All India Aakash Test Series for NEET - 2026

TEST - 4

Click here for Code-B Sol.

Test Date : 07/12/2025

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (4)

Hint & Sol.: At the highest point, velocity has minimum value and is perpendicular to direction of acceleration.

2. Answer (2)

Hint: Velocity $\vec{v} = \frac{d\vec{r}}{dt} \Rightarrow \int d\vec{r} = \int \vec{v}\, dt$

Sol.: $\int_0^{\vec{r}} d\vec{r} = \int_0^1 3t^2 dt\, \hat{j} + \int_0^1 3dt\, \hat{k}$

$\Rightarrow \vec{r} = t^3\Big|_0^1 \hat{j} + 3t\Big|_0^1 \hat{k} = \left(\hat{j} + 3\hat{k}\right)$ m

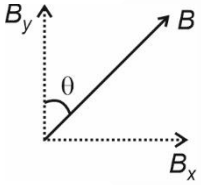
3. Answer (4)

Hint: In uniform circular motion, $|\vec{a}_c|$ = constant

Sol.: **A** is false because tangential acceleration = $\frac{dv}{dt}$ = zero but centripetal acceleration $|\vec{a}_c|$ = non-zero, in uniform circular motion.

4. Answer (4)

Hint:



Sol.: Taking rectangular components,

$B_y = B\cos\theta$

$B_x = B\sin\theta$

5. Answer (4)

Hint: Maximum relative error = $\frac{\Delta P}{P} = x = \frac{3\Delta a}{a} + \frac{1}{2}\frac{\Delta b}{b} + \frac{1}{2}\frac{\Delta c}{c}$

Sol.: $x = 3\times\frac{1}{50} + \frac{1}{2}\left(\frac{1}{25} + \frac{1}{25}\right) = \frac{5}{50} = \frac{1}{10} = 0.1$

6. Answer (4)

Hint & Sol.: Ampere is fundamental unit of Electric current.

candela is fundamental unit of Luminous intensity.

kelvin is fundamental unit of Temperature.

7. Answer (1)

Hint: For maximum value of y, $\frac{dy}{dx} = 0$

Sol.: $\frac{dy}{dx} = -6x - 1 = 0 \Rightarrow 6x = -1 \Rightarrow x = \frac{-1}{6}$

$\therefore$ At $x = \frac{-1}{6}$, this downward parabola would have maximum value.

8. Answer (3)

Hint: Acceleration $a = \frac{dv}{dt}$ and velocity $v = \frac{dx}{dt}$

Sol.: Given $t = kx^2v = x^2v$ ($k = 1$)

Differentiating both sides w.r.t. time,

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

$\Rightarrow a = \frac{1-2xv^2}{x^2} = \frac{1}{x^2} - \frac{2v^2}{x}$

9. Answer (2)

Hint: Final reading of screw gauge

= M.S.R + n × (L.C.)

Sol.: Final reading = 4×1 mm + (40 – 5) × $\frac{1\,\text{mm}}{100}$

= 4 mm + 0.35 mm

= 4.35 mm

10. Answer (4)

Hint: Straight line in intercept form is given by $\frac{x}{a} + \frac{y}{b} = 1$ where a, b = intercepts on x, y-axes.

Sol.: Rearranging we get, $y + 3x = 2$

$\Rightarrow \frac{y}{2} + \frac{3x}{2} = 1$

$\therefore$ x-intercept = $\frac{2}{3}$ and y-intercept = 2

11. Answer (2)

Hint: Total displacement = zero

$\Rightarrow$ Average velocity = zero

Sol.: Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$$= \frac{2d}{\frac{d}{v}+\frac{d}{2v}} = \frac{4v}{3}$$

$$= 4\times\frac{30}{3} = 40 \text{ km/h}$$

12. Answer (3)

Hint: Particle comes to rest when $v = \frac{dx}{dt} = 0$

Sol.: $v = 3pt^2 - 2qt = 0 \Rightarrow t = \frac{2q}{3p} = t_1 \Rightarrow (A)$ is correct.

($\because$ both $p, q > 0$)

$$a = 0 \Rightarrow t = \frac{2q}{6p} = \frac{q}{3p} = \frac{t_1}{2}$$

Therefore option (3) is correct.

13. Answer (3)

Hint: Lower the least count of instrument, higher the precision.

Sol.: Order of precision:

19.127 m > 18.81 m > 19.3 m > 18 m

14. Answer (2)

Hint: Equation of projectile is given by $y = x\tan\theta\left(1-\frac{x}{R}\right)$

Sol.: $4y = 4x - x^2 \Rightarrow y = x - \frac{x^2}{4} = x\left(1-\frac{x}{4}\right)$

On comparing, we get $\tan\theta = 1$ and range $R = 4$ m

Using $R = \frac{2u_x u_y}{g} \Rightarrow u_x u_y = \frac{40}{2} = 20 \text{ m}^2/\text{s}^2$

15. Answer (4)

Hint: $R_{min} \le R \le R_{max}$

Sol.: $|F_2 - F_1| \le R \le F_1 + F_2$

$\Rightarrow$ 2 N $\le R \le$ 8 N

16. Answer (2)

Hint: In addition/subtraction, the result would have the same decimal places as in the original number (3.3) with the least decimal places (which is one).

Sol.: $\therefore$ $2.111 + 2.22 - 3.3 = 1.031 \approx 1.0$

17. Answer (4)

Hint: Use homogeneity of dimensions

Sol.: $[E] = [pA\omega^2] \Rightarrow [p] = \frac{[E]}{[A][\omega^2]}$

$$\Rightarrow [p] = \frac{[ML^2T^{-2}]}{[L][T^{-2}]} = [ML]$$

18. Answer (4)

Hint & Sol.:

Graph (1) $\Rightarrow$ Increasing acceleration ($v\uparrow$)

Graph (2) $\Rightarrow$ Decreasing acceleration ($v\uparrow$)

Graph (3) $\Rightarrow$ Decreasing retardation ($v\downarrow$)

Graph (4) $\Rightarrow$ Increasing retardation ($v\downarrow$)

19. Answer (3)

Hint: In conversion of units, $n_1u_2 = n_2u_2$ and [Pressure] = $[ML^{-1}T^{-2}]$

Sol.: $n_2 = n_1\left(\frac{M_1}{M_2}\right)^1\left(\frac{L_1}{L_2}\right)^{-1}\left(\frac{T_1}{T_2}\right)^{-2}$

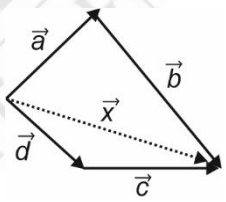
$$= 10\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)^{-1}\left(\frac{1}{4}\right)^{-2}$$

$n_2 = 10 \times 16 = 160$

20. Answer (2)

Hint: Use head to tail method of vector addition

Sol.: $\vec{a} + \vec{b} = \vec{x} = \vec{d} + \vec{c}$



21. Answer (3)

Hint & Sol.: Plane angle and solid angle are both dimensionless but have units (radian, steradian)

$\Rightarrow$ statement I is correct.

A unitless quantity lacks any physical dimensions.

$\Rightarrow$ statement II is also correct.

22. Answer (2)

Hint: When two measured values are multiplied or divided, there must be as many significant figures retained in the final result, as are there in the original number with the least significant figures.

Sol.: $\frac{2.01\times 4.04}{3.0} = \frac{8.1204}{3.0} = 2.7068 \approx 2.7$

23. Answer (4)

Hint: Relative error for a quantity x is given by $\frac{\Delta x}{x}$

Sol.: In series connection,

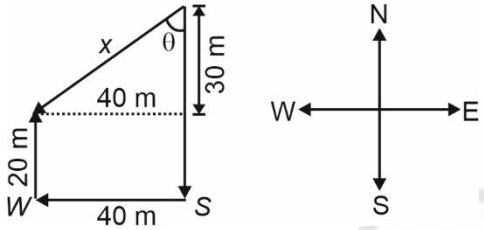
$R_{eq} = R_1 + R_2 = (60 + 30) \pm (3 + 2) = (90 \pm 5)\Omega$

$\therefore \frac{\Delta x}{x} = \frac{5}{90} = \frac{1}{18}$

24. Answer (2)

Hint: Displacement is the shortest path connecting initial and final points.

