# ANSWERS

## MATHEMATICS

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. (b) | 2. (b) | 3. (d) | 4. (b) | 5. (d) | 6. (d) | 7. (a) | 8. (c) | 9. (b) | 10. (b) |
| 11. (a) | 12. (d) | 13. (b) | 14. (b) | 15. (a) | 16. (a) | 17. (c) | 18. (b) | 19. (b) | 20. (c) |
| 21. (a) | 22. (a) | 23. (c) | 24. (a) | 25. (b) | 26. (c) | 27. (c) | 28. (a) | 29. (b) | 30. (b) |
| 31. (b) | 32. (b) | 33. (a) | 34. (b) | 35. (b) | 36. (b) | 37. (d) | 38. (b) | 39. (c) | 40. (c) |
| 41. (b) | 42. (a) | 43. (a) | 44. (a) | 45. (c) | | | | | |

## PHYSICS

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 46. (a) | 47. (c) | 48. (c) | 49. (b) | 50. (d) | 51. (b) | 52. (c) | 53. (a) | 54. (d) | 55. (a) |
| 56. (b) | 57. (a) | 58. (d) | 59. (c) | 60. (d) | 61. (d) | 62. (b) | 63. (b) | 64. (b) | 65. (a) |
| 66. (d) | 67. (a) | 68. (d) | 69. (c) | 70. (d) | 71. (a) | 72. (b) | 73. (b) | 74. (a) | 75. (a) |
| 76. (d) | 77. (c) | 78. (d) | 79. (b) | 80. (d) | 81. (d) | 82. (c) | 83. (a) | 84. (b) | 85. (b) |

## CHEMISTRY

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|---|---|---|---|---|---|---|---|---|---|
| 86. (d) | 87. (b) | 88. (b) | 89. (b) | 90. (d) | 91. (b) | 92. (c) | 93. (b) | 94. (c) | 95. (d) |
| 96. (a) | 97. (a) | 98. (d) | 99. (b) | 100. (d) | 101. (a) | 102. (b) | 103. (d) | 104. (b) | 105. (a) |
| 106. (b) | 107. (b) | 108. (a) | 109. (b) | 110. (b) | 111. (c) | 112. (c) | 113. (b) | 114. (a) | 115. (c) |
| 116. (d) | 117. (b) | 118. (c) | 119. (b) | 120. (c) | 121. (a) | 122. (b) | 123. (c) | 124. (b) | 125. (c) |

## INTELLIGENCE, LOGIC & REASONING

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 126. (d) | 127. (b) | 128. (b) | 129. (d) | 130. (a) | 131. (a) | 132. (d) | 133. (a) | 134. (a) | 135. (d) |

## ENGLISH LANGUAGE & COMPREHENSION

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 136. (b) | 137. (a) | 138. (c) | 139. (c) | 140. (c) | 141. (a) | 142. (c) | 143. (c) | 144. (a) | 145. (b) |
| 146. (c) | 147. (a) | 148. (b) | 149. (b) | 150. (a) | | | | | |

