3 \xrightarrow{Heat}$

$(CH_2CH_2-OOC-C_6H_4-COO)_n + CH_3OH$

Dacron

75. **(d) :** When $KClO_3$ is heated with conc. HCl, a mixture of chlorine and chlorine dioxide is obtained [called Euchlorine]

$[KClO_3 + HCl \rightarrow KCl + HClO_3] \times 2$

$2HClO_3 + 2HCl \rightarrow 2ClO_2 + Cl_2 + 2H_2O$

$2KClO_3 + 4HCl \rightarrow 2KCl + 2ClO_2 + Cl_2 + 2H_2O$

76. **(a) :** $CHCl_3 + HNO_3 \rightarrow CCl_3NO_2$

Cloropicrin

(Tear gas)

77. **(b) :** $CH_3CN \xrightarrow[H_2O]{H^+} CH_3 - CO - NH_2 \xrightarrow[H_2O]{H^+} CH_3COOH + NH_3.$

(Acetic acid)

78. **(c) :** $\overset{3}{Cl_3C} - \overset{2}{CH_2} - \overset{1}{CHO}$

IUPAC name is :

3, 3, 3 – trichloropropanal

79. **(c) :** Given: Weight of magnesium = 4 gm, We know that $\frac{\text{Weight of silver displaced } (M)}{\text{Weight of magnesium}}$

$= \frac{\text{Equivalent weight of silver}}{\text{Equivalent weight of magnesium}}$ or $\frac{M}{4} = \frac{108}{12}$

or $M = \frac{108 \times 4}{12} = 36$ gm.

80. **(d) :** $NH_4^+ + OH^- \rightarrow NH_3 + H_2O$

To the aqueous solution of ammonium salt when Nessler's reagent is added, brown coloured precipitate is formed.

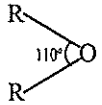
$K_2HgI_4 + NH_4Cl + 4KOH \longrightarrow$ $Hg(NH_2)OHgI$ (Brown ppt.) $+ KI + KCl + H_2O$

(Nessler's reagent)

81. **(a) :** Moles of glucose $= \frac{\text{mass}}{\text{Molecular mass}} = \frac{18}{180}$

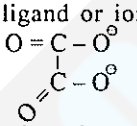
$\Rightarrow$ Molality $= \frac{0.1}{500} \times 1000 = 0.2M$

82. **(d) :** The oxygen atom in ethers is sp^3 hybridized. Two of the hybrid orbitals overlap with hybrid orbitals of two carbon atoms to form sigma bonds and the bond angle is



83. **(a) :** A molecule or an ion, which can attach itself to a metal ion from two different positions, is known as bidentate ligand or ion.

$C_2O_4^{2-}$:



It contains two donation sites so it is a bidentate ligand.

84. **(c) :** $PbS + 2HNO_3 \rightarrow Pb(NO_3)_2 + H_2S$

$CuS + 2HNO_3 \rightarrow Cu(NO_3)_2 + H_2S$

$CdS + 2HNO_3 \rightarrow Cd(NO_3)_2 + H_2S$

85. **(b) :** In this experiment, when a thin foil of gold was bombarded by α–particles but most of the α–particles went straight and very few got large deflections. Conclusion was drawn that nucleus is very small and very compact.

86. **(c) :** Due to the high heat of hydration of small cations, ionic mobility for the small cations is low. Order of Ionic mobility is :

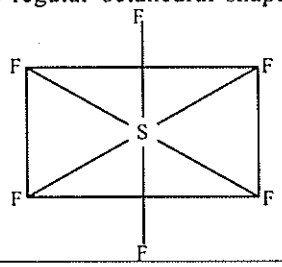
$Be^{2+} < Mg^{2+} < Ca^{2+} < Ba^{2+}$.

87. **(a) :** $CH_4 + O \rightarrow CO + H_2O$

88. **(d) :** S : $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow\downarrow}$ $\boxed{1}$ $\boxed{1}$ ground state

S : $\boxed{1}$ $\boxed{1}$ $\boxed{1}$ $\boxed{1}$ $\boxed{1}$ $\boxed{\ }$ $\boxed{\ }$ $\boxed{\ }$ excited state

Six unpaired electrons, form bonds with six fluorine atoms. It has regular octahedral shape.