Sol.:



Displacement $x = \sqrt{30^2 + 40^2}$

$= \sqrt{50^2} = 50\,\text{m}$

$\tan\theta = \frac{4}{3} \Rightarrow \theta = 53°$

25. Answer (3)

Hint: Average acceleration = $\vec{a}_{avg} = \frac{\vec{v}_2 - \vec{v}_1}{t_2 - t_1}$

Sol.: For A to B, $v_B > v_A$, a_{avg} = +

For A to C, $v_C = v_A$, $a_{avg} = 0$

For A to D, $v_D < v_A$, a_{avg} = –

26. Answer (2)

Hint: For any freely falling body, $s = \frac{1}{2}gt^2$ (as $u = 0$)

Sol.: Distance fallen = $s = \frac{1}{2} \times 10 \times 10^2$

$= \frac{1000}{2} = 500\,\text{m}$

27. Answer (3)

Hint: Heat capacity $C = \frac{\text{Heat}}{\text{Change in temp}} = \frac{Q}{\Delta T}$

Sol.: $[C] = \frac{[Q]}{[\Delta T]} = \frac{[ML^2T^{-2}]}{[K]} = [ML^2T^{-2}K^{-1}]$

28. Answer (3)

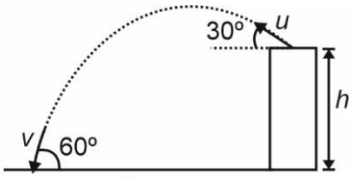
Hint: Position $\vec{r} = \vec{r}_0 + \vec{v}_0 t + \frac{1}{2}\vec{a}t^2$, where $\vec{r}_0$ and $\vec{v}_0$ = zero

Sol.: $\vec{r} = \frac{1}{2}(\hat{j} + 2\hat{i})16 = (8\hat{j} + 16\hat{i})\,\text{m}$

29. Answer (1)

Hint: Along the horizontal, velocity of ball remains same $\Rightarrow u\cos30° = v\cos60° \Rightarrow v = u\sqrt{3}$

Sol.: Along vertical direction, $v_y^2 = u_y^2 + 2gh$



$\Rightarrow v^2 \sin^2 60° = u^2 \sin^2 30° + 2gh$

$\Rightarrow 3u^2 \times \frac{3}{4} = \frac{u^2}{4} + 2g\alpha \Rightarrow \frac{8u^2}{4} = 2g\alpha$

$\Rightarrow u^2 = g\alpha \Rightarrow u = \sqrt{g\alpha}$

30. Answer (2)

Hint: In a number with decimal, the trailing zeros are significant.

Sol.: Option (2) has 4 significant digits.

Option (1) has three significant digits while option (3) has two significant digit.

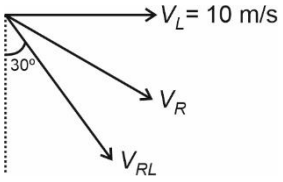
31. Answer (2)

Hint: Draw appropriate vector diagram

Use $\vec{V}_{RL} = \vec{V}_R - \vec{V}_L$

Sol.:

Case-I:



$\vec{V}_R = \vec{V}_{Rx}\hat{i} - V_{Ry}\hat{j}$

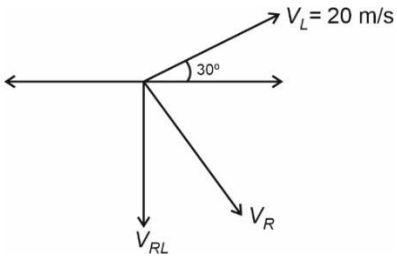
$\vec{V}_{RL} = \vec{V}_R - \vec{V}_L = V_{Rx}\hat{i} - V_{Ry}\hat{j} - 10\hat{i}$

$= (V_{Rx} - 10)\hat{i} - V_{Ry}\hat{j}$

$\tan30° = \frac{V_{Rx} - 10}{V_{Ry}} = \frac{1}{\sqrt{3}}$

$V_{Rx} - 10 = \frac{V_{Ry}}{\sqrt{3}}$ …(i)

Case-II:



As per situation:

$V_{Rx} - 10\sqrt{3} = 0$

$V_{Rx} = 10\sqrt{3}$ m/s

Put V_{Rx} in (i)

$$10\sqrt{3} - 10 = \frac{V_{Ry}}{\sqrt{3}} \Rightarrow V_{Ry} = (30 - 10\sqrt{3})\ \text{m/s}$$

Original speed of rain

$$V_R = \left[(V_{Rx})^2 + (V_{Ry})^2\right]^{1/2}$$

$$V_R = \sqrt{\left(10\sqrt{3}\right)^2 + \left(30 - 10\sqrt{3}\right)^2}$$

$$= 10\sqrt{15 - 6\sqrt{3}}\ \text{m/s}$$

32. Answer (4)

Hint & Sol.: Path of a projectile can be a straight line if launched vertically. If launched obliquely, it will take a parabolic path.

33. Answer (4)

Hint: [Thrust] = [ML T^{-2}]

Sol.: [Weight] = [Energy gradient] = [ML T^{-2}]

34. Answer (4)

Hint: Use principle of homogeneity

Sol.: Option (1) becomes $v^2 - u^2 = 2as$

Option (2) becomes $s - ut = \frac{1}{2}at^2$

In all 3 options, [LHS] = [RHS] $\Rightarrow$ all equations are dimensionally correct.

35. Answer (1)

Hint: $[F] = [v^x\ V^y\ D^z]$ and use principle of homogeneity.

Sol.: [MLT^{-2}] = [LT^{-1}]^x [L^3]^y [ML^{-3}]^z

Equating the dimension on both sides, we get

$-2 = -x \Rightarrow x = 2$

$1 = z$

$1 = x + 3y - 3z$

$\Rightarrow\ 1 = 2 + 3y - 3 \Rightarrow 2 = 3y \Rightarrow y = \frac{2}{3}$

36. Answer (1)

Hint: [Magnetic susceptibility] = [M^{0}L^{0}T^0]

Sol.: [Boltzmann's constant] = [ML^{2}T^{-2}K^{-1}]

[Modulus of elasticity] = [ML^{-1}T^{-2}]

[Planck's constant] = [ML^{2}T^{-1}]

37. Answer (2)

Hint: If $|\vec{A}| = |\vec{B}|$, then $|\vec{A} - \vec{B}| = 2A\sin\left(\frac{\theta}{2}\right)$

Sol.: As $|\vec{v}| = |\vec{u}| = v$, thus $|\vec{v} - \vec{u}| = 2v\sin\left(\frac{\theta}{2}\right)$ in uniform circular motion.

$$n = \frac{4}{3} \Rightarrow \theta = \frac{360^\circ}{n} = \frac{360^\circ \times 3}{4} = 270^\circ$$

$$\therefore\ |\Delta\vec{v}| = 2v\sin\left(\frac{270^\circ}{2}\right) = 2v\sin(135^\circ)$$

$$= 2v\sin 45^\circ = \sqrt{2}\,v$$

$n = 2 \Rightarrow \theta = 180^\circ \Rightarrow |\Delta\vec{v}| = 2v\sin 90^\circ = 2v$

$n = 4 \Rightarrow \theta = 90^\circ \Rightarrow |\Delta\vec{v}| = 2v\sin 45^\circ = \sqrt{2}\,v$

$n = 6 \Rightarrow \theta = 60^\circ \Rightarrow |\Delta\vec{v}| = 2v\sin 30^\circ = v$

38. Answer (2)

Hint: To cross in shortest possible time, the boat should have its velocity in still water $(\vec{v}_{BW})$ perpendicular to river current $(\vec{v}_R)$.

Sol.: $\vec{v}_{BW} \perp \vec{v}_R$

Time taken = $\frac{\text{width}}{v_{BW}} = \frac{1\,\text{km}}{4\,\text{km/hr}} = \frac{1}{4}\text{hr} = 15\ \text{min}$

39. Answer (2)

Hint: Distance travelled in n^{th} second, $S_n = u + \frac{g}{2}(2n - 1)$, where u = zero

Sol.: $S = \frac{1}{2}gn^2 \Rightarrow$ total time taken = $n = \sqrt{\frac{2S}{g}} = \sqrt{\frac{2 \times 176.4}{9.8}} = 6$

$$S_n = \frac{g}{2} \times 11 = \frac{9.8 \times 11}{2} = 53.9\ \text{m}$$

40. Answer (1)

Hint & Sol: A particle thrown upwards has zero velocity at topmost point but acceleration is non-zero $\Rightarrow$ **A** is true.

If acceleration = zero, then particle will continue moving with uniform velocity $\Rightarrow$ **B** is true.

41. Answer (2)

Hint: Absolute error $|\Delta x| = |x - x_{mean}|$

Sol.: $x_{mean} = \frac{x_1 + x_2 + x_3}{3} = \frac{6.41 + 6.42 + 6.39}{3}$

$= \frac{19.22}{3} = 6.4066 \approx 6.41\,m$

Mean absolute error = $\frac{0 + 0.02 + 0.01}{3} \approx 0.01$

42. Answer (4)

Hint & Sol.: Systematic error arise due to both instrumental error (zero error) and personal error.

43. Answer (3)

Hint: A vector has both magnitude as well as direction.