## EXPLANATIONS

**1.** $f(x) = (a - x^n)^{1/n}$

$fof\ (x) = f(f(x))$

$= [a - [(a - x^n)1/n]^n]^{1/n}$

$= (x^n)^{1/n} = x.$

**2.** Since, $f(x) = 4x^3 - 12x$ is continuous in $[-1, 3]$, so, minimum is $-8$ and maximum is 72.

Hence, range f $[-8, 72]$

**3.** $f_4$ is a function from A to itself and $f_1$, $f_2$, $f_3$ are not

**4.** Since, $f : R \to R$ given by $f(x) = x^2 + 5$ is bijection, hence $f^{-1}$ exits

Let $f(x) = y$

$\therefore\ x^3 + 5 = y$

$\Rightarrow\ f^{-1}(y) = (y - 5)^{1/3}$

$\therefore\ f^{-1}(x) = (x - 5)^{1/3}$

**5.** f(x) is periodic. Period $\frac{2\pi}{5}$, since it is not injective.

**6.** Let $z = x + iy$

$\therefore\ z^2 = x^2 - y^2 + 2ixy.$

$\therefore\ Im(\tau^s) = k$

$\Rightarrow\ 2xy = k$

$\Rightarrow\ xy = \frac{k}{2}$, which is hyperbola

**7.** Let $w = \frac{2}{z}$. Then $|w| = \left|\frac{2}{z}\right| = \frac{2}{1} = 2$

Hence, w lies on circle and radius is 2

**8.** $|z| \le z + \frac{2}{|z|}$

$\Rightarrow\ |z|^2 - 2|z| + -2 \le 0$

$\Rightarrow\ (|z| - 1 + \sqrt{3})(|z| - 1 - \sqrt{3}) \le 0$

$\therefore\ 1 - \sqrt{3} \le |z| \le 1 + \sqrt{3}$

**9.** Let $w = -1 + 4|z|$

$\therefore\ w + 1 = 42$

$\Rightarrow\ |w + 1| = 4|z| = 12$

Thus w lies on circle with center $-1$ and radius $=12$

**10.** $a_2 = a_1 r,\ a_3 = a_1 r^2,$

$a_3 > 4a_2 - 3a_1$

$\Rightarrow\ r^2 > 4r - 3$

$\Rightarrow\ r^2 - 4r + 3 > 0$

$\Rightarrow\ (r - 1)(r - 3) > 0$

$\Rightarrow\ r < 1$ or $r > 3$

**11.** $1 + |\cos x| + \cos^2 x + |\cos^3 x| + \ldots\ldots \infty$

$= \frac{1}{1 - |\cos x|}$

$\Rightarrow\ 8\frac{1}{1 - |\cos|} = 8^2$

$\Rightarrow\ \frac{1}{1 - |\cos|} = 2$

$\Rightarrow\ \cos x = \pm\frac{1}{2}$

$\therefore\ x = \frac{\pi}{3}, \frac{2\pi}{3}$

**12.** $(a^{x/2})^2 = \log_x a \cdot \log_b x$

$\Rightarrow\ a^x = \log_b a$

$\Rightarrow\ x = \log_a (\log_{ba})$

**13.** Let $f(x) = ax^2 + bx + c.$

k lies between $\alpha$ and $\beta$, if

$af(k) < 0$

$\Rightarrow\ a(ak^2 + bx + c) < 0$

$\Rightarrow\ a^2k^2 + abx + ac < 0$

**14.** $\alpha\beta = qr,\ \beta q = rp$ and

$\Rightarrow\ q\alpha = pq$

$\therefore\ (\alpha\beta q)^2 = (p\,q\,r)^2$

$\Rightarrow\ \alpha\beta q = p\,q\,r.$

**15.** $3x^2 - 2(a + b + c)x + (ab + bc + ca) = 0$

Roots are equal, if $D = 0$

$\Rightarrow\ 4(a + b + c)^2 - 12(ab + bc + ca) = 0$

$\Rightarrow\ (a + bw + cw^2)(a + bw^2 + cw) = 0$

$\therefore\ a + bw + cw^2 = 0$ or $a + bw^2 + cw = 0.$

**16.** $nPr = 720\ {}^nC_r$

$\therefore\ \frac{n!}{(n-r)!} = 720\ \frac{n!}{(n-r)!r!}$

$\Rightarrow\ r! = 720$

$\Rightarrow\ r = 6$

**17.** Required arrangements :

(i) WBWB (ii) BWBN

$\therefore$ Number of ways $= n! \times n! + n! \times n!$

$= 2(n!)^2$

**18.** Number of ways $= \left(\frac{(mn)!}{(n!)^m m!}\right)^{m!} = \frac{(mn)!}{(n!)^m}$

**19.** $2 < (1 + .0001)^{1000} < 3$

$\Rightarrow\ [(1 + 0.0001)^{1000}] = 2$

**20.** Let $G = \left(\sqrt{2}-1\right)^{2n+1}$

Then $R - G = \left(\sqrt{2}+1\right)^{2n+1} - \left(\sqrt{2}-1\right)^{2n+1}$

$= 2\left[{}^{2n+1}C_1 (\sqrt{2})^{2n} + \ldots.\right]$

= an integer

$\Rightarrow$ [R] + f – G = even integer

$\Rightarrow$ f – G = 0

$\Rightarrow$ f = G.