89. **(d) :** Electronic configuration of element with atomic number 118 will be $[Rn]5f^{14}\,6s^2\,6p^6$. Since its electronic configuration in the outermost orbit (ns^2np^6) resembles with that of inert or noble gases, therefore it will be a noble gas element.

90. **(a) :** Adsorption of reactants on the solid surface of the catalysts affect the rate of reaction between the reactants. Reaction proceeds more rapidly after adsorption *e.g.* contact process. So heterogenous catalysis can be best understood in the light of adsorption phenomenon.

91. **(c) :** Given: Initial pH = 3 and final pH = 6. We know that pH $\propto$ Dilution. Therefore initially $[H^+] = 10^{-3}$ and after dilution $[H^+] = 10^{-6}$. Thus increase in dilution

$= \frac{\text{Original } H^+ \text{ concentration}}{\text{Concentration of } H^+ \text{ after dilution}} = \frac{10^{-3}}{10^{-6}} = 10^3$
= 1000 times.

92. (d) : Fractional distillation : In this process the distillate is collected in fractions under different temperature. *e.g.* It is used these days for distillation of coal tar, petroleum, and crude oil etc.

93. (d) : Arsenic forms two oxyacids H_3AsO_3 and H_3AsO_4. Antimony forms only one oxyacid H_3SbO_3 and bismuth forms only one oxyacid $HBiO_3$. Therefore H_3BiO_4 does not exist.

94. (c) : Bauxite is $Al_2O_3.2H_2O$

95. (a) : The density of O_2 at S.T.P. $(d_1) = \frac{32}{22\cdot4}$ gm/litres and that of CH_4 at S.T.P. $(d_2) = \frac{16}{22\cdot4}$ gm/litres.

We know that $d_1T_1 = d_2T_2$ or $T_2 = \frac{d_1T_1}{d_2}$

$= \frac{32}{22\cdot4} \times \frac{273}{1} \times \frac{22\cdot4}{16} = 546$ K = 273°C.
(where T_1 at STP is 273 K).

96. (d) : Intensive property is that which is independent of the amount of the substance present in the system *e.g.* density, temperature, concentration etc.
Extensive property depends upon the amount of the substance present in the system. *e.g.* volume, mass etc.

97. (b) : Order of electronegativity is
F > O > N > C

98. (c) : With reduction, participation of atom electron decreases, therefore, Oxidation number also decreases.

99. (b) : $CH \equiv CH \xrightarrow[H_2O]{H_2SO_4/HgSO_4} CH_3CHO$
Here, addition of water is according to Markownikoff's rule.

100. (d) : As AgBr is sensitive to light, it is used for making photographic films.
Solution of sodium thiosulphate is used as fixer. It forms a soluble complex with silver halides.
$AgBr + 2Na_2S_2O_3 \longrightarrow Na_3[Ag.(S_2O_3)_2] + NaBr$

101. (c) : $O_2 + 4e^- \longrightarrow 2O^{2-}$

$\therefore$ Equivalent weight of oxygen $= \frac{\text{molecular weight}}{4}$

102. (a) : rate of diffusion $\propto \frac{1}{\sqrt{M}}$

M = Molecular mass

$\Rightarrow \frac{r_x}{r_{o_2}} = 4 = \sqrt{\frac{M_{O_2}}{M_x}}$

r_x = rate of diffusion of x (gas)
M_x = Molecular mass of x

$\Rightarrow \frac{r_x}{r_{o_2}} = 4 = \sqrt{\frac{MO_2}{M_x}}$

$\Rightarrow 16 = \frac{32}{M_x} \Rightarrow M_x = 2$

103. (c) : Density of water = 1 g/cm³ and its molecular weight = 18. Therefore 1000 cm³ of water will weigh 1000 g of water. We also know that molarity

$= \frac{\text{Mass of water}}{\text{Molecular weight}} = \frac{1000}{18} = 55.56$ M.

