



Aakash

Medical | IIT-JEE | Foundations

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FORTNIGHTLY TEST FOR NEET-2027 (XII PASSED)

MM: 720

FT-01

Time: 180 Mins.

Answers

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

Hints and Solutions

PHYSICS

(1) Answer : (4)

Solution:

$$p = mv$$

$$[p] = [M][LT^{-1}]$$

$$= [MLT^{-1}]$$

(2) Answer : (2)

Solution:

Significant figures = 3

(3) Answer : (2)

Solution:

Absolute error in a measured value is $|a - a_{\text{mean}}|$, so it has same unit. Fractional error is unitless.

(4) Answer : (2)

Hint:

Power formula in combination of errors.

Solution:

$$\text{Given } P = \frac{A^2 B}{C^{2/3} D^{3/4}}$$

So,

$$\frac{\Delta P}{P} \times 100 = 2 \frac{\Delta A}{A} \times 100 + \frac{\Delta B}{B} \times 100 + \frac{2}{3} \times \frac{\Delta C}{C} \times 100 + \frac{3}{4} \times \frac{\Delta D}{D} \times 100$$

$$\text{or, } \frac{\Delta P}{P} \times 100 = 2 \times 1\% + 2\% + \frac{2}{3} \times 3\% + \frac{3}{4} \times 2\%$$

$$= 2\% + 2\% + 2\% + 1.5\% = 7.5\%$$

(5) Answer : (1)

Solution:

$$T = 2\pi \sqrt{\frac{L}{g}}$$

$$\therefore g \propto \frac{L}{T^2}$$

$$\frac{\Delta g}{g} \times 100 = \frac{\Delta L}{L} \times 100 + \frac{2\Delta T}{T} \times 100$$

$$= \left(\frac{0.1}{200}\right) \times 100 + 2 \times \frac{0.1}{400} \times 100$$

$$= 0.1\%$$

(6) Answer : (4)

Solution:

$$1 \text{ fermi} = 1 \text{ femtometre} = 10^{-15} \text{ m}$$

$$1 \text{ picometer} = 10^{-12} \text{ m}$$

$$1 \text{ angstrom} = 10^{-10} \text{ m}$$

(7) Answer : (4)

Solution:

$$\text{Angular momentum, } L = \frac{nh}{2\pi}$$

 $\therefore$ Unit of angular momentum (L) is same as Planck's constant.

$$E = hf \Rightarrow h = \frac{E}{f}$$

 $\therefore$ Unit of $\frac{\text{Energy}}{\text{Frequency}}$ is same as Planck's constant.

(8) Answer : (2)

Solution:

$$24.36 + 0.0623 + 256.2 = 280.6223$$

In addition, minimum number of decimal place is retained

 $\therefore$ 280.6 is correct answer.

(9) Answer : (4)

Solution:

$$(A - R) \Rightarrow [G] = [M^{-1}L^3T^{-2}]$$

$$(B - S) \Rightarrow [\eta] = [ML^{-1}T^{-1}]$$

$$(C - Q) \Rightarrow [K] = [MLT^{-3}K^{-1}]$$

$$(D - P) \Rightarrow [\sigma] = [MT^{-3}K^{-4}]$$

(10) Answer : (1)**Solution:**

Correctness of an equation is verified by the principle of homogeneity and all unitless quantities are dimensionless

(11) Answer : (3)**Solution:**

Checking dimensional consistency.

$$x = at + bt^2$$

Units of x and bt^2 should be same and equal to m . $\therefore$ Unit of b is m/s^2 .**(12) Answer : (3)****Solution:**

Least count = 1 M.S.D – 1 V.S.D

$$\frac{nN - nN + N}{n} = \frac{N}{n} \text{ cm}$$

(13) Answer : (1)**Solution:**

Two different physical quantities can't be added or subtracted.

(14) Answer : (4)**Solution:**

Precision is related to least count.

(15) Answer : (1)**Solution:**

The number of significant figure in 433.00 is 5.

(16) Answer : (3)**Solution:**

$$\frac{\Delta V}{V} \times 100 = 3 \frac{\Delta r}{r} \times 100$$

$$= 3 \times 0.2$$

$$= 0.6\%$$

(17) Answer : (4)**Solution:**The result $2.0 \times 4.01 = 8.02 \text{ m}^2$ must contain two significant figures i.e., 8.0 m^2 .**(18) Answer : (3)****Solution:**

$$\text{Kinetic energy } K = \frac{1}{2}mv^2$$

$$\text{Unit of kinetic energy} = \text{mass} \left[\frac{\text{length}}{\text{time}} \right]^2$$

$$= \left(100 \text{ g} \right) \left[\frac{10 \text{ cm}}{20 \text{ s}} \right]^2$$

$$= \left(100 \text{ g} \right) \left(\frac{100}{400} \right) \frac{\text{cm}^2}{\text{s}^2}$$

$$= 25 \text{ g} \frac{\text{cm}^2}{\text{s}^2}$$

$$= 25 \text{ erg}$$

(19) Answer : (3)**Hint:**Correct length = MSR + VSR $\times$ LC – zero error.**Solution:**

$$\text{Correct length} = 7.6 + 0.01 \times 4 - (-0.03)$$

$$= 7.6 + 0.04 + 0.03$$

$$= 7.67 \text{ cm}$$

(20) Answer : (1)**Hint:**Power = Force $\times$ velocity

$$\frac{\text{Energy}}{\text{Time}} = \text{Force} \times \text{Velocity}$$

Solution:

$$\frac{[E]}{[VT]} = \frac{[ML^2 T^{-2}]}{[LT^{-1} T]}$$

$$\left[\frac{E}{VT} \right] = [MLT^{-2}] = [F]$$

(21) Answer : (2)