$\therefore$ $[R] = \frac{1}{f} - f$

**21.** $(1+n)^n - 1 - nx = x^2 ({}^nC_2 + {}^nC_3 x + {}^nC_4 x^2 + \ldots. + {}^nCn\ x^{n-2})$

Hence, RHS divisible by $x^2 + x$. So L.H.S. also by x and $x^2$.

**22.** Let A be symmetric matrix. Then

$AA^{-1} = I$

$\Rightarrow$ $(AA^{-1})^T = I$

$\Rightarrow$ $(A^{-1})^T = (A)^{-1}$ $(\because A^T = A)$

Hence, $A^{-1}$ is symmetric

**24.** Since, $A^T = A$ therefore, $(A^n)^T = (A^T)^n = (A)^n$

Hence, $A^n$ is also symmetric

**25.** Solving the determinant, $(x + 1)(x - 2)^2 = 0$

$\therefore$ $x = -1, 2$

**26.** Since, distance between two pairs of parallel sides are equal, therefore

$$\left|\frac{C'-C}{\sqrt{a^2+b^2}}\right| = \left|\frac{C'-C}{\sqrt{a'^2+b'^2}}\right|$$

$\Rightarrow$ $a^2 + b^2 = a'^2 + b'^2$

**27.** Since, mid points of PR and QS concide in parallelogram

i.e., $\frac{1+5}{2} = \frac{4+a}{2}$ + $\frac{2+7}{2} = \frac{6+b}{2}$

$\therefore$ a = 2 and b = 3.

**28.** The lines are constant if

$$\begin{vmatrix} 1 & 2 & -9 \\ 3 & 5 & -5 \\ a & b & -1 \end{vmatrix} = 0$$

$\Rightarrow$ 35a – 22b + 1 = 0

$\Rightarrow$ 35x – 22y + 1 = 0 passes through (a, b)

**29.** $\frac{2a+0b+c}{\sqrt{a^2+b^2}} + \frac{0+2b+c}{\sqrt{a^2+b^2}} + \frac{a+b+c}{\sqrt{a^2+b^2}} = 0$

$\Rightarrow$ 3a + 3b + 3c = 0

or a + b + c = 0

**31.** Since, $S_1 = 10^2 + 7^2 - 4 \times 10 - 2 \times 7 - 20 > 0$

Hence, P is outside circle

$PC = \sqrt{(10-2)^2 + (7-1)^2} = 10$

CB = radius = 5

$\therefore$ PB = PC + CB = 10 + 5 = 15

**32.** Length of perperpendicular from center = radius.

$\Rightarrow$ $\left|\frac{-2+2-a}{\sqrt{2}}\right| = 2$

$\therefore$ $a = 2\sqrt{2}$

**33.** $\lim_{x\to 0}\left[\left(\frac{a^x-1}{x}\right) - \left(\frac{b^x-1}{x}\right)\right] = \log a - \log b = \log \frac{a}{b}$