104. (b) : $Mg(HCO_3)_2 \rightarrow MgO + 2CO_2 + H_2O$
146 g give 22.4 Litre of CO_2

$\Rightarrow$ 7.3 g will give = $\frac{22.4}{146} \times 7.3$

$\Rightarrow$ = 1.12 litre of CO_2
= 1120 ml of CO_2

105. (d) : $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$
65 g Zn will give 22.4 litre of H_2 at STP

$\Rightarrow$ 224 ml of H_2 corresponds to $\frac{65}{22400} \times 224$
= 0.65 g Zn

106. (a) : $Al^{3+} + 3e^- \rightarrow Al$
Therefore, 3 moles of electron is required to deposite 1 mole of Al.

107. (a) : Lithopone is ($ZnS + BaSO_4$). It is used as a filler in rubber and paper industry.

108. (a) : The electronic configuration, of an element of atomic number 7, is $1s^2\ 2s^2\ 2p_x^1,\ 2p_y^1\ 2p_z^1$. Thus the valency shell is second principal shell which has only four orbitals. Therefore the element can form maximum of four covalent bonds. Thus the covalency is 4.

109. (d) : Oxygen atom is monoatomic and oxidation number of an element in a monoatomic ion, is equal to the charge on the ion. *i.e.* -2.

110. (a) : There are three unpaired electrons.

1s	2s	2p		
↑↓	↑↓	1	1	1

111. (b) : Duma's method can be applied in case of all nitrogenous compounds. But Kjeldahl's method cannot be used in case of nitro, azo and azoxy compounds.

112. (a) : In cyclobutane, there is angle strain as bond angle (C–C–C) is close to 90°. Due to this kind of angle effecting overlapping of orbitals cannot take place.

113. (b) : Molecularity of reaction is the no. of molecules acting in the rate determing step while order of reaction is the sum total of all powers to which concentration are raised in the rate law expression. So both may or may not be same.

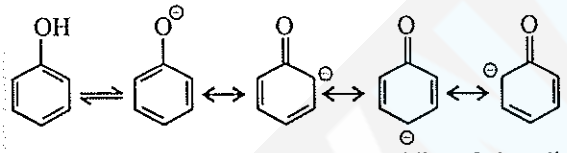
114. (a) : Bond order is the half of the difference between bonding and antibonding electrons i.e.,

$$\text{B.O.} = \frac{1}{2}\left[\begin{pmatrix}\text{No. of e}^-\text{s in}\\ \text{bonding M.O.}\end{pmatrix} - \begin{pmatrix}\text{No. of e}^-\text{s in}\\ \text{antibonding M.O.}\end{pmatrix}\right]$$

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

115. (a) : Alkali metals have very low value of ionisation energy as compared to other metals. So Alkali metals easily get excited and impact to flame.

116. (c) :



Phenol is acidic in nature due to the acidity of phenolic proton (due to reasonance stabilisation) but there is no such stabilisation in ethane.

117. (d) : Cu cannot liberate H_2 from a solution of dilute HCl as hydrogen is above copper in the electrochemical series.

$$E^\circ_{H^+/\frac{1}{2}H_2} = \pm 0.00$$

$$E^\circ_{Cu^{2+}/Cu} = +0.34$$

118. (b) : Greater entropy of graphite is related to its structure as graphite is less compact and rigid than diamond. ΔH°_f for graphite is zero, but the ΔH°_f for diamond is 2 kJ/mol. That is because graphite is the standard state for carbon, not diamond.

119. (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.

$$SO_2 + 2H_2O \longrightarrow H_2SO_4 + 2[H]$$

Similarity, Cl_2 in pressure of moisture give out nascent oxygen (oxidation) and cause bleaching.

$$Cl_2 + H_2O \longrightarrow 2HCl + [O]$$

Here, bleaching action is permanent.

120. (b) : $HCOOH + 2HgCl_2 \xrightarrow{\Delta} Hg_2Cl_2 + CO_2 + 2HCl$

Reducing property of formic acid is due to – CHO group.

BIOLOGY

121. (c) : Stomach in vertebrates is the chief site for digestion of proteins. Because HCl is secreted here which alters the pH suitable for protein digestion. At the same time gastric pepsin is secreted by the stomach which digests protein. On the other hand carbohydrate digestion in the stomach depends on the action of salivary amylase and fat digestion is minimal in stomach due to the restriction of gastric lipase activity there.