Solution:

Pitch = (Least count) × (No. of divisions on circular scale)

$$\Rightarrow \text{Pitch} = 5 \times 10^{-6} \times 2 \times 10^2 = 10^{-6} \times 10^3 = 10^{-3} \text{ m} = 1 \text{ mm}$$

(22) Answer : (2)

Hint:

Reading = MSR + CSR × LC

Solution:

$$\text{Correct diameter} = 0.5 + 23 \times 0.002 = 0.546 \text{ cm}$$

(23) Answer : (1)

Solution:

Total displacement = 0

Average velocity = 0

(24) Answer : (4)

Hint:

$$a = \frac{v dv}{dx}$$

Solution:

$$v = x^2 + x$$

$$\frac{dv}{dx} = 2x + 1$$

$$a = v \left(\frac{dv}{dx} \right) = (x^2 + x)(2x + 1)$$

$$a(x = 2 \text{ m}) = (2^2 + 2)((2)(2) + 1)$$

$$= (6)(5) = 30 \text{ m/s}^2$$

(25) Answer : (4)

Solution:

In both (2) and (3) velocity will go on reducing, it will become zero at some time and then goes on increasing in opposite direction.

(26) Answer : (1)

Solution: $g = \text{constant}$, so $\langle a \rangle = g$

(27) Answer : (1)

Solution:

To determine whether speed is increasing or decreasing, both velocity and acceleration direction must be known.

(28) Answer : (3)

Solution:

$$\text{Time taken} = \frac{\text{Total distance travelled}}{\text{Speed}}$$

$$= \frac{3}{1} = 3 \text{ minutes}$$

(29) Answer : (2)

Solution:

$$S_n = u + \frac{a}{2}(2n - 1)$$

$$\frac{S_3}{S_5} = \frac{2 \times 3 - 1}{2 \times 5 - 1} = \frac{5}{9}$$

(30) Answer : (1)

Solution:When a particle moves with constant velocity along a straight line, the **displacement** is equal to the **distance** traveled because both are measured along the same straight path. Therefore, the ratio of the magnitude of displacement to the distance is **equal to one**.

(31) Answer : (3)

Solution:

$$\frac{v_A}{v_B} = \frac{(\tan \theta)_A}{(\tan \theta)_B} = \frac{\tan 37^\circ}{\tan(37^\circ + 16^\circ)} = \frac{\tan 37^\circ}{\tan 53^\circ} = \frac{4}{3}$$

$$\boxed{\frac{v_A}{v_B} = \frac{9}{16}}$$

(32) Answer : (2)**Solution:**

$$v_{(avg)} = \frac{\text{Total distance travelled}}{\text{Total time taken}}$$

$$= \frac{40+40}{15} = \frac{80}{15} = 5.33 \text{ m/s}$$

(33) Answer : (2)**Solution:**

If the speed of body is increasing, then acceleration is in the direction of velocity.

Acceleration may be positive or negative as per sign convention.

When acceleration (a) is in direction of velocity (v), then v increases whether a is increasing or decreasing.**(34) Answer : (2)****Solution:** $\Delta v = \text{Area under } (a - t) \text{ graph.}$

$$v - u = \frac{1}{2} \times 10 \times 10$$

$$v - 10 = 50$$

$$v = 60 \text{ m/s}$$

(35) Answer : (4)**Solution:**Displacement $s = x_f - x_i$

$$s = x(2) - x(0)$$

$$s = (5 \times 4 - 10 \times 2 + 28) - 28$$

$$= 20 - 20 + 28 - 28$$

$$= \text{Zero}$$

(36) Answer : (4)**Solution:**

$$S = ut - \frac{1}{2}gt^2$$

$$20 = 20t - 5t^2$$

$$5t^2 - 20t + 20 = 0$$

$$t^2 - 4t + 4 = 0$$

$$(t - 2)^2 = 0$$

$$t = 2 \text{ s}$$

(37) Answer : (3)**Solution:**

$$I = \left[\frac{x^3}{3} + x^2 \right]_0^1 = \left(\frac{1}{3} + 1 \right) = \left(\frac{4}{3} \right)$$

(38) Answer : (2)**Solution:**Slope of v - t graph gives acceleration

$$a = \frac{\Delta v}{\Delta t} = \frac{2}{4} = \frac{1}{2} \text{ m s}^{-2}$$

(39) Answer : (4)**Solution:**

$$s = \frac{1}{2} \left(\frac{\alpha\beta}{\alpha+\beta} \right) \cdot T^2$$

$$= \frac{1}{2} \left(\frac{5 \cdot 10}{5+10} \right) \cdot 30^2$$

$$= 1500 \text{ m}$$

(40) Answer : (2)**Hint:**

$$a_{\text{relative}} = (g - a)$$

Solution:

$$t = \sqrt{\frac{2h}{a_{\text{rel}}}}$$

$$= \sqrt{\frac{2 \times 2}{4}}$$

$$= 1 \text{ s}$$

(41) Answer : (3)**Hint:**

$$S_{\text{nth}} = u + \frac{a}{2}(2n-1)$$

Solution:

$$S_1 = \frac{g}{2}(2-1) = \frac{g}{2}$$

$$S_2 = \frac{g}{2}(4-1) = \frac{3g}{2}$$

$$S_3 = \frac{g}{2}(6-1) = \frac{5g}{2}$$

$$S_1 : S_2 : S_3 = 1 : 3 : 5$$

(42) Answer : (3)