**34.** $\lim_{x\to 0} \frac{e^x - 1 - x}{x^2} = \lim_{x\to 0} \frac{e^x - 1}{2x}$ [L – hospital rule]

$= \frac{1}{2}$

**35.** For $2 < x < 3$, $[x] = 2$

$\therefore$ $f(x) = \sin\left(\frac{2\pi}{3} - x^2\right)$

**36.** $f(x) = |x-2| = (x-2)$ for $x > 20$

$\therefore$ $g(x) = f'(x-2) = x - 4$

$\therefore$ $g'(x) = 1$

**37.** $f'(x) = a \sin x + \frac{1}{3} \sin 3x$

$\therefore$ $f'(x) = a \cos x + \cos 3x$

$\therefore$ $f'\left(\frac{\pi}{3}\right) = 0$

$\Rightarrow$ $a \cos\frac{\pi}{3} + \cos \pi = 0$

$\Rightarrow$ $a = 2$

**38.** $f'(x) = \frac{a}{x} + 2bx + 1$

Here, $f'(-1) = 0, f'(2) = 0$

$\Rightarrow$ $-a - 2b + 1 = 0$ and $\frac{a}{2} + 4b + 1 = 0$

$\Rightarrow$ $a = 2$, and $b = \frac{-1}{2}$

**39.** Since, $f(x) = x|x|$ is an odd function

$\therefore$ $\int_{-1}^{1} x|x|\,dx = 0$

**41.** $\tan^{-1}\frac{x^2+1}{x} = \cot^{-1}\frac{x}{x^2+1}$

$\therefore$ $I = \int_{1}^{3} \frac{\pi}{2}\,dx = 2\pi$

**42.** Since, $\log x = 1$, therefore $x = e^1$

$$\therefore \quad I_1 = \int_1^2 \frac{e^t}{t}\,dt = \int_1^2 \frac{e^x}{x}\,dx = I_2.$$

**43.** Put $t = \frac{1}{u}$ in $I_1$, we get

$$I_1 = \int_{1/x}^{1} \frac{1}{1+\frac{1}{u^2}}\left(\frac{-1}{u^2}\right)dx = \int_1^{1/x} \frac{1}{1+u^2}\,dx = I_2.$$

**44.** $\phi'(x) = e^{-x^2/2}(1 - x^2)$

$\therefore \quad \phi'(x) = 0$

$\Rightarrow \quad x = \pm 1$

Hence, points of extremum are $x = \pm 1$

**46.** Wavelength, $\lambda = \frac{h}{mv} = \frac{h}{p}$.

Therefore for same wavelength of electrons and photons, the momentum should be same.

**48.** Number of balls = n, mass of each ball = m and velocity = u.

Momentum of one ball before impact

= mu and momentum after impact

= –mu (because elastic impinge)

$\therefore$ Change in momentum of each ball in one second = mu – (–mu) = 2mu.

Therefore change in momentum or force experienced by the surface per second due to n balls in one second = 2 mnu

or rate of change of momentum = 2 mnu.

**49.** Sound wave equation is,

$$y = 0.0015 \sin(62.4x + 316t).$$

Standard equation of wave motion is,

$$y = A \sin 2\pi\left[\frac{x}{\lambda} + \frac{t}{T}\right]$$

Comparing the given equation with the standard equation, we get

$$\frac{2\pi}{\lambda} = 62.4$$

or, wavelength of the wave, $\lambda = \frac{2\pi}{62.4} = 0.1$ unit.

**50.** Given: Dew point temperature, $T_1 = 18°C$

Atmospheric temperature, $T_2 = 25°C$

Pressure at dew point, $P_1 = 15.5$ mm

and pressure at atmospheric temperature

= 25.7 mm.

Relative humidity with reference to dew point

$$\text{R.H.} = \frac{\text{Saturation vapour pressure at dow point } (P_1)}{\text{Saturation vapour pressure at the temperature } (P_2)}$$

$$= \frac{15.5}{25.7} = 0.603 = 60.3\ \%.$$

**51.** Given: Surface tension, $T = 10^8$ dyne/cm$^2$.

$1$ dyne $= 10^{-5}$ N

and $1$ cm $= 10^{-2}$ m

or $1$ cm$^2 = 10^{-4}$ m$^2$.

$$\therefore \quad 10^8 \text{ dyne/cm}^2 = 10^{8} \times \frac{10^{-5}}{10^{-4}}$$

$$= 10^8 \times 10^{-1}$$

$$= 10^7 \text{ N/m}^2.$$

**52.** Initially, the current will pass through the capacitor.

So effective resistance in the circuit is $R_{AB}$.

Therefore current in the resistor is 2 mA. After some time, the capacitor will become fully charged and will be in its steady state.

Now, no current will pass through the capacitor and effective resistance of the circuit will be (1000 + 1000) = 2000 Ω.

$\therefore$ Current in the resistor

$$= \frac{V}{R} = \frac{2}{2000}$$

$$= 1 \times 10^{-3}\ \text{A} = 1\ \text{mA}.$$

**54.** Given: Initial velocity of particle = v

Initial pressure = P, and final pressure = 2P.

$$\text{r.m.s. velocity, } v_{r.m.s.} = \sqrt{\frac{3RT}{M}}$$

Since the r.m.s. velocity is independent of pressure, therefore velocity remains constant.