122. (c) : Diapedesis is passage of blood cells, especially leucocytes, by amoeboid movements through the unruptured wall of a capillary vessel.

123. (c) : In *Leucosolenia,* food is stored in amoebocytes. Amoebocytes receive the partly digested food particles from choanocytes, complete its digestion and distribute the digested material throughout the body. Rest is stored in them.

124. (d) : Inheritance of ABO blood groups illustrates multiple allelism. Here, a single gene codes for an enzyme that is responsible for the addition of sugar residues to a specific glycoprotein on the membrane of red blood cells. Three different alleles of this gene are known. All three alleles have arisen by mutation from a single ancestor.

125. (d) : *Physalia* is tetramorphic in nature. It consists of

(i) a gastrozooid with mouth but no tentacle,
(ii) a small dactylozooid with a long slender tentacle,
(iii) a large dactylozooid with an enormous nematocyst bearing fishing tentacle and
(iv) a branched gonozooid which bears both male and female gonophores.

126. (c) : Starch is a complex polysaccharide carbohydrate, formed by polymerization (condensation) of several hundred glucose subunits by glycosidic bonds. Starch is easily broken down by amylase during digestion.

127. (d) : Intervertebral disc is made up of fibrous cartilage. The intervertebral discs are somatic derivatives. The spaces between developing vertebral bodies firstly become mesenchymal cells, these cells subsequently form the fibrocartilage of the annulus fibrous of the intervertebral discs.

128. (a) : Actomyosin is a protein complex found in

muscles. It is formed between molecules of actin and myosin present in adjacent thick and thin muscle filaments. These actomyosin complexes are involved in the process of muscle contraction.

129. (b) : Parotid glands are yellowish, flattened and the largest salivary glands located in the cheeks near the ears. The single, long, thick Stenson's duct from each gland opens in the vestibule in buccal cavity opposite to the second molar of its side. In man, inflammation and enlargement of these glands due to virus infection is a condition known as mumps.

130. (a) : Sarcoplasm is the protoplasm of the fibres of striated muscle, excluding the myofibrils.

131. (a) : Meroblastic cleavage refers to incomplete type of division of eggs. This occurs in macrolecithal and centrolecithal eggs. In such a cleavage, the furrows divide the small amount of active cytoplasm of animal pole or periphery of egg and most of the yolky portion of vegetal pole or central area of egg remains undivided.

132. (a) : Spider monkey (*Ateles paniscus*) has prehensile tail and belongs to new world monkeys. They are mostly found in tropical forests from Mexico to Brazil.

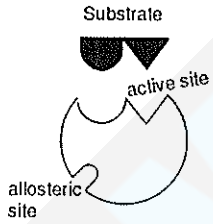
133. (b) : *Cis-trans* test is a test that determines whether two mutations that have the same effect occur in the same gene or in different genes. The mutation may be in either the *cis*-position (*i.e.*, on the same chromosome) or the *trans*-position (one on each homologue).

134. (d) : Schneiderian membrane is found in nasal mucosa. The olfactory organs of vertebrates have a lining of olfactory mucous membrane or schneiderian membrane. It is made up of basal cells, supporting cells and elongated neurosensory cells.

135. (a) : Brush border is the outer surface of columnar epithelial cells lining the intestine, kidney of man. With a light microscope, it appears as a narrow layer with vertical striations. But the electron microscope shows it to be made of fine hairline processes called microvilli. These greatly increase the surface area of the cell for absorption of dissolved substances.

136. (b) : Pliocene was the epoch of the tertiary, which followed the miocene. In the pliocene, the homonids such as *Australopithecus* and *Homo erectus,* which eventually led to man, became clearly distinguishable from the apes.

137. (a) : Allosteric site is a part of an enzyme to which a specific effector or modulator can be attached. This attachment is reversible. Allosteric enzymes possess an allosteric site in addition to their active site. This site is as specific in its relationship to modulators as active sites are to substrates.



An allosteric enzyme having allosteric site and active site

138. (c) : Chromatophores lie in the skin of certain animals with permanent radiating processes containing pigment that can be concentrated or dispersed within the cell under nervous and/or hormonal stimulation, effecting colour changes. They often result in camouflage in *Chameleon.*

139. (b) : Dermal bone (membrane bone) is a vertebrate bone developing directly from mesenchyme rather than from pre-existing cartilage (cartilage bone). It is largely restricted to bones of cranium, jaws and pectoral girdle.