Solution:

$$t = \frac{S_{\text{relative}}}{V_{\text{relative}}} = \frac{360}{(50+10)} = 6 \text{ s}$$

(43) Answer : (2)

Solution:

The particle will be at maximum height at $t = 5$ sec. So

$$v = u - gt \Rightarrow 0 = u - gt$$

$$u = gt = 5 \times 10 = 50 \text{ m s}^{-1}$$

(44) Answer : (3)

Solution:

$$\text{Height above level of projection } h = \frac{v^2}{2g} = \frac{20 \times 20}{2 \times 10} = 20 \text{ m}$$

$$\text{From ground, height of ball (max)} = 20 + h = 20 + 30 = 50 \text{ m}$$

(45) Answer : (4)

Solution:

Velocity is vector. So, direction of velocity may change even if magnitude of velocity does not change.

Increment or decrement in speed depends on direction of $\vec{v}$ and $\vec{a}$

CHEMISTRY

(46) Answer : (1)

Solution:

- Constituent of pure substance can not be separated by physical method.
- Milk is heterogenous.

(47) Answer : (4)

Solution:

Percentage of oxygen in

$$\text{a - CaCO}_3 = \frac{1}{100} \times 48 \times 100 = 48\%$$

$$\text{b - NaOH} = \frac{1}{40} \times 16 \times 100 = 40\%$$

$$\text{c - CaO} = \frac{1}{56} \times 16 \times 100 = 28.5\%$$

$$\text{d - C}_6\text{H}_{12}\text{O}_6 = \frac{1}{180} \times 96 \times 100 = 53.3\%$$

(48) Answer : (4)

Solution:

Multiple Prefix

$$10^{-24} \quad \text{yocto}$$

$$10^{-21} \quad \text{zepto}$$

$$10^{-18} \quad \text{atto}$$

$$10^{-9} \quad \text{nano}$$

(49) Answer : (4)

Solution:

As per Dalton's atomic theory all atoms of a given element have identical properties, including identical mass. Atoms of different elements differ in mass.

(50) Answer : (3)

Solution:

Compound Molecular formula Empirical formula Molecular mass

$$\text{Acetylene} \quad \text{C}_2\text{H}_2 \quad \text{CH} \quad 26 \text{ u}$$

$$\text{Benzene} \quad \text{C}_6\text{H}_6 \quad \text{CH} \quad 78 \text{ u}$$

$$\text{As, } 26 \times 3 = 78$$

$\therefore$ Molecular mass of $C_2H_2 \times 3 =$ Molecular mass of C_6H_6

(51) Answer : (3)

Solution:

Law of conservation of mass is not applicable for nuclear reaction.

(52) Answer : (2)

Solution:

9.1×10^{-31} kg mass of 1e

So, 0.5 kg mass will be of $\frac{1}{9.1 \times 10^{-31}} \times 0.5$ electrons

$$= \frac{0.5 \times 10^{31}}{9.1 \times 6.022 \times 10^{23}}$$

$$= 9.1 \times 10^5$$

(53) Answer : (3)

Solution:

The SI unit of thermodynamic temperature and luminous intensity respectively are Kelvin and candela

(54) Answer : (1)

Solution:

$$\text{mass of Fe} = 100 \times \frac{0.33}{100} = 0.33 \text{ g}$$

$$\therefore \text{mole of Fe} = \frac{0.33}{56} = 5.89 \times 10^{-3} \text{ mole}$$

$$\therefore \text{Number of atoms of Fe} = 5.89 \times 10^{-3} \times 6.022 \times 10^{23} = 0.035 \times 10^{23} \text{ atoms}$$

(55) Answer : (3)

Solution:

$$2A + B = 80 \dots (i)$$

$$2A + 3B = 100 \dots (ii)$$

From equations (i) and (ii)

$$A = 35 \text{ u and } B = 10 \text{ u}$$

(56) Answer : (3)

Solution:

$$\text{Molality (m)} = \frac{\text{Mole of solute}}{\text{Weight of solvent (kg)}}$$

$$2 = \frac{0.5}{\text{Weight of solvent (kg)}}, \text{ weight of solvent} = 0.25 \text{ kg}$$

$$= 250 \text{ g}$$

(57) Answer : (3)

Solution:

1 mole of NO_2 will occupy 22.4 L at STP.

$$\text{Density} = \frac{\text{Molar mass}}{\text{Molar volume}} = \frac{46}{22.4} = 2.05 \text{ g/L}$$

(58) Answer : (1)

Solution:

$$M_1V_1 = M_2(V_1 + V_2)$$

$$200 \times 3 = M_2(200 + 400)$$

$$M_2 = \frac{600}{600} = 1 \text{ M}$$

(59) Answer : (4)

Solution:

$$\% \text{ by mass} = \frac{10}{10^6} \times 100 = 10^{-3} \%$$

(60) Answer : (2)

Solution:

4 amu He means 1 atom.