**56.** Given: number of electrons, $n_e = 3.13 \times 10^{15}$ and number of proton, $n_p = 3.12 \times 10^{15}$.

Current, $I = n_e q_e + n_p q_p$

$$= (3.13 \times 10^{15} \times 1.6 \times 10^{-19}) + (3.12 \times 10^{15} \times 1.6 \times 10^{-19})$$

$$= 1 \times 10^{-3} = 1\ \text{mA}.$$

Now due to excess charge on electrons, the direction of the current will be towards right.

**58.** When the man jumps from the platform, first the platform goes down with some force and after some ups and downs it will stop. Therefore the reading of spring balance first increases and then decreases to zero.

**59.** Given: Number of half-lives, n = 5.

Fraction left after five half-lives = $\left(\frac{N}{N_0}\right)^n$

$= \left(\frac{1}{2}\right)^n = \left(\frac{1}{2}\right)^5 = \frac{1}{32} = 0.03 = 3\%$

**60.** Given: Angle of inclination, $\theta = 30°$; coefficient of friction, $\mu = 0.4$

and gravitational acceleration, $g = 9.8\ m/s^2$.

Acceleration of the body sliding on inclined plane,

$$a = g(\sin\theta - \mu\cos\theta)$$
$$= 9.8[\sin 30° - (0.4)\cos 30°]$$
$$= 9.8[0.5 - (0.4 \times 0.866)]$$
$$= 1.51\ m/s^2.$$

**61.** Initial current, $I_1 = I$, and final current, $I_2 = 1.011$.

Power, $P = VI^2 \propto I^2$.

$\therefore \quad \frac{P_2}{P_1} = \frac{(I_2)^2}{(I_1)^2} = \frac{(1.01I)^2}{I^2} = 1.02$

or, $P_2 = 1.02\ P_1$.

Therefore change in power = 2%.

**63.** The energy in higher orbit is more therefore when an electron jumps from 1st orbit to 3rd orbit, then it will absorb energy.

**64.** Inductance of the coil, L = 5 H

Rate of change of current, $\frac{dI}{dt} = 2$ A/sec.

Induced e.m.f. $= -L\left(\frac{dI}{dt}\right) = -5 \times 2 = -10$ V.

**65.** Initial velocity, $v_1 = v$, and final velocity, $v_2 = 2v$.

Initial kinetic energy, $KE_1 = \frac{1}{2}mv^2 \propto v^2$.

Therefore initial kinetic energy, $KE_1 \propto V_1^2 = v^2$

and final kinetic energy, $KE^2 \propto V_2^2$

i.e., $(2v)^2 = 4v^2$.

**67.** Here V = 220 volts and frequency = 50 Hz.

We know, peak voltage, $E_0 = E_{rms} \times \sqrt{2}$

$= 220 \times \sqrt{2}$

$= 311$ V.

**69.** Hour, nano-second and micro second, all of these are the unit of time. Only light year is the unit of distance. Therefore in the given unit only light year is not a unit of time.

**70.** In the satellite, acceleration due to gravity = 0.

$\therefore \quad T = 2\pi\sqrt{\frac{l}{g}} = \infty$.

**71.** Millimeter is equal to $10^{-3}$m, one Å is equal to $10^{-15}$m, one fermi is equal to $10^{-15}$ m. Therefore fermi is the smallest unit.

**73.** Resonance occurs, if the natural frequencies of the forced body and the forcing body are equal. Therefore it is a special case of forced vibration.

**74.** The diamagnetic materials are magnetised in the opposite direction to the magnetising field. Therefore diamagnetic material moved from stronger to weaker parts of the magnetic field.

**75.** Current, I = 5 A; Angle, $\theta = 30°$; and magnetic field, B = 0.1 T.

Magnitude of magnetic force per unit length on a wire

$= IB\sin\theta$

$= 5 \times 0.1 \times \sin 30°$

$= 0.5 \times 0.5 = 0.25$ N-m.

**77.** Potential energy at A (or C)

= Kinetic energy at B.