140. (d) : According to fossils, the evolution of modern horse began in the eocene epoch in North America with a fox-sized species originally named *Eohippus.* But later on, it was renamed *Hyracotherium.* After its origin, *Hyracotherium* spread throughout Europe and Asia.

141. (d) : Cholinergic nerve fibre releases acetylcholine from its end when stimulated by a nerve impulse. In vertebrates, motor fibres to striped muscle, parasympathetic fibres to smooth muscle, and preganglionic sympathetic fibres are all cholinergic.

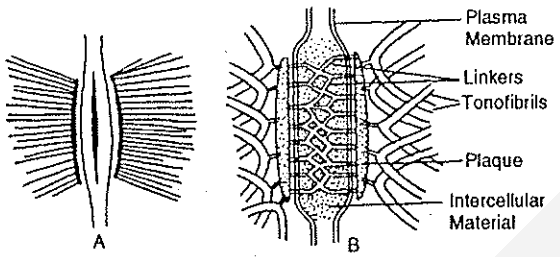
142. (b) : Bohr effect is the phenomenon whereby the affinity of the respiratory pigment of the blood for oxygen is reduced, and the level of carbon dioxide is increased. This facilitates gaseous exchange, because more oxygen is released in the tissues where the amount of carbon dioxide is rising due to metabolic activity. At the same time, more oxygen is taken up at the lungs where the amount of carbon dioxide is low.

143. (d) : Gout is hereditary metabolic disease in the form of acute arthritis. It is marked by inflammation of the joints. In gout patients, excessive uric acid in blood and iron urates of sodium in and around of joints are present.

144. (b) : In the resting muscle, creatine is combined with phosphoric acid to form phosphagen (creatine phosphate). When the muscle contracts, creatine

phosphate (phosphagen) is split back into creatine and phosphoric acid, with the release of energy. This energy is responsible for the actual muscle contraction through the medium of ATP.

145. (a) : Desmosomes are junctional complexes in which adjacent membranes possess disc - shaped



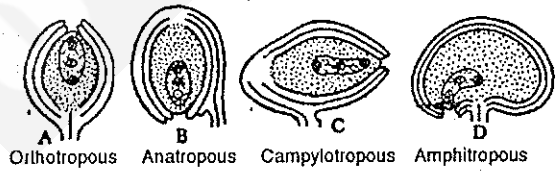
Structure of desmosome. A, in section. B, detailed reconstruction

thickenings of about 0.5 μm diameter, a number of tonofibrils and *trans*-membrane linkers embedded in dense intercellular material. Desmosomes function as spot welds and are hence called spot desmosomes. They occur in epithelia.

146. (a) : Large amount of absorbed water are translocated to the leaves and are lost to the surrounding atmosphere. Transpiration has cooling effect on the plant as well as on the surrounding atmosphere. A roof causes shade, but due to lack of any transpiration like system, it fails to give the same cooling effect as given by a plant.

147. (a) : Calcium oxalate crystals are present in raphides of almost all the plants organs and are particularly common in storage organs, pith and cortical tissues. The shape of the crystal is variable. Needle like or acicular crystal called raphides are found in aroids (*e.g. Colocasia, Amorphophallus, Impatiens*) and many aquatic plants (*e.g., Pistia, Eichornia* etc.).

148. (a) : The ovule where micropyle comes to lie close to the funiculus due to unilateral growth of the ovule are called anatropous. This is the most common



Types of ovule

type of ovule in the angiosperms. Where the curvature of the ovule also affects the nucellus so that the latter becomes horse - shoe - shaped. The ovuale is called amphitropous. In campylotropous ovule, the curvature is less than that in the anatropous ovules.

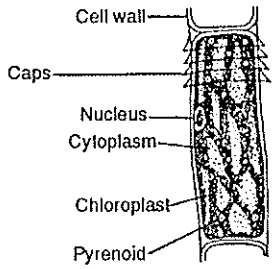
149. (a) : Darwin proposed the theory of evolution, in which he brought forward the fact that the present - day plants originated from some ancestral ones after undergoing periodical modifications due to environmental changes, therefore, all living plants today are related to each other in one way or the other. Thus later classification is also called vertical classification as it mainly depends upon evolutionary relationship or presumed ancestry.