So, 40 amu He means 10 atoms

(61) Answer : (4)

Solution:

Na_2CO_3 is thermally stable so only $MgCO_3$ decomposes.



$$\frac{0.22}{44} = \frac{1}{200} \text{ mol}$$

$$\frac{1}{200} \times 84 = 0.42 \text{ g}$$

$$\text{So, Mass of } Na_2CO_3 = 4 - 0.42 = 3.58 \text{ g}$$

(62) Answer : (3)**Solution:**Moles of ethanol = $M \times V = 0.2 \times 2 = 0.4 \text{ mol}$ Mass of ethanol = $0.4 \times 46 = 18.4 \text{ g}$ $\therefore$ Volume of ethanol needed = $\frac{\text{mass}}{\text{density}} = \frac{18.4}{0.8} = 23 \text{ mL}$ **(63) Answer : (3)****Solution:**

At S.T.P

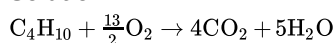
$$\Rightarrow \frac{V(L)}{22.4} = \frac{\text{Mass}}{\text{Molar mass}}$$

$$\Rightarrow \frac{5.6}{22.4} = \frac{16}{\text{Molar mass}}$$

 $\Rightarrow$ Molar mass = 64.

Now,

$$\text{Number of atoms} = \frac{64}{64} \times N_A \times 3 = 3 N_A$$

(64) Answer : (3)**Solution:** $\therefore$ 1 mole C_4H_{10} produces 4 mole CO_2 $\therefore$ 58 g $\text{C}_4\text{H}_{10} \equiv 4 \times 44 \text{ g CO}_2$

$$\therefore 116 \text{ g C}_4\text{H}_{10} \equiv \frac{4 \times 44}{58} \times 116$$

= 352 g

(65) Answer : (2)**Hint:**

$$\text{Mole fraction } (X) = \frac{n_{\text{NaOH}}}{n_{\text{NaOH}} + n_{\text{H}_2\text{O}}}$$

Solution:

$$n_{\text{NaOH}} = \frac{40}{40} = 1$$

$$n_{\text{H}_2\text{O}} = \frac{60}{18} = 3.33$$

$$X_{\text{NaOH}} = \frac{1}{1+3.33} = \frac{1}{4.33} = 0.23$$

(66) Answer : (1)**Solution:**

In case of ionic compounds formula mass is preferred to molecular mass.

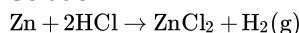
(67) Answer : (4)**Solution:**

$$\text{Average atomic mass} = \frac{25 \times 40 + 28 \times 60}{100} = 26.8$$

(68) Answer : (3)**Solution:**

Precision refers to the closeness of various measurements for the same quantity.

Accuracy refers to agreement of a particular value to the true value of the result.

(69) Answer : (3)**Solution:**22400 ml of H_2 gas is produced from $\text{Zn} = 65 \text{ g}$

$$1.12 \text{ ml of H}_2 \text{ gas is produced from Zn} = \text{Zn} = \frac{65}{22400} \times 1.12 \text{ g} = 3.25 \times 10^{-3} \text{ g}$$

i.e., $32.5 \times 10^{-4} \text{ g}$ **(70) Answer : (2)****Solution:**

As per the law of multiple proportions, if two elements combine to form more than one compound the masses of one element that combine with a fixed mass of the other element, are in the ratio of small whole numbers.

(71) Answer : (1)**Solution:**

$$0.0023 = 2.3 \times 10^{-3}$$

(72) Answer : (1)**Hint:**

$$M_1V_1 + M_2V_2 = M_3V_3.$$

Solution:

$$M_3 = \frac{M_1 V_1 + M_2 V_2}{V_3}$$

$$= \frac{0.1 \times 2 + 0.2 \times 1}{2+1} = 0.133 \text{ M}$$

(73) Answer : (2)**Solution:**

0.281 has 3 significant figures

While all other have 2 significant figures

(74) Answer : (1)**Solution:**

$$\frac{^{\circ}C}{5} = \frac{F-32}{9}$$

$$\Rightarrow ^{\circ}C = 5 \left(\frac{182-32}{9} \right) = 83.3^{\circ}C$$

(75) Answer : (3)**Hint:**

$$\text{One AVOGRAM} = \frac{1}{N_A}$$

(76) Answer : (3)**Solution:**

$$\text{Total number of moles} = \frac{4.2}{14} = 0.3 \text{ mol}$$

$$1 \text{ mol of } N^{3-} \text{ have electrons} = 10 \times N_A$$

$$\therefore \text{Number of electrons in } 0.3 \text{ mol} = 0.3 \times 10 \times N_A = 3 \times N_A$$

(77) Answer : (4)**Solution:**

$$\frac{1.5}{4} \quad \frac{2}{5}$$

$$\Rightarrow 0.375 \quad 0.4$$

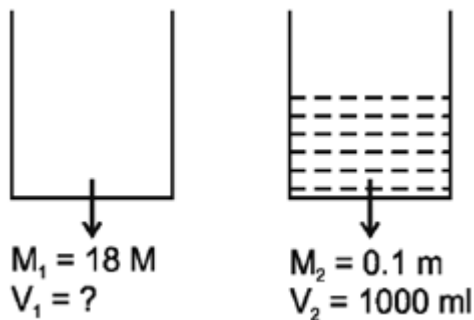
NH₃ is limiting reactant

$$\frac{1.5}{4} = \frac{\text{Number of moles of NO}}{4}$$

Number of moles of NO = 1.5

(78) Answer : (3)**Solution:**molarity of 98% H₂SO₄ by mass having density 1.80 g/ml will be

$$M = \frac{\%w/w \times d \times 10}{M. \text{ mass}} = \frac{98 \times 1.80 \times 10}{98} = 18 \text{ M.}$$