Thus $\frac{1}{2}mv_B^2 = mgH$

or, $v_B = \sqrt{2gH}$.

**78.** Half-life of radioactive materials is independent of physical condition. Therefore it is fully dependent upon the nature of that material.

**80.** Angle of minimum deviation, $\delta_m = 40°$

Angle of Equilateral triangular prism, $A = 60°$.

$\therefore$ Angle of incidence, $i = \frac{A + \delta_m}{2}$

$= \frac{60° + 40°}{2} = 50°$

**81.** $\vec{A} \times \vec{B} = AB\sin\theta$

**82.** The resultant of 5 and 10 must be in between 15 (10 + 5) and 5 (10 – 5).

**84.** Given: Avogadro number, $N = 6.022 \times 10^{23}\ mol^{-1}$

and, atomic mass of silver, M = 108 amu.

Mass of one atom of silver

$= \frac{M}{N} = \frac{108}{6.022 \times 10^{23}}$

$= 17.93 \times 10^{-23}$ g

$= 17.93 \times 10^{-26}$ kg.

**85.** Mass of the disc, N = 50 g; radius, r = 2.5 cm.

Moment of inertia, $I = \frac{Mr^2}{2} = Mk^2$

or, $k^2 = \frac{r^2}{2}$

or radius of gyration $k = \frac{r}{\sqrt{2}} = \frac{2.5}{\sqrt{2}} = 1.76$ cm

**86.** Methane ($CH_4$) occurs in natural gas to the extent of 80–85% and in coal gas 20–35%.

**87.** Smog is the combination term for smoke and fog and it is formed when smoke is present along with fog in the environment.

**88.** $H_2O \longrightarrow H_2 + 1/2\ O_2$ mole

Number of electrons involved

$= 2$ mole $= 2 \times 6.023 \times 10^{23}$

1 mole of electronic charge = 96500 C.

$\Rightarrow$ 2 mole of electronic charge

$= 2 \times 96500 = 1.93 \times 10^5$ C

**89.** Light oil obtained from fractional distillation of petroleum contains 5–8% of benzene.

**90.** $C_2H_4$ involves $SP^2$-hybridisation and its bond angle is 120°. Therefore its structure is planar.

**91.** **Solvay process:** $NaHCO_3$ is obtained as the intermediate product in the solvay ammonia soda process.

$$NH_3 + H_2O + CO_2 \longrightarrow NH_4HCO_3$$
$$NaCl + NH_4HCO_3 \longrightarrow NaHCO_3 + NH_4Cl$$

**92.** Mn : [Ar] $3d^5\ 4s^2$

$Mn^{2+}$ : [Ar] $3d^5\ 4s^0$

$\therefore$ Number of unpaired electrons present = 5

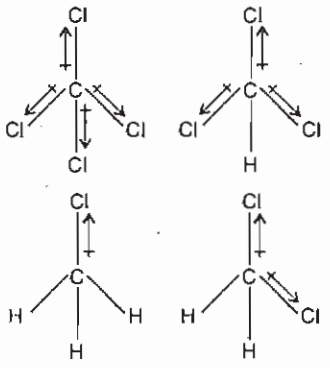
Magnetic moment, $\mu = \sqrt{n(n+2)}$ BM

where n = number of unpaired electrons

BM = Bohr magneton

Hence, more is the number of unpaired electron, more is the magnetic moment.

**93.**



In $CCl_4$, the polarities of C–Cl bonds get cancelled due to tetrahedral geometry around the central carbon atom, and molecule becomes non-planar

**94.** Methane can be prepared from $CH_3Br$ by simple hydrogenation.

$$CH_3Br + H_2 \xrightarrow{Pd} CH_4 + HBr$$

Ethane can be prepared by wurtz reaction,

$$CH_3Br \xrightarrow[\text{dry ether}]{\Delta,\ Na} CH_3 - CH_3 + 2\ NaBr$$

**95.** Most of the medicines in use are colloidal in nature. For example, Colloidal antimony is used in curing kala-azar. Colloidal medicines are more effective because they are easily assimilated and absorbed.