150. (c) : In *Polysiphonia*, a multicellular gametophytic phase alternate with two sporophytic phases (*viz.* a *carposporophyte* which is attached to gametophyte and a tetrasporophyte. It is independent of gametophyte).

151. (b) : The cells of velamen are dead and empty. The water absorbed by them is later taken by the living cells of the root.

152. (d) : LPP-1 was the first cyanophage to be discovered by Safferman and Morris. It was so named because in can infect three different blue green algae which are *Lyngbya, Phormidium* and *Plectonema.*

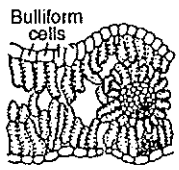
153. (a) : In *Oedogonium*, the longitudinal bands of chloroplast get interconnected showing reticulations. The pyrenoids are located on every point of cross connection of the bands of chloroplast.



Oedogonium cell

154. (c) : The hornworts are so called because their capsule resembles the horn of animals. *Anthoceros* of this class is considered as a link between the bryophytes and pteridophytes as it is believed to have given rise to *Rhynia* (a fossil pteridophytes).

155. (d) : Bulliform cells are present in epidermis. These epidermal cells are found in the upper leaf epidermis of poaceae and other monocotyledons. Turgor changes in bulliform cells are responsible for the inrolling and unrolling of leaves. *e.g.* maiza, psamma grasses.



Bulliform cell in leaf epidermis

Therefore they are also called motor cells.
They are highly vacuolate and can store water.

156. (a) : *Dalbergia latifolia* is also called Kali Shisham.The sapwood is narrow and pale yellowish white in colour, often with a purple tinge. The heartwood ranges in colour from golden brown through shades of light rose, purple with darker streaks, to deep purple with rather distant, nearly black lines, darkening with age.

157. (c) : Gibberellins play an important role in controlling a balance between internode growth and leaf development. In rosette forming plants (*e.g.*, cabbage) internode growth is poor but leaves are large. So the leaves appear to arise in tufts. This internode suddenly elongates and the stem becomes normal just before flowering.This is called bolting.

158. (c) : During aerobic respiration complete oxidation of food takes place. Thus during it a glucose molecule produce 38 ATP while during fermentation the food is oxidise partially and instead of $CO_2 + H_2O$ formation it results in formation of ethyl alcohol and water with net production of 2ATP.

159. (a) : Thylakoid membrances possess photosynthetic pigments and coupling factors. Coupling factors are involved in ATP synthesis. Photosynthetic pigments include chlorophyll *a*, chlorophyll *b*, carotene and xanthophylls.

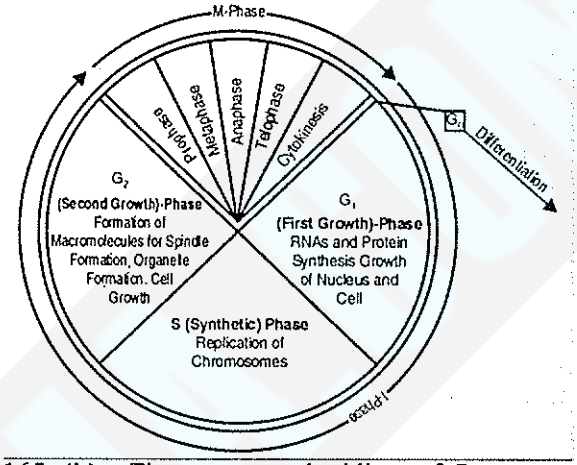
160. (d) : Chromosome theory of inheritance was proposed by Sutton and Boveri independently in 1902.

161. (c) : In painful spasmodic affections, opium (*obtained from Papaver somniferum*) is large and repeated does often affords immediate relief.

162. (c) : The auxin content is maximum in stem tip. It is responsible for apical dominance (suppression of lateral buds). Decapitation results in translocation of auxins towards lower side. Hence lateral buds (axillary buds) get activated.