Applying $M_1 V_1 = M_2 V_2$

$$18 \times V_1 = 1000 \times 0.1$$

$$V_1 = \frac{100}{18} = 5.55 \text{ ml}$$

(79) Answer : (3)**Solution:**

$$\text{Ratio of number of atoms in } H_2 \text{ and } O_3 = \frac{1}{2} \times 2 N_A : \frac{3}{48} \times 3 N_A = 1 : \frac{3}{16} = 16 : 3$$

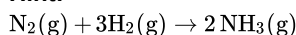
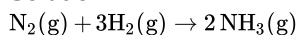
(80) Answer : (2)**Solution:**

$$\text{Number of carbon atoms} \Rightarrow \text{In } 112 \text{ mL of } CO_2 \text{ at STP} = \frac{112}{22400} \times N_A$$

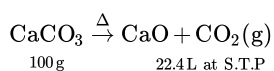
$$\text{In } 30 \text{ g of } \text{C}_2\text{H}_6 = \frac{30}{30} \times 2N_A = 2N_A$$

$$\text{In } 4.5 \text{ g of } \text{H}_2\text{C}_2\text{O}_4 = \frac{4.5}{90} \times 2N_A = 0.1N_A$$

$$\text{In } 13 \text{ g of } \text{C}_2\text{H}_2 = \frac{13}{26} \times 2N_A = N_A$$

(81) Answer : (3)**Hint:****Solution:**

Initially	2 mol	10 mol	0
Finally	0	4 mol	4 mol (68g)

(82) Answer : (2)**Solution:**So, to get 5.6 L $\text{CO}_2(\text{g})$ we need

$$\frac{100}{22.4} \times 5.6 \text{ g} = 25 \text{ g of } \text{CaCO}_3, \text{CaCO}_3 \text{ is } 50\% \text{ pure only}$$

$$\therefore \text{Mass of impure } \text{CaCO}_3 = 25 \times \frac{100}{50} = 50 \text{ g}$$

(83) Answer : (1)**Solution:**

$$\text{Molarity of } \text{Al}_2(\text{SO}_4)_3 = \frac{W_{\text{Al}_2(\text{SO}_4)_3} \times 1000}{M_{\text{Al}_2(\text{SO}_4)_3} \times V_{\text{solution}}}$$

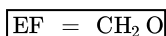
$$\text{Molarity of } \text{Al}_2(\text{SO}_4)_3 = \frac{68.4 \times 1000}{342 \times 500} = 0.4$$

$$\therefore \text{Conc. of } \text{Al}^{3+} = 2 \times 0.4 = 0.8 \text{ M}$$

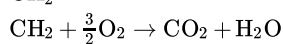
$$\text{Conc. of } = 0.4 \times 3 = 1.2 \text{ M}$$

(84) Answer : (2)**Solution:**

	Percentage	Atomic mass	Moles	Simple ratio
C	40%	12	$\frac{40}{12} = 3.33$	1
H	6.7%	1	$\frac{6.7}{1} = 6.7$	2
O	53.3%	16	$\frac{53.3}{16} = 3.33$	1

**(85) Answer : (1)****Solution:**

$$\text{Empirical formula of } \text{C}_x\text{H}_y : \frac{6}{12} : \frac{1}{1}$$



no. of oxygen required = 3

so, Empirical formula of the compound = CH_2O **(86) Answer : (2)****Solution:**

For minimum molecular mass at least one Sulphur atom should be present.

$$\text{Mass percentage of an element} = \frac{\text{Mass of an element}}{\text{Molecular mass}} \times 100$$

$$\Rightarrow 8 = \frac{32}{\text{Molecular mass}} \times 100$$

$$\Rightarrow \text{Molecular mass} = 400 \text{ u}$$

(87) Answer : (2)**Hint:**

$$\text{Mole fraction} = \frac{\text{Mole of one component}}{\text{total mole}}$$

Solution:

$$\text{Mole fraction of A} = \frac{2}{2+3} = 0.4$$

Mole fraction of B = $\frac{3}{2+3} = 0.6$

(88) **Answer :** (4)

Solution:

Mole fraction is a unitless quantity

(89) **Answer :** (2)

Solution:

Normality depends upon temperature because volume of a solution is temperature dependent.

(90) **Answer :** (2)

Solution:

0.2 molal urea means 12 g of urea dissolved in 1 kg of solvent, i.e., 1012 g of solution.

So, 2 kg of 0.2 molal solution requires.

$$\text{Urea} = \frac{12}{1012} \times 2000 \text{ g} = 23.72 \text{ g}$$

BOTANY

(91) **Answer :** (3)

Solution:

The *cis* and *trans* faces of Golgi complex are interconnected.

(92) **Answer :** (2)

Solution:

Nerve cells are the longest branched cells of human body.

(93) **Answer :** (2)

Solution: Mesosomes are intricate structures that appear as extensions of the plasma membrane in various bacterial species.

(94) **Answer :** (2)

Hint:

Secondary constriction is a non-staining region of SAT chromosome.

Solution:

Satellite is a region beyond secondary constriction in SAT chromosome.