Sol.: Angular velocity is the only vector quantity among the given options.

44. Answer (3)

Hint & Sol.: When the jaws of vernier touch each other, then zero error is positive if zero of vernier scale is to the right of the zero of main scale.

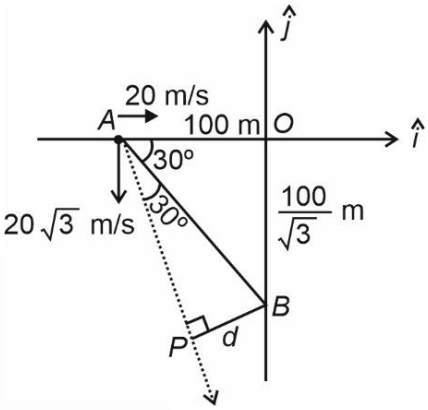
Zero error will be negative if zero of vernier scale is to the left of the zero of main scale.

45. Answer (2)

Hint: Analyse motion of car *A* w.r.t. car *B*

Sol.: $\vec{v}_{AB} = \vec{v}_A - \vec{v}_B$

$= \left(20\hat{i} - 20\sqrt{3}\hat{j}\right)$ m/s



$\vec{v}_{AB}$ makes angle θ with horizontal.

$\tan\theta = \frac{20\sqrt{3}}{20} = \sqrt{3} \Rightarrow \theta = 60°$

In ΔAOB,

$AB = \frac{AO}{\cos 30°} = \frac{100}{\frac{\sqrt{3}}{2}} = \frac{200}{\sqrt{3}}$ m

The car A and car B will be closest at *P*.

$\therefore$ Time taken

$= \frac{AP}{v_{AB}} = \frac{AB\cos 30°}{\sqrt{20^2 + (20\sqrt{3})^2}} = \frac{\frac{200}{\sqrt{3}} \times \frac{\sqrt{3}}{2}}{\sqrt{400 + 1200}}$

$= \frac{100}{40} = \frac{10}{4} = 2.5\,sec$

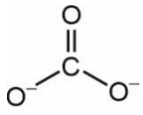
[CHEMISTRY]

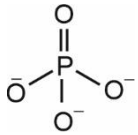
46. Answer (4)

Hint: For the species like CO_3^{2-} ion,

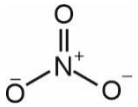
Bond order = $\frac{\text{Total number of covalent bonds}}{\text{Total No. of } \sigma \text{ bonds}}$

Sol.:

1. $CO_3^{2-} \Rightarrow$  B.O = $\frac{4}{3} = 1.33$

2. $PO_4^{3-} \Rightarrow$  B.O = $\frac{5}{4} = 1.25$

3. $CO \Rightarrow$ $\overset{+}{C} \equiv O^-$ B.O = 3

4. $NO_3^- \Rightarrow$  B.O = $\frac{4}{3} = 1.33$

47. Answer (2)

Hint: According to Fajans rule, as the size of cation decreases and charge on it increases, its tendency to polarise anion increases, hence covalent character of compound increases.

Sol.: Increasing covalent character:

$MgCl_2 < AlCl_3$

48. Answer (3)

Hint:

$$\% \text{ ionic character} = \frac{\text{Observed dipole moment}}{\text{Calculated dipole moment}} \times 100$$

Sol.: $\mu = q \times d \Rightarrow \mu_{calculated} = 1.6 \times 10^{-19} \times 9.17 \times 10^{-11}$

$= 1.4672 \times 10^{-29}$ C m

$$\therefore \% \text{ ionic character} = \frac{6.1 \times 10^{-30}}{1.4672 \times 10^{-29}} \times 100$$

$= 41.6\%$

Hence % covalent character $= 100 - 41.6$

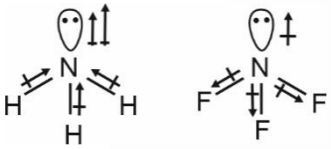
$= 58.4\%$

49. Answer (3)

Hint: Presence of polar bonds in a polyatomic molecule does not always lead to a definite dipole moment.

Sol.: In a polyatomic molecule, if bond dipoles get cancelled by one-another then net dipole moment becomes zero.

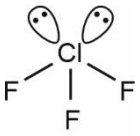
In NH_3, the bond dipoles (N – H bonds) and dipole due to lone pair are aligned in same direction while its in opposite direction in NF_3.



Hence $\mu_{NF_3} < \mu_{NH_3}$

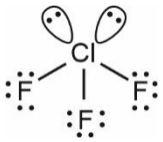
50. Answer (3)

Hint: ClF_3



T. shaped

Sol.:



Lone pairs on Cl = 2

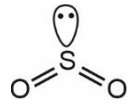
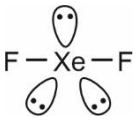
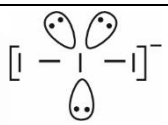
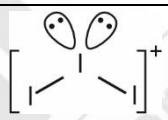
Lone pairs on F = 3 × 3 = 9

Total lone pairs = 11

Total bond pairs = 3

51. Answer (2)

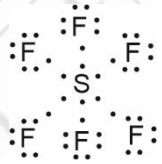
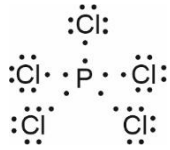
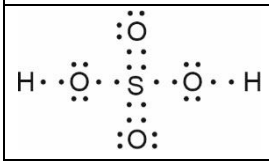
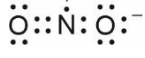
Hint & Sol.:

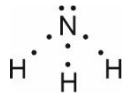
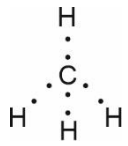
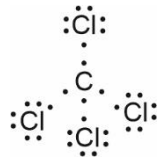
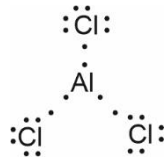
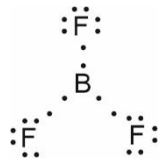
CO_2	O = C = O Linear
SO_2	 Bent
XeF_2	 Linear
I_3^-	 Linear
I_3^+	 Bent

52. Answer (2)

Hint: The species with atoms in which eight electrons are present in valence shell follow octet rule.

Sol.:

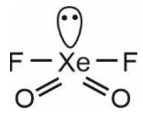
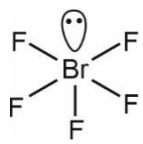
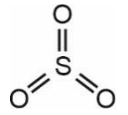
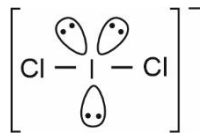
	⇒	Expanded octet in sulphur
	⇒	Expanded octet in phosphorus
	⇒	Expanded octet in sulphur
	⇒	Odd electron molecule
	⇒	Odd electron molecule
	⇒	Complete octet of all atoms

	⇒	Complete octet of all atoms
	⇒	Complete octet of all atoms
	⇒	Complete octet of all atoms
	⇒	Incomplete octet on Al
	⇒	Incomplete octet on B

53. Answer (4)

Hint: Shape of molecule/species depends on the arrangement of electron pairs (lone pairs and bond pairs) around central atom.

Sol.:

	⇒	See-saw
	⇒	Square pyramidal
	⇒	Trigonal planar
	⇒	Linear

54. Answer (3)

Hint: Presence of unpaired electron(s) in the species leads to paramagnetic behaviour.

Sol.:

Species	Configuration
O_2	$KK\sigma 2s^2\ \sigma^*2s^2\ \sigma 2p_z^2\ \pi 2p_x^2 \equiv \pi 2p_y^2\ \pi^*2p_x^1 \equiv \pi^*2p_y^1$
Bond order	$\frac{1}{2}(10-6)=2$
O_2^-	$KK\ \sigma 2s^2\ \sigma^*2s^2\ \sigma 2p_z^2\ \pi 2p_x^2 \equiv \pi 2p_y^2\ \pi^*2p_x^2\ \pi^*2p_y^1$
Bond order	$\frac{1}{2}(10-7)=1.5$
N_2	$KK\ \sigma 2s^2\ \sigma^*2s^2\ \pi 2p_x^2 \equiv \pi 2p_y^2\ \sigma 2p_z^2$
Bond order	$\frac{1}{2}(10-4)=3$
N_2^+	$KK\ \sigma 2s^2\ \sigma^*2s^2\ \pi 2p_x^2 \equiv \pi 2p_y^2\ \sigma 2p_z^1$
Bond order	$\frac{1}{2}(9-4)=2.5$
C_2	$KK\ \sigma 2s^2\ \sigma^*2s^2\ \pi 2p_x^2\ \pi 2p_y^2$
Bond order	$\frac{1}{2}(8-4)=2$
C_2^-	$KK\ \sigma 2s^2\ \sigma^*2s^2\ \pi 2p_x^2 \equiv \pi 2p_y^2\ \sigma 2p_z^1$
Bond order	$\frac{1}{2}(9-4)=2.5$
O_2^+	$KK\ \sigma 2s^2\ \sigma^*2s^2\ \sigma 2p_z^2\ \pi 2p_x^2 \equiv \pi 2p_y^2\ \pi^*2p_x^1$
Bond order	$\frac{1}{2}(10-5)=2.5$

P means paramagnetic

D means diamagnetic

Conversion	$O_2 \to O_2^-$		$N_2 \to N_2^+$		$C_2 \to C_2^-$		$O_2 \to O_2^+$	
Magnetic Behaviour	P	P	D	P	D	P	P	P
Bond order	2	1.5	3	2.5	2	2.5	2	2.5

55. Answer (1)

Hint & Sol.:

Electronic configuration of F_2

$\sigma 1s^2\ \sigma^*1s^2\ \sigma 2s^2\ \sigma^*2s^2\ \sigma 2p_z^2\ \pi 2p_x^2 \equiv \pi 2p_y^2$

$\pi^*2p_x^2 \equiv \pi^*2p_y^2$

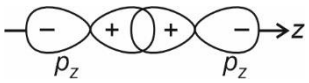
56. Answer (2)

Hint & Sol: Promotion of an electron is not essential condition prior to hybridisation.