163. (b) : Number of oxygen molecules released per photon or quantum of light is known as quantum yield. Its value is $\frac{1}{8}$ to $\frac{1}{10}$. In other words evolution of one molecule of oxygen or consumption / fixation of one molecule of CO_2 requires 8 - 10 quanta.

164. (d) : Cell cycle consists of two stages, a long nondividing growing I (Interphase) - phase and a short dividing M (Metaphase) - phase. Both have substages. I - phase represents interphase. Interphase is a series of chages that take place in a newly formed cell and its nucleus before it becomes capable of division again. It is divisible into three stages G_1, S and G_2.



165. (b) : The mature antheridium of *Dryopteris* consists of a jacket layer composed of two ring - shaped cells and either one or two cap cells (cover cells). Inside the jacket layer there are 20 to 50 large spirally coiled atherozoids contained within their mother cells. The antherozoids are motile and multiciliate.

166. (d) : A large taxon, mostly treated as distinct order comprising 3 families : papilionaceae (Fabaceae), caesalpiniaceae and mimosaceae. Of all these families papilionaceae is predominantly herbaceous with a few shurbs and trees, but both the caesalpiniaceae and mimosaceae are chiefly arborescent. The flowers in racemose inflorescence, bisexual, actino or zygomorphic are usually highly ornamental. Stamens few to numerous, basifixed, mostly dehisce longitudinally. Ovary monocarpellary, superior, unilocular, placentation marginal.

167. (a) : The presence of pollinium is the characteristic feature of family asclepiadaceae: *e.g.*madar.

168. (c) : An organism having a number of complete chromosome sets higher than diploid number is called polyploid. The phenomenon of having more than two sets of chromosomes is called polyploidy.

169. (c) : Temin (1970) reported that retroviruses operate a central dogma reverse (inverse flow of information) or teminism inside host cells. Genomic RNA of these viruses first synthesizes DNA through

reverse transcription. DNA then transfers information to messenger RNA which takes part in translation of the coded information to form polypeptide.

170. (c) : Plant peroxisomes found in photosynthetic cells perform photorespiration. For this, they are associated with chloroplast. Mesosomes are plasmalemma infoldings found in bacteria. Ribosomes are popularly known as protein factories due to their involvement in protein synthesis. Lysosomes take part in intracellular digestion of various types of materials and autolysis of cell.

171. (b) : Third cleavage of frog is latitudinal. Here, the unequally distributed yolk makes its influence felt. The mitotic spindles orient parallel to the polar axis and displaced as they are toward animal pole. The four blastomeres not only cleave latitudinally, but unequally.

172. (b) : The reaction of glycolysis occurs in the cytoplasm and do not require the presence of oxygen. The conversion of one molecule of glucose to two molecules of pyruvate results in a net gain of two ATP and two NADH molecules. 2 NADH produces 6 ATP (3 ATP per NADH molecule). Thus, glycolysis yields total 8 ATP. The kerbs cycle is far more efficient in the release of energy than are either glycolysis or fermenfation. The reactions of the krebs cycle require the presence of oxygen and are confined to the mitochondria. Total ATP produced during krebs cycle is 24.

173. (a) : In mammals, secondary plate is developed when the response comes for shifting the internal areas of body organs.

174. (c) : The development of cockroach is heterometabolous metamarophosis. It is gradual or incomplete metamorphosis. They have terrestrial youngs called nymphs. Nymphs look similar to adults but they lack the wings that gradually develop during several moults. The stages are –

egg → *nymph* (several instars) → *adult*

175. (a)

176. (b) : In *E. coli*, synthesis of β galactosidase, an enzyme meant for hydrolysis of lactose into glucose and galactose, has been studied in considerable detail.

Lactose $\xrightarrow{\beta \text{ galactosidase}}$ glucose + galactose

If β galactosides (e.g. lactose) are not supplied to *E. coli* cells, the presence of β galactosidase is hardly detectable, but as soon as lactose is added, production of enzyme β galactosidase increases as much as 10,000 times. The enzyme quantity again fall down as quickly as the substance (i.e. lactose) is removed. Such enzymes, whose synthesis can be induced by adding substrate are known as "inducible enzymes". F. Jacob and J. Monod in 1961, on the basis of their study on the inducible system for the synthesis of β - galactosidase enzyme in *E. coli*, proposed a model in order to explain the induction or repression of enzyme synthesis. The model is popularly known as "operon model",

E. coli like other bacteria has incipient nucleus, i.e. nucleoid.

177. (c) : The ionizing radiations can have direct effect on chromosomes. They may directly break chromosomes or alter one of the DNA bases or indirectly may initiate a chain of chemical reactions. The biological effect also depends on the kind of cell and stage of nuclear cycle.