(95) **Answer :** (4)

Solution:

Schleiden and Schwann were credited with cell theory but the cells are not always the living unit. Cells die and still remain functional such as sclereids and xylem vessels in plants. Rudolf Virchow (1855) first explained that cells divide and new cells are formed from pre-existing cells (*Omnis cellula-e cellula*).

(96) **Answer :** (3)

Solution:

A tracheid is elongated while, mesophyll cells are round and oval.

(97) **Answer :** (2)

Solution:

Eukaryotes have both 70S and 80S ribosomes. 70S ribosome has 50S and 30S subunits, whereas 80S ribosome has 60S and 40S subunits.

(98) **Answer :** (2)

Solution:

Elaeoplast, aleuroplast and amyloplast are leucoplast.

(99) **Answer :** (3)

Solution:

According to fluid mosaic model proposed by Singer and Nicolson, the quasi-fluid nature of lipid enables lateral movement of proteins within the overall bilayer.

(100) **Answer :** (3)

Solution:

Microbodies are found in both animal and plant cells.

(101) **Answer :** (1)

Solution:

Main arena of cellular activities is cytoplasm. In both prokaryotic and eukaryotic cells, a semi-fluid matrix called cytoplasm occupies the volume of the cell.

(102) **Answer :** (3)

Solution:

In plants, vacuole are bounded by a single, semipermeable membrane called tonoplast.

(103) Answer : (4)

Solution:

Nucleolus is found in the nucleoplasm but it is not a membrane bound structure.

(104) Answer : (2)

Solution:

Several ribosomes may attach to a single mRNA and form a chain called polyribosomes or polysome.

(105) Answer : (1)

Solution:

In a centriole, arrangement of microtubules is $9 + 0$. Each peripheral fibril is a triplet.

(106) Answer : (2)

Solution:

Inclusion bodies are not surrounded by any membrane and lie freely in cytoplasm.

(107) Answer : (1)

Solution:

Mitochondria are the site of aerobic respiration.

(108) Answer : (1)

Solution:

The membrane mechanism responsible for maintaining ionic balance by exchanging sodium and potassium ions across the plasma membrane is the Na^+/K^+ pump. This process requires the expenditure of cellular energy in the form of ATP, making it an example of active transport.

(109) Answer : (4)

Solution:

Blue-green algae are photosynthetic prokaryotes.

(110) Answer : (3)

Solution:

Ribosomes are composed of ribonucleic acid (RNA) and proteins and are not surrounded by any membrane.

(111) Answer : (3)

Solution:

Formation of cleavage furrow during animal cell division occur with the help of microfilaments.

(112) Answer : (3)

Solution:

Cell wall is a non-living rigid structure that forms an outer covering for the plasma membrane of fungi and plants. It protects the cell from mechanical damage and infection. Animal cells lack cell wall.

(113) Answer : (1)

Hint:

Cytoskeleton is an elaborate network of filamentous proteinaceous structures, consisting of microtubules.

Solution:

Cytoskeleton consists of microtubules, microfilaments and intermediate filaments. It is involved in the functions such as, motility.

(114) Answer : (2)

Solution:

Small bristle like fibres on bacteria are called fimbriae.

Fimbriae are helpful in attachment to the surface like host tissue or substratum.

(115) Answer : (3)

Solution:

The major function of contractile vacuole is osmoregulation, i.e., removal of excess of water.

(116) Answer : (2)

Solution:

The basal body of cilia and flagella is made up of centrioles.

(117) Answer : (1)

Solution:

Bacterial cell wall is mainly composed of peptidoglycan.

(118) Answer : (3)

Solution:

In case of acrocentric chromosome the centromere is situated close to its end forming one extremely short and one very long arm

(119) Answer : (2)

Solution:

A number of organised flattened membranous sacs called the thylakoids, are present in the stroma.

(120) Answer : (1)

Solution:

The unconnected units of Golgi apparatus in plants is called as dictyosomes.

(121) Answer : (1)

Solution:

Secondary constriction is non staining region of SAT chromosomes.

(122) Answer : (2)

Solution:

Golgi apparatus consists of many flat, disc-shaped sacs or cisternae. Cristae is found in mitochondria. Thylakoid in chloroplast and oxysomes in mitochondria.

(123) Answer : (4)

Solution:

The endomembrane system include endoplasmic reticulum (ER), golgi complex, lysosomes and vacuoles. Since the functions of the mitochondria, chloroplast and peroxisomes are not coordinated with the above components, these are not considered as part of the endomembrane system.

(124) Answer : (2)

Solution:

The cell wall and middle lamellae may be traversed by plasmodesmata which connects the cytoplasm of neighbouring cell. Whereas, middle lamellae holds the different neighbouring cells together.

(125) Answer : (2)

Solution:

Steroid hormones are synthesised in smooth endoplasmic reticulum.

(126) Answer : (2)

Solution:

Hint: Mycoplasma is the smallest living cell.

Sol.: Mycoplasma being prokaryote have nucleoid.

(127) Answer : (3)

Solution:

The cell wall determines the shape of the cell and provides a strong structural support to prevent the bacterium from bursting or collapsing.

(128) Answer : (3)

Solution:

Golgi apparatus is the important site of formation of glycoproteins and glycolipids.

(129) Answer : (4)

Solution:

Cell wall is the outermost layer in the plant cell.

(130) Answer : (2)

Solution:

Mitochondrial ribosomes in animal cells are similar to prokaryotic ribosomes and consist of 50S and 30S subunits.

(131) Answer : (4)

Solution:

Packed DNA has RNA, histones and some non-histone proteins.