57. Answer (4)

Hint: Negative overlap involves the overlap of lobes of opposite sign.

Sol.:



Represents positive overlap as overlap of the lobes of same sign occurs.

58. Answer (4)

Hint: Nearest noble gas of Na, Mg, Al and F is Ne

Sol.:

Element	Ion formed to get Nearest noble gas configuration
Na	Na^+
Mg	Mg^{2+}
Al	Al^{3+}
F	F^-

F^-, Na^+, Mg^{2+} and Al^{3+} are isoelectronic species and the order of their size is

$Al^{3+} < Mg^{2+} < Na^+ < F^-$

59. Answer (3)

Hint: The minimum amount of energy required to remove an electron from the valence shell of an isolated gaseous atom in its ground state is known as ionization enthalpy.

Sol.: For conversion of an X atom into X^+ ion, x kJ energy is needed.

So, for 1 mol (N_A) atoms of X

Energy required = xN_A

Where N_A = Avogadro's number

60. Answer (4)

Hint: Nobelium (102) has symbol Unb

Sol.:

Element	Atomic number	IUPAC Name	Symbol
Meitnerium	109	Unnilenniun	Une
Bohrium	107	Unnilseptium	Uns
Seaborgium	106	Unnilhexium	Unh

61. Answer (2)

Hint: Nickel is a transition element

Sol.:

Germanium – Metalloid

Phosphorus – Non-metal

Neodymium – Lanthanoid

62. Answer (2)

Hint: $_4Be = 1s^2\ 2s^2$

$_5B = 1s^2\ 2s^2\ 2p^1$

Sol.: The first ionization enthalpy of Be is greater than that of B because removal of electron from 2s orbital which is closer to nucleus, is more energetic process as compared to removal of electron from 2p orbital.

63. Answer (3)

Hint: Radial node = n – *l* – 1

Sol.: $4d \Rightarrow 4 - 2 - 1 = 1$

$3s \Rightarrow 3 - 0 - 1 = 2$

$5p \Rightarrow 5 - 1 - 1 = 3$

$5s \Rightarrow 5 - 0 - 1 = 4$

64. Answer (2)

Hint: K.E of photoelectrons = $h\nu - h\nu_0$

Sol.: Energy (KE) of photon

$= (6 \times 10^{-16}) - (3 \times 10^{-16}) = 3 \times 10^{-16}$ J

$$\lambda = \frac{h}{\sqrt{2mKE}} = \frac{6\times10^{-34}}{\sqrt{2\times9.1\times10^{-31}\times3\times10^{-16}}}$$

$= 2.56 \times 10^{-11}$ m

$= 25.6$ pm

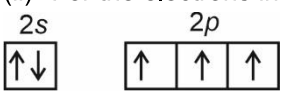
65. Answer (2)

Hint: According to Aufbau's principle electrons are filled in the orbitals on the basis of increasing energy.

Sol.:

(i) Orbital with lower energy 2*s* should be fully filled before filling of 2*p* orbitals.

(ii) For the electrons in 2*p* subshell of N-atom



n = 2

l = 1

m_l = +1, 0, +1

$m_s = +\frac{1}{2}$ or $-\frac{1}{2}$

Spin quantum number for the three electrons in 2*p* orbital are same [either $+\frac{1}{2}$ or $-\frac{1}{2}$] while m value will be different.

$_{29}Cu = [Ar]\ 3d^{10}\ 4s^1$

66. Answer (4)

Hint & Sol.: Spherically symmetric state with one radial node = 2s

If energy of H-atom in its ground state is

$$E_1 = E_0 \frac{Z^2}{(1)^2} = E_0 \qquad (Z = 1)$$

So, energy of state $S \Rightarrow E_2 = E_0 \times \frac{3^2}{2^2}$

$$E_2 = E_0 \times \frac{9}{4} = 2.25\ E_0 \text{ or } 2.25\ E_1$$

67. Answer (3)

Hint: The orbital for which (n + l) value is more, more will be its energy

Sol.:

	Orbital	n + l value
(i)	3*d*	3 + 2 = 5
(ii)	4*p*	4 + 1 = 5
(iii)	5*s*	5 + 0 = 5
(iv)	4*f*	4 + 3 = 7

For same value of (n + l), orbital with lower n value will have less energy. Hence (iv) > (iii) > (ii) > (i)

68. Answer (4)

Hint: $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

Sol.: 16 g methane reacts with 64 g oxygen

a. 2 g methane will react with $\frac{64}{16} \times 2 = 8$ g oxygen

Excess oxygen = 10 – 8 = 2 g

b. 80 g of oxygen will react with $\frac{16}{64} \times 80 = 20$ g of CH_4

Excess methane = 24 – 20 = 4 g

c. 3.2 g of methane will react with $\frac{64}{16} \times 3.2 = 12.8$ g

Excess of oxygen = 16 – 12.8 = 3.2 g

d. 20 g of oxygen will react with $\frac{16}{64} \times 20 = 5$ g of methane

Excess of methane = 7 – 5 = 2 g

69. Answer (1)

Hint: Only pure carbon (40%) out of 0.5 kg will take part in reactions.

Sol.: Pure carbon in coal = $\frac{0.5 \times 40}{100} = 0.2$ kg $= 200$ g

$\Rightarrow$ 30% pure carbon (60 g) forms CO_2

$\Rightarrow$ 12 g of carbon produces $\equiv$ 44 g of CO_2

Hence, 60 g of carbon produces $\equiv \frac{44}{12} \times 60 = 220$ g

Again, 140 g carbon produces CO = $\frac{28}{12} \times 140 = 326.7$ g

70. Answer (3)

Hint: % of an element in a compound

$$= \frac{\text{Mass of element}}{\text{Molar mass of compound}} \times 100$$

Sol.:

a. Sulphuric acid (H_2SO_4) $= \frac{16 \times 4}{98} \times 100 = 65.3\%$

b. Acetic acid (CH_3COOH) $= \frac{16 \times 2}{60} \times 100 = 53.3\%$

c. Carbon dioxide $= \frac{32}{44} \times 100 = 72.7\%$

d. Ethanol (C_2H_5OH) $= \frac{16}{46} \times 100 = 34.8\%$

71. Answer (2)

Hint: The simplest ratio of the elements in a compound is represented by its empirical formula

Sol.:

Elem-ents	Mass %	Moles	Simplest ratio
C	77.38	$\frac{77.38}{12} = 6.45$	$\frac{6.45}{1.07} = 6.02 \approx 6$
H	7.58	$\frac{7.58}{1} = 7.58$	$\frac{7.58}{1.07} = 7.08 \approx 7$
N	15.04	$\frac{15.04}{14} = 1.07$	$\frac{1.07}{1.07} = 1$

Empirical formula = C_6H_7N

Empirical formula mass = 72 + 7 + 14 = 93 u

72. Answer (2)

Hint: 100 g of chlorophyll contain 2.68 g of Mg

$\therefore$ 9.6 g of chlorophyll contain $\left(\frac{2.68}{100}\times 9.6\right)$ g Mg

Sol.: Moles of Magnesium =

$$\frac{2.68}{100}\times\frac{9.6}{24}=0.01072\,\text{mol}$$

$\therefore$ Mg atoms = $0.0172 \times 6.022 \times 10^{23}$

$= 6.45 \times 10^{21}$

73. Answer (1)

Hint: Number of atoms in a sample = moles $\times N_A \times$ atomicity.