178. (a) : As a result of continued secondary growth for several years, the older parts of the stem and its old branches have a part of its secondary xylem renderd non - functional. Such a modified and non - functional secondary xylem is called the heart wood or *duramen*, the functional outer younger rings of secondary xylem constitute the sap wood or *alburnum*. With the passage of time and addition of new outer rings of secondary xylem more rings of the sap wood are changed into heart wood. This leads to the increase in the thickness of heart wood, whereas the sap wood remains of about the same thickness.

179. (a) : An *absorption spectrum* is a measure of the extent to which a given substance absorbs the light of different colours or wavelengths. An *action spectrum* is the measure of the efficiency of a process induced by light of different wavelengths but of the same intensity. It is actually a plot of the extent of a response (such as photosynthesis) against different wavelengths of light. A comparison of an action spectrum with the absorption spectrum of a pigment indicates whether or not the pigment is involved in the response. For example, the absorption spectrum of chlorophyll *a* is very similar to the action spectrum

of photosynthesis in most plant tissues. Although, light energy is absorbed by chlorophylls as well as by other accessory pigments, only chlorophyll *a* is involved in photosystem I and II.

180. (b) : The initial work of Kortschak, Hartt and Barr, which demonstrated that rapidly photosynthesizing sugarcane plants fix CO_2 into aspartic and malic acids, was confirmed by Hatch and Slack. Hatch and Slack proposed this pathway as Hatch and Slack pathway and named such plant as C_4 plants (as the products are four carbon compounds).

C_4 plants possess two types of chloroplasts bundle sheath cells and mesophyll cells. The mesophyll cells of C_4 plants exhibit high activity of phosphoenolpyruvate (PEP) carboxylase, which catalyzes the fixation of CO_2 with PEP to form oxaloacetic acid. The bundle sheath cells exhibit high RuBP carboxylase and the other enzymes of the Calvin - Benson cycle. C_4 plants are highly productive photosynthetically in view of the low affinity of the RuBP carboxylase for its substrate. But CO_2 is concentrated as C_4 acids due to the activity of the PEP carboxylase, which in effect maintains high pool levels of CO_2 C_4 plants are related to very high light - harvesting saturation points. C_4 plants exibit low rates of photorespiration only in bundle sheath cells. C_4 plants are adapted to high temperature. C_4 plants show better utilization of available water.

GENERAL KNOWLEDGE

181. (b)

182. (c) : First chief justice of India was Shri Harilal J. Kania in the duration between 1950-51.

183. (b)

184. (d) : The attorney general of India is the legal adviser to the government of India. He is appointed by the president of India on the advice of the Prime Minister.

185. (d)

186. (b) : The equator, which divides the earth into the northern and southern and southern hemispheres is designated as latitude.

187. (b)

188. (a) : IRDP programme with some modifications was taken up in 2300 blocks of different cities to provide full employment in these blocks within 5 years. This was initiated during the year of 1976-77.

189. (c)

190. (c) : Rudolf Dieself invented the diesel engine in 1895. He was a German scientist.

191. (b)

192. (b) : Aravali range is one of the oldest mountain in the world, which is situated in north-western India.

193. (c)

194. (a) : Aurbindo was a great philospher. He set up an ashram in Pondichery in 1910.

195. (b)

196. (c) : Mother Teresa came to India, when she was 18 years old and took up teaching as a profession. She established a 'Missionaries of charity'.

197. (d)

198. (b) : Vitamin 'D' regulates the absorption of calcium and phosphorus from the intestinal track and affords antiachitic activity.

199. (c)

200. (b) : The human skeleton is divided into two parts. *i.e.*, the axial skeleton and appendicular skeleton. The axial skeleton consists of the head, neck and trunk while the appendicular skeleton is made up of arms and legs.

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