(132) Answer : (4)

Solution:

In prokaryotes, chromatophores help in photosynthesis.

(133) Answer : (1)

Solution:

Glycocalyx as a loose sheath - Slime layer. Glycocalyx thick and tough - Capsule

(134) Answer : (1)

Solution:

In *Chlamydomonas* there is one chloroplast per cell.

(135) Answer : (1)

Hint:

Cellulose is present in cell walls of all groups of plants.

Solution:

Algal cell wall is composed of cellulose, galactans, mannans and minerals like calcium carbonate.

ZOOLOGY

(136) Answer : (1)

Solution:

Ligaments connect bone to bone. Tendons join muscle to bone.

(137) Answer : (3)

Solution:

The cells of adipose tissue are specialised to store fats. Each muscle is made of many long, cylindrical fibres. These fibres are composed of numerous fine fibrils, called myofibrils. RBCs and WBCs are not the only formed elements present in blood.

(138) Answer : (2)

Solution:

Cartilage is present in epiglottis, ear pinnae, in between adjacent bones of the vertebral column, limbs and hands in adults.

(139) Answer : (2)

Solution:

In neural tissues, neurons coordinate between different organs through nerve impulses that adjusts the body with respect to change in the environment.

(140) Answer : (1)

Solution:

The function of the cilia is to move particles, free cells or mucus in a specific direction. It is present in inner surfaces of some hollow organs such as fallopian tubes, bronchioles and small bronchi and help in movement of the particles present there.

(141) Answer : (4)

Solution:

A - Fibroblast B - Macrophage C - Collagen fibres D - Mast cell

(142) Answer : (2)

Solution:

Each myofibril shows alternate dark and light bands giving a characteristic striped or striated appearance. Skeletal muscle fibres are cylindrical and unbranched fibres with multi-nucleated condition.

(143) Answer : (4)

Hint:

A stimulus can be excitatory or inhibitory.

Solution:

When a neuron is suitably stimulated, an electrical disturbance is generated which swiftly travels along its plasma membrane.

Arrival of the disturbance at neuron's endings, or output zone, triggers events that may cause stimulation or inhibition of adjacent neurons and other cells.

(144) Answer : (2)

Solution:

Bone and cartilage are skeletal connective tissues.

Blood and lymph are fluid connective tissues.

(145) Answer : (2)

Solution:

Tendons and ligaments are examples of dense regular connective tissues.

(146) Answer : (1)

Solution:

Cartilage consists of chondrocytes which are present in lacunae and matrix rich in chondroitin sulfate.

(147) Answer : (1)

Hint:

Multicellular animal

Solution:

In unicellular organisms, all functions like digestion, respiration and reproduction are performed by a single cell. In the complex body of multicellular animals, the same basic functions are carried out by different groups of cells in a well organised manner. The body of a simple organism like *Hydra* is made of different types of cells and the number of cells in each type can be in thousands. *Hydra* exhibits division of labour. Others are unicellular organisms which do not show division of labour at tissue level.

(148) Answer : (2)

Solution:

Air sacs of lungs have squamous epithelium.

(149) Answer : (1)

Solution:

The cell junctions which perform cementing to keep neighbouring cells together is called adhering junctions.

(150) Answer : (4)

Hint:

Its cells are formed in bone marrow.

Solution:

Collagen or elastin fibres are absent in fluid connective tissue (e.g., blood).

(151) Answer : (4)

Hint:

All complex animals consist of only four basic types of tissues.

Solution:

In complex animals, the tissues are organised in specific proportion and pattern to form an organ like stomach, lungs, heart, etc.

In the GIT, organs like small intestine, stomach possess different types of tissues.

Connective tissue like blood, is also present in the GIT.

The GIT is also composed of distinct functional muscular layers.

The GIT is innervated by various types of nerve fibres.

(152) Answer : (1)

Solution:

- It is commonly found in ducts of glands and tubular parts of nephrons in kidney.
- Compound epithelium covers the moist surface of buccal cavity and pharynx.
- Ciliated columnar epithelium is present in fallopian tubes.
- Squamous epithelium is found in the walls of blood vessels and air sacs of lungs.

(153) Answer : (3)

Solution:

Areolar tissue is a type of loose connective tissue that provides support framework for epithelial tissue.

(154) Answer : (4)

Solution:

Areolar tissue contains fibroblasts, macrophages, mast cells, plasma cells, etc. Cells of cartilage are called chondrocytes.

(155) Answer : (4)

Solution:

Nerve cells do not form continuous tissue layers.

(156) Answer : (2)

Solution:

Pigments	Carotenoids, Anthocyanins, etc.
Alkaloids	Morphine, Codeine, etc.
Terpenoides	Monoterpenes, Diterpenes, etc.
Essential oils	Lemon grass oil, etc.
Toxins	Abrin, Ricin
Lectins	Concanavalin A
Drugs	Vinblastin, curcumin, etc.
Polymeric substances	Rubber, gums, cellulose

(157) Answer : (1)

Solution:

If a DNA sample was composed of 10% thymine, then the percentage of guanine would be 40%.

(158) Answer : (3)

Solution:

Saturated fatty acids lack double bonds in their carbon chains; rather, they have single bonds.

(159) Answer : (4)

Solution:

Haem in peroxidase and catalase, is the prosthetic group and is a part of active site of enzyme.

(160) Answer : (4)

Solution:

Transferases are class II enzymes.