Sol.: Let the mass of the samples of S_2, S_4 and S_8 is x g each.

$$\text{Atoms in } S_2 = \frac{x}{32\times 2}\times N_A\times 2=\frac{x}{32}N_A$$

$$\text{Atoms in } S_4 = \frac{x}{32\times 4}\times N_A\times 4=\frac{x}{32}N_A$$

$$\text{Atoms in } S_8 = \frac{x}{32\times 8}\times N_A\times 8=\frac{x}{32}N_A$$

In O_2 and $O_3 \Rightarrow$

$$\text{Molecules in } O_2 = \frac{3.2}{32}\times N_A = 0.1\,N_A$$

$$\text{Molecules in } O_3 = \frac{4.8}{48}\times N_A = 0.1\,N_A$$

74. Answer (3)

Hint: Molality = $\frac{\text{Moles of solute}}{\text{Mass of solvent (kg)}}$

Sol.: Molality = $\frac{\frac{6.02\times 10^{22}}{6.02\times 10^{23}}}{20\times 18\times 10^{-3}}$

$= 0.277$ m

75. Answer (2)

Hint: Molarity = $\frac{\text{Moles of solute}}{\text{Volume of solution (L)}}$

Sol.: Moles of HCl = $\frac{0.5\times 50}{1000}$ = 0.025 mol

Moles of $CaCO_3 = \frac{1.5}{100} = 0.015$ mol

1 mol of $CaCO_3 \equiv 2$ mol of HCl

$\therefore$ 0.015 mol of $CaCO_3 \equiv 2\times 0.015$ mol of HCl

$= 0.030$ mol of HCl

Available mol of HCl = 0.025

Hence, HCl is limiting reagent

Moles of CO_2 obtained = $\frac{0.025}{2} = 0.0125$ mol

Mass of CO_2 obtained = 0.0125×44

$= 0.55$ g

76. Answer (4)

Hint: *s* and *p* block elements are known as representative elements as well as main group elements.

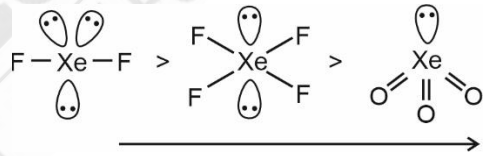
Sol.:

- Electronegativity of C(2.5) is higher than that of Al(1.5)
- Cerium (atomic number = 58) is *f* block element and called inner transition element.
- Element X is thorium and has electronic configuration [Rn] $5f^0\ 6d^2\ 7s^2$

77. Answer (2)

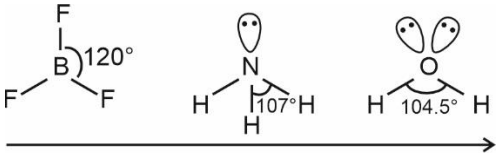
Hint: More the number of lone pairs on central atom, more will be the lone pair-lone pair repulsion.

Sol.:



Decreasing order of lp - lp repulsion

Bond type	Bond length
O – H	96 pm
C – H	107 pm
N – O	136 pm



Decreasing bond angle

Molecule	Bond enthalpy
N_2	946.0 kJ mol^{-1}
O_2	498.0 kJ mol^{-1}
H_2	435.8 kJ mol^{-1}

78. Answer (3)

Hint & Sol.: Dalton's theory could explain the laws of chemical combination. However, it could not explain the law of gaseous volume.

79. Answer (2)

Hint: $r_n = \frac{52.9 \times n^2}{Z}$ pm

$E_n = \frac{-2.18 \times 10^{-18} \times Z^2}{n^2}$ J

Sol.:

$E_{Li^{2+}} = -2.18 \times 10^{-18} \times 9 = -19.62 \times 10^{-18}$ J

$r_{Li^{2+}} = \frac{52.9 \times 1}{3} = 17.63$ pm

$E_{Be^{3+}} = -2.18 \times 10^{-18} \times 16 = -34.88 \times 10^{-18}$ J

$r_{Be^{3+}} = \frac{52.9 \times 1}{4} = 13.225$ pm

80. Answer (1)

Hint & Sol.: $\Delta E = R_H Z^2 \left[\frac{1}{n_i^2} - \frac{1}{n_f^2}\right]$

So, $\Delta E_{3\to4} = \frac{R_H \times 7}{hc \times 16 \times 9}$

$\Delta E_{4\to5} = \frac{hc}{\lambda_{4\to5}}$

$\Rightarrow \Delta E_{4\to5} = \frac{R_H \times 9}{hc \times 25 \times 16}$

$\frac{\Delta E_{3\to4}}{\Delta E_{4\to5}} = \frac{R_H \times 7 \times hc \times 25 \times 16}{hc \times 16 \times 9 \times R_H \times 9}$

$= \frac{175}{81}$

81. Answer (1)

Hint: Density = $\frac{\text{Mass}}{\text{Volume}}$

Sol.: Let the weight of solution = 100 g

$\therefore$ Weight of solute (H_2SO_4) = 9.8 g

Mole of solute = $\frac{9.8}{98} = 0.1$

Volume of solution = $\frac{\text{Mass}}{\text{Density}} = \frac{100\,g}{1.2\ gmL^{-1}}$

$= \frac{1000}{12}$ mL

Molarity = $\frac{\text{Moles of solute}}{\text{Volume of solution(L)}}$

$= \frac{0.1 \times 12 \times 1000}{1000} \Rightarrow 1.2$ M

82. Answer (4)

Hint: $h\nu = h\nu_0 + K.E.$

$h\nu$ = Total energy

$h\nu_0$ = Work function of metal or threshold energy

Sol.:

Metal	Work function (W_0) in eV
Mg	3.7
Cu	4.8

83. Answer (3)

Hint: Generally the value of $\Delta_{eg}H$ becomes less negative on moving down the group.

Sol.:

Elements	$\Delta_{eg}H$ (kJ mol^{-1})
Li	–60
Na	–53
K	–48
O	–141
S	–200
Se	–195
F	–328
Cl	–349
Br	–325
I	–295

84. Answer (2)

Hint: After removal of first electron, removal of second electron from the species becomes more difficult due to increased effective nuclear charge.

Sol.:

$\Rightarrow$ Size of anion is larger than that of parent atom due to inter-electronic repulsion

$\Rightarrow$ Noble gases have positive value of electron gain enthalpy.

$\Rightarrow$ First ionisation enthalpy of N is greater than that of oxygen.

85. Answer (3)

Hint & Sol.: CO_2 is an acidic oxide

86. Answer (2)

Hint: $\Delta x \cdot \Delta v \geq \frac{h}{4\pi m}$

Sol.: $\Delta v = \frac{3\times10^{5}\times0.001}{10^{2}\times10^{2}} \Rightarrow 3\times10^{-2}$ m/s

$$\Delta x = \frac{6.6\times10^{-34}}{4\times3.14\times9\times10^{-31}\times3\times10^{-2}}$$

$= 1.95\times10^{-3}$ m

87. Answer (4)

Hint: Number of orbitals in an energy level = n^2

Sol.:

- Total number of orbitals in fourth energy level = 4^2 = 16 (4*s*, 4*p*, 4*d*, 4*f*) orbitals.
- In a *d* sub-shell total 10 electrons are present, out of which 5 have same spin.
- Energies of the orbitals in the same subshell decrease with increase in the atomic number (z_{eff})

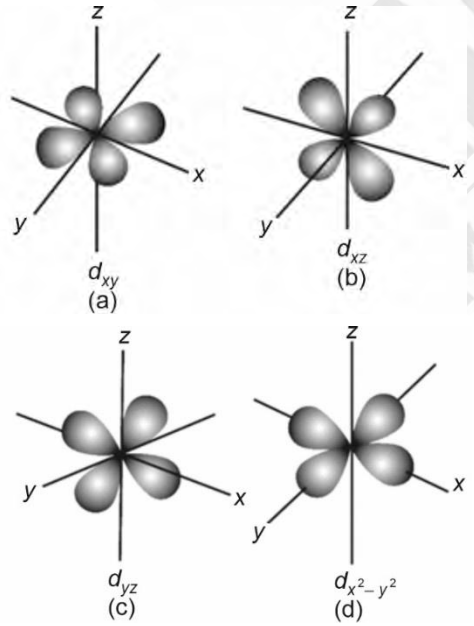
  $E_{2s}(H) > E_{2s}(Li)$
- Orbital angular momentum = $\sqrt{l(l+1)}\hbar$

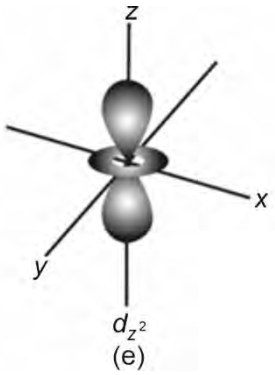
$= \sqrt{1(1+1)}\hbar = \sqrt{2}\hbar$

88. Answer (3)

Hint: d_{z^2} has electron density along the *z*-axis

Sol.:





89. Answer (1)

Hint & Sol.:

Series	Region
Lyman	Ultraviolet
Balmer	Visible
Paschen	Infrared
Brackett	Infrared

90. Answer (2)

Hint: Mole fraction is temperature independent unitless quantity

Sol.:

- Mole fraction = $\frac{\text{Moles of solute}}{\text{Total moles of solution}}$
- For 1.2 molal solution, moles of solute = 1.2

Moles of solvent = $\frac{1000}{18} = 55.55$

$\therefore$ Mole fraction = $\frac{1.2}{55.55+1.2} = \frac{1.2}{56.75} = 0.02$

- On dilution, moles of solvent will increase and it will change mole fraction of both solute and solvent
- 100 g solution have 40 g of NaOH

Mole of NaOH = $\frac{40}{40} = 1$

Moles of H_2O = $\frac{60}{18} = 3.33$

Mole fraction of solute = $\frac{1}{1+3.33} = 0.23$

[BOTANY]

91. Answer (2)

Hint.: Interphase nucleus is a nucleus of a cell when it is not dividing.