**96.** Ni (Z = 28) : (Ar) $3d^8\ 4s^2$

Cu (Z = 29) : (Ar) $3d^{10}\ 4s^2$

Zn (Z = 30) : (Ar) $3d^{10}\ 4s^2$

The period of elements have same shell and same principle quantum number (n).

**97.** Plaster of paris is $CaSO_4 .\ 1/2\ H_2O$

It is formed by heating the gypsum

$$CaSO_4 .\ 2H_2O \xrightarrow[\Delta]{-\frac{3}{2}H_2O} CaSO_4 .\ \frac{1}{2}H_2O.$$

**99.** Milk is an emulsion of fat particles dispersed in water. Emulsions are the dispersions of one liquid in the other when two immiscible or partly miscible liquids is shaken.

**100.** Hydrogen peroxide is an unstable liquid and decomposes into water and oxygen upon heating. The decomposition of $H_2O_2$ is retarded (stability is increased) by adding small amounts of acid. Therefore it is more stable in acidic solution.

**101.** Acetylene is formed when chloroform is heated at high temperature with silver powder.

$$CHCl_3 + 6Ag + Cl_3CH \xrightarrow{\Delta} HC \equiv CH + 6AgCl$$

**102.** According to the following equation, on increasing temperature, the osmotic pressure is also increased

$$\pi = KCT$$

where, $\pi$ = Osmotic pressure, K = Constant

C = Molar Concentration, T = Temperature

**103.** $pH = -\log [H^+]$

$\Rightarrow$ $4 = -\log [H^+]$

$\Rightarrow$ $[H^+] = 10^{-4}$

As $[H^+][OH^-] = 1 \times 10^{-14}$

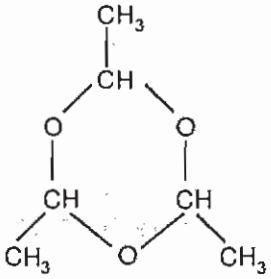
$\therefore$ $[OH^-] = 10^{-10}$

**104. Moderator :** The fast neutrons ejected during fission must be slowed down by collisions with atoms of comparable mass which don't absorb them. Such material are called **moderaters.**

**105.** Boron or cadmium rods, are used as control rods. These rods absorb neutrons and thereby control the rate of fission.

**106.** Paraldehyde is formed if anhydrous acetaldehyde is treated with conc. $H_2SO_4$.

$$3CH_3CHO \xrightarrow{\text{Conc. } H_2SO_4} (CH_3CHO)_3$$



Paraldehyde

**107.** Unlike other halogen acids, HF acid attacks silica and glass. Glass being a mixture of sodium and calcium silicates react with HF acid forming sodium and calcium fluorosilicates respectively.

**109.** Nuclear fission involves the cleavage of bigger unstable nuclei to form stable smaller nuclei. But radioactive substances usually undergo $\alpha$ - emission, $\beta$ - particle emission, electron capture etc. $\alpha$ - particles are He nuclei $\beta$ - particles are electrons.

**110.** The process of coating a metal with a corrosion resistant metal by electrolysis is called as electroplating. It was first discovered by Faraday.

**112.** When colloidal solutions are viewed under a powerful ultra microscope, the colloidal particles appear to be in a state of continuous motion in zig-zag directions all over the field of view. small the size of particles, faster is the motion.

**113.** Diamond is the hardest natural substance known so it is used for glass cutting purposes.

**114.** Ammonia reacts with water to form, ammonium hydroxide.

$$NH_3 + H_2O \longrightarrow NH_4OH$$

$$\frac{\text{mole of solute}}{\text{volume of solution (in litres)}}$$

$NH_4OH$ exists in solution as $NH_4^+$ and $OH^-$ ions therefore ionic bonding (or electrovalent bonding) is present in $NH_4OH$.

**115.** $CCl_4$ is used as fire extinguishers under the name pyrene. The dense vapours form protective layer on the burning objects and prevent the oxygen or air to come in contact with the burning objects thus gives incombustible vapours.

**116.** Higher the negative charges, higher will be the size of the ion. Also, negative ion (anion) is always bigger than the cation or neutral atom counter part.