(161) Answer : (4)**Solution:**

The polysaccharide that is not a storage polysaccharide is cellulose. Storage polysaccharides are carbohydrates that organisms use to store energy. The most common storage polysaccharides are starch and glycogen.

(162) Answer : (4)**Solution:**

DNA contains 2-deoxyribose ($C_5H_{10}O_4$), which lacks one oxygen atom as compared to other monosaccharides.

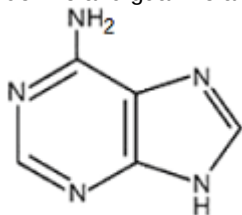
Thus, it does not conform to the empirical formula $(CH_2O)_n$, proving that this relationship is a useful generalization rather than a universal rule.

The formula for ribose is $C_5H_{10}O_5$.

(163) Answer : (3)**Solution:**

Trypsin and collagen are proteins (heteropolymers of amino acids).

• Adenine and guanine are substituted purines. They contain two heterocyclic rings in their structures.



Adenine (nitrogenous base)

• Oils have lower melting point (e.g., Gingelly oil) and hence remain as oil in winters. Lipids are also called fats and oils based on their melting points.

• Exoskeleton of arthropods have a complex polysaccharide called chitin. The monomeric unit of chitin is N-acetyl glucosamine (NAG).

(164) Answer : (3)**Hint:**

DNA possesses deoxyribose sugar.

Solution:

The sugar found in polynucleotides is either ribose (a monosaccharide pentose) or 2' deoxyribose. A nucleic acid containing deoxyribose sugar is called deoxyribonucleic acid (DNA) while the one which contains ribose sugar is called ribonucleic acid.

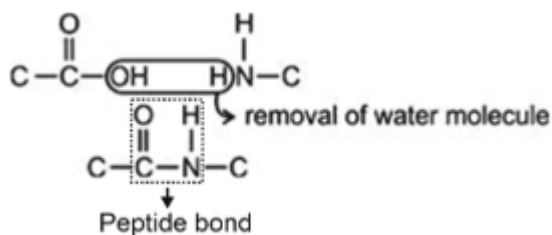
(165) Answer : (4)**Solution:**

A comparison of elements present in non-living and living matter.

Element	% Weight of	
	Earth's crust	Human body
Hydrogen (H)	0.14	9.5
Carbon (C)	0.03	18.5
Oxygen (O)	46.6	65.0
Nitrogen (N)	very little	3.3
Sulphur (S)	0.03	0.3
Sodium (Na)	2.8	0.2
Calcium (Ca)	3.6	1.5
Magnesium (Mg)	2.1	0.1
Silicon (Si)	27.7	negligible

(166) Answer : (4)**Solution:**

Peptide bond is formed by amino and carboxyl group.

**(167) Answer :** (4)**Solution:**

Nucleoside is made up of a nitrogenous base and a five-carbon sugar.

(168) Answer : (3)**Solution:**

RuBisCO is a protein. It is the most abundant protein in the whole of the biosphere.

(169) Answer : (2)**Solution:**

- Carbohydrates get broken down into monosaccharides.
- Lipids are not macromolecules.
- Different pyrimidine bases are present in DNA and RNA.

(170) Answer : (3)**Hint:**

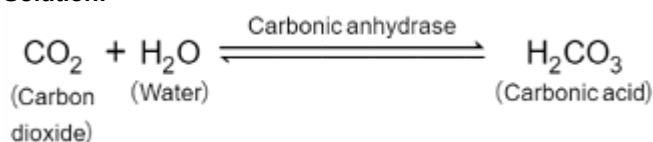
Acid-soluble fraction

Solution:

Compounds with molecular weight ranging from 18 to 800 Daltons approx. are found in acid-soluble fraction. The acid-soluble pool represents roughly the cytoplasmic composition. The macromolecules from organelles and cytoplasm become the acid-insoluble fraction. Lipids are present in structure like cell membrane.

(171) Answer : (4)**Solution:**

Lecithin is an example of a phospholipid.

(172) Answer : (2)**Solution:**

By using the enzyme named carbonic anhydrase, the reaction speeds dramatically with about 600,000 molecules being formed every second.

(173) Answer : (4)**Solution:**

Insulin is a hormone released from the endocrine part of pancreas directly into the fluid bathing the gland.

(174) Answer : (2)**Solution:**

Thymidylic acid (TMP) is not a component of RNA. Instead of thymine, uracil is present in RNA.

(175) Answer : (2)**Hint:**

Component of lipids.

Solution:

Amino acids are substituted methanes. Amino acids have four substituent groups *i.e.*, hydrogen, carboxyl group (–COOH), amino group (–NH₂) and a variable group designated as R-group. Glycerol is trihydroxy propane and is a constituent of lipids.

(176) Answer : (3)**Solution:**

A protein is imagined as a line, the left end is represented by the first amino acid and the right end is represented by the last amino acid. The first amino acid is also called the N-terminal amino acid. The last amino acid is also called the C-terminal amino acid.

(177) Answer : (2)**Solution:**

Glucose is stored in the form of glycogen in animals.

(178) Answer : (3)**Solution:**

Cytosine is a nitrogenous base.

(179) Answer : (3)**Solution:**

Tertiary structure is required for attaining biological activity. In tertiary structure, protein folds in such a way to form pockets called as active sites, where substrate can bind.

(180) Answer : (2)**Solution:**

Alkaloids – Morphine and codeine.