Sol.: Interphase nucleus has one or more non-membrane bound spherical bodies called nucleoli.

92. Answer (3)

Hint.: Species is the lowest and basic taxonomic category of classification.

Sol.: Scientific name of wheat is

Triticum *aestivum*

↓ ↓

Genus Species

93. Answer (2)

Hint.: The ribosomes in eukaryotes are of 80S type.

Sol.: The ribosomes that are attached to nuclear envelope is 60S (large subunit of 80S ribosome)

94. Answer (2)

Hint.: Housefly belongs to phylum Arthropoda.

Sol.: Human beings belong to order Primata.

95. Answer (2)

Hint.: Kingdom is the highest category in taxonomic hierarchy with related phylum or division.

Sol.: Taxonomic categories showing hierarchical arrangement of taxa w.r.t. mango in ascending order from species to kingdom is

Mangifera → Anacardiaceae → Sapindales → Dicotyledonae → Angiospermae → Plantae

96. Answer (3)

Hint.: Structure labelled as I and II are peroxisomes and lysosome respectively.

Sol.: Structure IV is Golgi apparatus, primarily performs the function of packaging materials.

97. Answer (1)

Hint.: Biological names are Latinised or derived from Latin language irrespective of their origin.

Sol.: The first word in biological name represents the genus while the second component represents the specific epithet.

98. Answer (4)

Hint.: The membranous cell organelles which function in a coordinated manner, constitute an endomembrane system.

Sol.: The endomembrane system include ER, Golgi complex, lysosomes and vacuoles.

99. Answer (4)

Hint.: Ribosomes were discovered by George Palade.

Sol.: Fluid mosaic model was proposed by Singer and Nicolson.

100. Answer (2)

Hint.: The homologous chromosomes come to lie side by side in pairs and this pairing is known as synapsis.

Sol.: Crossing over takes place in pachytene. The phenomenon of bringing the chromosomes on the equator of spindle is called congression and it occurs in metaphase stage.

101. Answer (3)

Hint.: The non-dividing cell enters the quiescent stage or G_0 stage of the cell cycle.

Sol.: Mitochondria, chloroplast and Golgi bodies duplicate in G_2 phase.

102. Answer (3)

Hint.: Metaphase is the best stage to study morphology of chromosome.

Sol.: Anaphase is the best stage to study shape of the chromosomes.

103. Answer (1)

Hint.: Robert Hooke studied and discovered the cell from a thin slice of cork but that was the 'dead cell'.

Sol.: Antonie Von Leeuwenhoek first saw and described a living cell.

Rudolf Virchow – Explained *Omnis-cellula e cellula.*

Flemming – Gave the term chromatin.

104. Answer (3)

Hint.: The shape of white blood cells is amoeboid.

Sol.: Shape of mesophyll cell is round and oval.

105. Answer (4)

Hint.: The endoplasmic reticulum which is free of ribosomes is known as smooth endoplasmic reticulum.

Sol.: RER provides precursors of enzymes for the formation of lysosomes in Golgi complex.

106. Answer (2)

Hint.: Unicellular organisms are capable of independent existence.

Sol.: Anything less than a complete structure of a cell does not ensure independent living. Hence, cell is the fundamental structural and functional unit of all living organisms.

107. Answer (2)

Hint.: Pili are elongated tubular structures made up of a special protein and are involved in mating process.

Sol.: The fimbriae are small bristle-like fibres sprouting out of the cell. They are known to help in attaching the bacteria to rocks in streams and also to the host tissues.

108. Answer (2)

Hint.: Slime layer protects the cell from loss of water and nutrients.

Sol.: The cytoplasm is the main arena of cellular activities in all living cells.

109. Answer (3)

Hint.: Reserve material in prokaryotic cells are stored in the cytoplasm in the form of inclusion bodies.

Sol.: During translation many ribosomes form a chain on a common messenger RNA and form polysome.

110. Answer (3)

Hint.: In metacentric chromosomes, the centromere is present at the centre.

Sol.: In acrocentric chromosomes, the centromere is present very close to one end of the chromosome and they appear J-shaped during anaphase.

111. Answer (1)

Hint.: Gas vacuole in prokaryotes provide buoyancy.

Sol.: Contractile vacuoles are present in *Amoeba*, helps in excretion and osmoregulation.

112. Answer (3)

Hint.: This organelle is also known as 'suicidal bags'

Sol.: Lysosomes are formed by the process of packaging in the Golgi apparatus. They are rich in hydrolytic enzymes.

113. Answer (4)

Hint.: Root cap cells are rich in Golgi bodies which secrete mucilage for the lubrication of root tip.

Sol.: Endoplasmic reticulum without ribosomes is SER.

114. Answer (2)

Hint.: Chromatophores are membranous extensions into cytoplasm which contains pigments.

Sol.: Chloroplast contain DNA, RNA, pigments and other proteins. Secondary cell wall is formed on the innerside of the primary wall.

115. Answer (2)

Hint.: Lipids in plasma membrane have polar head and non-polar tail.

Sol.: Lipids are arranged within the membrane with the polar head towards the outer sides and tails towards the inner sides.

The ratio of proteins and lipids varies considerably in different cell types.

116. Answer (3)

Hint.: M phase or mitotic phase is the phase where actual cell division occurs involving a major reorganisation of virtually all components of the cell.

Sol.: Meiosis involves two sequential cycles of nuclear division but only one cycle of DNA replication.

117. Answer (4)

Hint.: Mitosis is called equational division because the two daughter cells have the same number of chromosomes as present in the parent cell.

Sol.: Meiosis provides a chance for the formation of new combinations of chromosomes.

118. Answer (4)

Hint.: It is the fourth stage of prophase I.

Sol.: In oocytes of some vertebrates, diplotene lasts for month or years. It is called dictyotene stage.

119. Answer (3)

Hint.: Period of cell cycle varies from organism to organism and also from cell to cell.

Sol.: A yeast cell divides once in 90 minutes and a typical human cell divides approximately every 24 hours.

120. Answer (2)

Sol.: Cell growth results in disturbing the ratio between the nucleus and the cytoplasm. It therefore becomes essential for the cell to divide to restore the nucleo-cytoplasmic ratio.

121. Answer (2)

Hint.: Nucleolus is a spherical structure found in the nucleoplasm.

Sol.: Nucleolus is the site for ribosomal RNA synthesis.

122. Answer (3)

Hint.: Flagella are longer in size.

Sol.: Cilia help in locomotion, feeding and circulation.

123. Answer (2)

Hint.: The cristae are infoldings of inner membrane and are formed towards the matrix which increase the surface area for enzyme action.

Sol.: Matrix contains single circular dsDNA, a few RNA molecules and 70S ribosomes.

124. Answer (1)

Hint : Prophase – Chromosomes appear like ball of wool.

Sol.: Metaphase – Chromosome align at the equator.

Anaphase – Formation of interzonal fibres takes place.

Telophase – Nucleolus, Golgi bodies, and ER reappear.

125. Answer (2)

Hint.: It occurs after separation of homologous chromosomes.

Sol.: Following telophase I when cytokinesis begins, it is marked by formation of dyad of cells.

126. Answer (2)

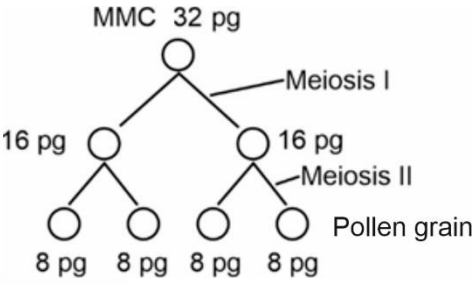
Hint.: The cell exit the G_1 stage to enter an inactive stage.