**117.** Methane ($CH_4$) can be prepared simply by hydrogenation of $CH_3Br$.

$$CH_3Br + H_2 \xrightarrow{Pd} CH_4 + HBr$$

Ethane can be prepared from $CH_3Br$ by Wurtz reaction

$$CH_3Br + 2Na + BrCH_3 \xrightarrow{\text{ether}} CH_3 - CH_3 + 2NaBr$$

**118.** According to Heisenberg uncertainity principle, it is impossible to measure simultaneously the exact position and exact momentum of a body as small as an electron.

Mathematically, $\Delta x.\ \Delta p \leq h/4\pi$

where, $\Delta x$ = Uncertainity in measurement of position

$\Delta p$ = Uncertainity in measurement of momentum

h = Plancks constant ($6.63 \times 10^{-34}$ Js)

**119.** Atomic number of an atom is defined as the total number of protons present in its nucleus. e.g., carbon has six protons, hence Z = 6.

**120.** A neutral atom whose atomic number (Z) is greater than one, contains protons, electrons and also neutrons equal to difference of atomic mass and atomic number (Z).

**121.** Tetra-ethyl lead [$Pb(C_2H_5)_4$] is used as antiknocking agent in engines. It is prepared from ethyl bromide.

**122.** The carbon content percentages are :

Anthracite – 95%, Peat – 60%,

Bituminous – 88%.

**123.** Mixed halides of flourine and chlorine are easily liquifible gases having low boiling point and low specific heats.

**124.** $CaH_2 + 2H_2O \longrightarrow Ca(OH)_2 + 2H_2$

$Ca + 2H_2O \longrightarrow Ca(OH)_2 + H_2$

**125.** Distillation is done to separate benzene and chlorobenzene due to the difference in their boiling point helps to collect them at different temperatures.

**126.** Given: Rate of sulphur on the earth = 5 parts out of 2250 parts.

Percentage of sulphur in the earth

$$= \frac{\text{Rate of sulphur}}{\text{Total number of sulphur parts}}$$

$$= \frac{5}{2250} \times 100 = \frac{2}{9}\%.$$

**127.** Given, tax per rupee = 10 paise = 0.1 rupee and total paid tax = 18.25 rupees.

Total amount on which tax is paid

$$= \frac{\text{Total paid tax}}{\text{Tax per rupee}} = \frac{18.25}{0.1} = ₹\ 182.5$$

**128.** Given : length of train, l = 50 m; Length of platform, d = 100 m, and time, t = 10 sec.

Total distance covered by the train to pass the platform, s = l + d

$$= 50 + 100 = 150 \text{ m.}$$

$$\therefore \text{ Speed of train, } v = \frac{s}{t} = \frac{150}{10} = 15 \text{ m/s.}$$

**129.** $0.12 \times 0.13 + 2 + 2 = 0.12 \times \frac{0.13}{2} + 2$

$$= 0.12 \times 0.065 + 2$$

$$= \times.0078 + 2 = 0.0078.$$

**130.** The third and fifth numbers are the multiple of 4 of the first and third number respectively. Therefore next number in the series will be (i.e. 128) multiple of 4 of the fifth number $32 \times 4 = 128$.

**131.** The difference of each successive and previous numbers has the sequential increase of one as

$3 - 1 = 2, 6 - 3 = 3, 10 - 6 = 4, 15 - 10 = 5,$

$21 - 6 = 15, 28 - 7 = 21, 36 - 8 = 28, 45 - 9 = 36$

(i.e. 2, 3, 4, 5, 6, 7, 8, 9)

Therefore next number after 15 in the series will be 21 (i.e. 21 – 15 = 6).

**132.** Each alphabet XBUFS is the next alphabet of WATER. Therefore SALT will be written as TBMU.

**133.** Each alphabet of UKPI is the next alphabet of SING. Therefore TAKE will be written as VCMG.

**134.** 'D' is the husband of 'B'. And C, B and G are the brother and sisters. Therefore 'D' is the brother-in-law of 'C'.

**135.** 'A' and 'E' are husband-wife and B, G and C are their children. 'H' is the father of 'E'. Therefore 'H' is the grandfather of 'C'.