Sol.: In G_0 phase or quiescent stage the cell remains metabolically active but do not proliferate unless they are called on to do so.

127. Answer (3)

Hint.: Pollen mother cell is diploid while pollen grain is haploid.

Sol.:



128. Answer (2)

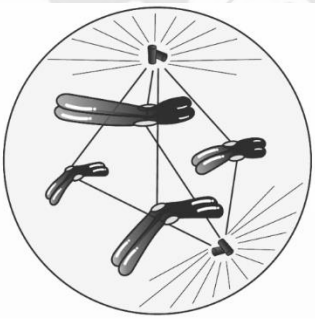
Hint : Microtubules attach to the kinetochore of chromosome during second phase of karyokinesis.

Sol.: Microtubules of the spindle fibres attach to the kinetochore during metaphase.

129. Answer (3)

Hint.: Metaphase is characterised by the alignment of chromosome at the equator.

Sol.:



Transition to Metaphase

130. Answer (2)

Hint.: Terminalisation of chiasmata occurs in last stage of prophase I of meiosis I. In this phase, the chromosomes are fully condensed.

Sol.: During leptotene, the chromosomes become gradually visible under light microscope. The correct sequence of phases of prophase I is as follows:

Leptotene → Zygotene → Pachytene → Diplotene → Diakinesis

131. Answer (3)

Hint.: Gametes are haploid cells formed from specialised diploid cells.

Sol.: In animal cells, cytokinesis is achieved by the formation of furrow in the plasma membrane.

132. Answer (4)

Hint.: Double metaphasic plate is formed during metaphase I.

Sol.: In metaphase II, the univalent chromosomes align themselves at the equator and microtubules attach to kinetochores of sister chromatids.

133. Answer (3)

Hint.: Cell wall maintains the shape of the cell.

Sol.: Cell wall allows the materials to pass in and out of the cell.

134. Answer (4)

Hint.: Between telophase I and prophase II, metabolic stage like cytokinesis and interkinesis are present.

Sol.: Replication of DNA does not take place during interkinesis.

135. Answer (4)

Hint.: Gap 1 phase is interval between M-phase and S phase

Sol.: M-phase – Equational division

Gap-2-phase – Protein synthesis

Synthesis phase – Duplication of chromosomes

[ZOOLOGY]

136. Answer (3)

Hint: Some nucleic acids behave like enzymes

Sol.: Almost all enzymes are proteins. There are some nucleic acids like RNA that behave like enzymes. They are called ribozymes.

137. Answer (2)

Hint: Complex homopolysaccharide

Sol.: Exoskeleton of arthropods has a complex polysaccharide called chitin. Glycogen and inulin are polymers of glucose and fructose, respectively. Insulin is a protein.

138. Answer (3)

Hint: Inter-costal muscles help in breathing

Sol.: The action of muscles moves the body to adjust to the changes in the environment and to maintain the positions of various parts of the body. In general, muscles play an active role in all the movements of the body.

139. Answer (3)

Hint: Features of loose connective tissue

Sol.: Areolar tissue and adipose tissue are the types of loose connective tissue. Both of them are present beneath the skin. Mast cells, fibroblasts, adipocytes, macrophages, all are present here.

Osteocytes are bone cells while chondrocytes are cartilage cells.

140. Answer (1)

Hint: High energy states are unstable

Sol.: In an enzyme catalysed reaction, the substrate bound to the active site of an enzyme results in the formation of a new structure of substrate called transition state structure. It is an unstable high energy state.

141. Answer (4)

Hint: Prosthetic groups are tightly bound to the apoenzyme.

Sol.: Haem is the prosthetic group which is present in enzymes named peroxidase and catalase. Prosthetic groups are tightly bound to the apoenzyme.

142. Answer (2)

Hint: Competitive inhibitor closely resembles the substrate in structure.

Sol.: Malonate is a competitive inhibitor of enzyme succinic dehydrogenase. Malonate closely resembles the substrate succinate in structure.

Zinc acts as the co-factor for carboxypeptidase. Co-enzyme NADP contains niacin.

143. Answer (2)

Hint: COOH group is present at the right side.

Sol.: In a linear protein chain, the left end represents the first/N-terminal amino acid while the right end represents the last/C-terminal amino acid.

144. Answer (3)

Hint: Gums are polymeric substances.

Sol.:

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

145. Answer (2)

Hint: Equal to the number of ear ossicles in one ear in a man.

Sol.: Each molecule of adenylic acid contains one adenine, one ribose and H_3PO_4. Out of these components, adenine has two heterocyclic rings and ribose also has a heterocyclic ring. Hence, we can say that each adenylic acid contains three heterocyclic rings in its structure.

146. Answer (3)

Hint: Most abundant protein in the animal world

Sol.: Collagen acts as the intercellular ground substance.

Protein	**Functions**
Collagen	Intercellular ground substance
Trypsin	Enzyme
Insulin	Hormone
Antibody	Fights infectious agents
Receptor	Sensory reception (smell, taste, hormone, etc.)
GLUT-4	Enables glucose transport into cells

147. Answer (4)

Hint: Proteins are heteropolymers.

Sol.: The amino acids can be essential or non-essential. The non-essential amino acids are those which our body can make while we get essential amino acids through our diet/food. A protein is a heteropolymer and not a homopolymer.

148. Answer (2)

Hint: Exclude the feature associated with cartilage

Sol.: Bones have hard and non-pliable matrix. The bone cells *i.e.,* osteocytes are present in lacunae. Limb bones serve the weight bearing functions. The bone marrow in some bones is the site of erythropoiesis.

149. Answer (3)

Hint: Exclude skeletal tissues

Sol.: The cells of adipose tissue are specialised to store fats. The excess of nutrients which are not used immediately are converted into fats and are stored in adipocytes.

150. Answer (4)

Hint: Identify a fibre.

Sol.: Elastin is a connective tissue fibre that is absent in blood. Formed elements like RBCs, WBCs and platelets are components of blood.

151. Answer (4)

Hint: Communication junction in cardiac muscles allow cells to contract as a unit.

Sol.: In nearly all the animal tissues, cell junctions provide structural and functional links between their individual cells.

152. Answer (2)

Hint: Ghee is insoluble in water.

Sol.: Gingelly oil has lower melting point hence remains as oil in winters. Lipids are generally water insoluble.

Two fatty acids are found esterified with glycerol in a diglyceride molecule and three fatty acids are present in a triglyceride molecule.

153. Answer (1)

Hint: Water is the maximum amongst all.

Sol.:

Component	**% of the total cellular mass**
Water	70-90
Proteins	10-15
Carbohydrates	3
Lipids	2
Nucleic acids	5-7
Ions	1

154. Answer (3)

Hint: Identify a nitrogen base.

Sol.: When nitrogen bases are found attached to pentose sugar, they are called nucleosides. Adenine, guanine, cytosine, thymine and uracil are nitrogen bases while adenosine, guanosine, cytidine, thymidine and uridine are nucleosides.

155. Answer (4)

Hint: Contains a ring in its structure

Sol.: 'R' group in the serine is hydroxymethyl, hence it is an alcoholic amino acid. Based on the number of amino and carboxyl groups, amino acids are acidic (*e.g.,* glutamic acid), basic (*e.g.*, lysine) and neutral (*e.g.,* valine). Tyrosine. tryptophan and phenylalanine are aromatic amino acids.

156. Answer (3)

Hint: Think about blood

Sol.: In all connective tissues except blood and lymph, fibroblasts are present.

Only neurons and muscle fibres show the property of excitability.

Modified polysaccharides, which accumulate between cells and fibres act as matrix which is involved in linking and supporting other tissues/organs.

157. Answer (2)

Hint: Cardiac muscle fibres are striated.

Sol.: Skeletal muscle such as biceps and cardiac muscles have striated muscle fibres. Unstriated muscle fibres are present in stomach wall and walls of blood vessels.

158. Answer (4)

Hint: Neurons are the units of neural system.

Sol.: Neurons, the unit of neural system, are excitable cells. The neuroglial cells which constitute more than one-half the volume of neural tissue protect and support neurons.

159. Answer (4)

Hint: Exclude specialised connective tissue

Sol.: Ligaments and tendons are dense regular connective tissue. In these tissues, the collagen fibres are present in rows between many parallel bundles of fibres. Ligaments connect bones to bones while tendons connect bones to muscles.

160. Answer (2)

Hint: Class IV enzymes

Sol.: The mentioned reaction is catalysed by carbonic anhydrase which is a lyase. Lyases catalyse the removal of groups from substrates by mechanism other than hydrolysis leaving double bonds. The E.C. number of lyases starts with 4.

161. Answer (4)

Hint: Exclude neutral amino acids

Sol.: Tryptophan, phenylalanine and tyrosine are aromatic amino acids. Glutamic acid is an acidic amino acid. Alanine and glycine are neutral amino acids.

162. Answer (1)

Hint: No free enzyme molecules are left.

Sol.: With the increase in substrate concentration, the velocity of enzymatic reaction rises first. The reaction ultimately reaches V_{max}, which is not exceeded by any further rise in the concentration of the substrate. This is because all the enzyme molecules are fully saturated with substrate molecules.

163. Answer (4)

Hint: Feature of loose connective tissue

Sol.: The epithelial tissue has a free surface, which faces either a body fluid or the outside environment and thus provides a covering or a lining for some parts of the body. The cells are compactly packed with little intercellular matrix.

164. Answer (2)

Hint: Simple epithelium is classified on this basis.

Sol.: PCT of nephron has cuboidal epithelium while columnar epithelium is found in the lining of stomach and intestine. Epithelial cells of both PCT and intestine has microvilli on their free surfaces. They help in absorption.

165. Answer (2)

Hint: Exclude endocrine secretions

Sol.: Exocrine glands secrete saliva, oil, earwax, milk, *etc.* Insulin and adrenaline are the hormones secreted from endocrine glands.

166. Answer (4)

Hint: Tile-like appearance

Sol.: The squamous epithelium is made of a single thin layer of flattened cells with irregular boundaries. They are found in the walls of blood vessels and air sacs of lungs.

Tall and slender cells are found in simple columnar epithelium.

167. Answer (4)

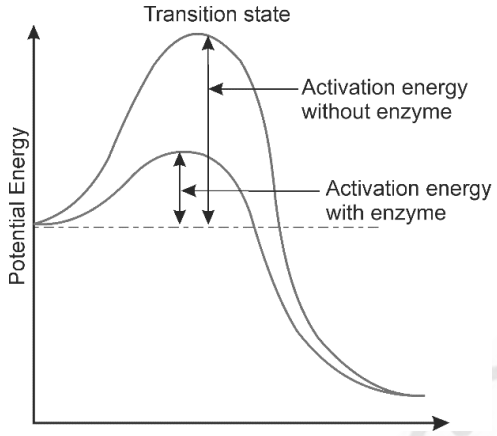
Hint: Diterpenes are terpenoids.

Sol.: Concanavalin A is categorised under lectins. Monoterpenes and diterpenes are terpenoids.

168. Answer (3)

Hint: Enzymes lower the activation energy.

Sol.:



169. Answer (4)

Hint: One of the co-factor

Sol.: Co-enzymes are the organic compounds but their association with the apoenzyme is only transient.

Metal ions are inorganic compounds.

170. Answer (2)

Hint: Glucose is 6C compound while pyruvic acid is 3C compound.

Sol.: Change of glucose into pyruvic acid is a metabolic pathway in which one molecule of glucose changes into 2 molecules of pyruvic acid through different enzyme catalysed metabolic reactions.

171. Answer (4)

Hint: Secretion is main function of simple cuboidal epithelium

Sol.: Compound epithelium is made of more than one layer (multi-layered) of cells that are tightly packed and thus has a limited role in secretion and absorption. Their main function is to provide protection against chemical, mechanical, thermal and osmotic stresses.

172. Answer (3)

Hint: Location of compound epithelium

Sol.: The compound epithelium covers the dry surface of the skin, the moist surface of buccal cavity, pharynx, inner lining of ducts of salivary glands and of pancreatic ducts.

Ciliated epithelium is present in the lining of fallopian tube and bronchioles.

173. Answer (2)

Hint: Loose connective tissue.

Sol.: Cartilage, bones and blood are various types of specialised connective tissue. Areolar tissue is included under the category of loose connective tissue.

174. Answer (3)

Hint: Exclude specialised connective tissues

Sol.: Areolar tissue is a type of loose connective tissue present beneath the skin. Often it serves as a support framework for epithelium.

175. Answer (2)

Hint: Stored in liver

Sol.: Cellulose, starch and glycogen are homopolymers of glucose. Cellulose is a structural polysaccharide while starch and glycogen are storage polysaccharides in plants and animals, respectively. Inulin is a polymer of fructose.

176. Answer (4)

Hint: Pyrimidines are single ringed structures.

Sol.: Adenine, guanine, cytosine, thymine and uracil are nitrogenous bases associated with nucleic acids. Adenine and guanine are substituted purines while cytosine, uracil and thymine are substituted pyrimidines.

177. Answer (2)

Hint : Towards synaptic vesicles

Sol.: When a neuron is stimulated suitably, an electrical disturbance is generated which swiftly travels along its plasma membrane towards nerve endings.

178. Answer (1)

Hint: Cardiac muscle fibres are uninucleated and branched.

Sol.: Cardiac muscle fibres are striated, branched uninucleated and involuntary.

Skeletal muscle fibres are striated, unbranched multinucleated and voluntary.

Smooth/visceral muscle fibres are unstriated, unbranched, uninucleated and involuntary.

179. Answer (3)

Hint: Absent in animals.

Sol.: Collagen is the most abundant protein in the animal world and RuBisCO is the most abundant protein in the whole of the biosphere. Trypsin is a protein digesting enzyme. GLUT-4 enables glucose transport into cells. Chitin is a complex homopolysaccharide which forms the exoskeleton of arthropods.

180. Answer (2)

Hint: Molecular weight of lipids does not exceed 800 Da

Sol.: The acid-insoluble fraction has only four types of organic compounds. Except lipids, all are polymeric substances. With the exception of lipids, others have molecular weights in the range of 10,000 Daltons and above.

❑ ❑ ❑

All India Aakash Test Series for NEET - 2026

TEST - 4

Click here for Code-A Sol.

Test Date : 07/12/2025

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (4)

Hint & Sol.: At the highest point, velocity has minimum value and is perpendicular to direction of acceleration.

2. Answer (2)

Hint: Velocity $\vec{v} = \frac{d\vec{r}}{dt} \Rightarrow \int d\vec{r} = \int \vec{v}\, dt$

Sol.: $\int_0^{\vec{r}} d\vec{r} = \int_0^1 3t^2 dt\, \hat{j} + \int_0^1 3dt\, \hat{k}$

$\Rightarrow \vec{r} = t^3\Big|_0^1 \hat{j} + 3t\Big|_0^1 \hat{k} = \left(\hat{j} + 3\hat{k}\right)$ m

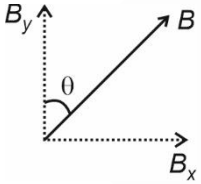
3. Answer (4)

Hint: In uniform circular motion, $|\vec{a}_c|$ = constant

Sol.: **A** is false because tangential acceleration = $\frac{dv}{dt}$ = zero but centripetal acceleration $|\vec{a}_c|$ = non-zero, in uniform circular motion.

4. Answer (4)

Hint:



Sol.: Taking rectangular components,

$B_y = B\cos\theta$

$B_x = B\sin\theta$

5. Answer (4)

Hint: Maximum relative error = $\frac{\Delta P}{P} = x = \frac{3\Delta a}{a} + \frac{1}{2}\frac{\Delta b}{b} + \frac{1}{2}\frac{\Delta c}{c}$

Sol.: $x = 3\times\frac{1}{50} + \frac{1}{2}\left(\frac{1}{25} + \frac{1}{25}\right) = \frac{5}{50} = \frac{1}{10} = 0.1$

6. Answer (4)

Hint & Sol.: Ampere is fundamental unit of Electric current.

candela is fundamental unit of Luminous intensity.

kelvin is fundamental unit of Temperature.

7. Answer (1)

Hint: For maximum value of y, $\frac{dy}{dx} = 0$

Sol.: $\frac{dy}{dx} = -6x - 1 = 0 \Rightarrow 6x = -1 \Rightarrow x = \frac{-1}{6}$

$\therefore$ At $x = \frac{-1}{6}$, this downward parabola would have maximum value.

8. Answer (3)

Hint: Acceleration $a = \frac{dv}{dt}$ and velocity $v = \frac{dx}{dt}$

Sol.: Given $t = kx^2v = x^2v$ ($k = 1$)

Differentiating both sides w.r.t. time,

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

$\Rightarrow a = \frac{1 - 2xv^2}{x^2} = \frac{1}{x^2} - \frac{2v^2}{x}$

9. Answer (2)

Hint: Final reading of screw gauge

= M.S.R + n × (L.C.)

Sol.: Final reading = 4×1 mm + (40 – 5) × $\frac{1\,\text{mm}}{100}$

= 4 mm + 0.35 mm

= 4.35 mm

10. Answer (4)

Hint: Straight line in intercept form is given by $\frac{x}{a} + \frac{y}{b} = 1$ where a, b = intercepts on x, y-axes.

Sol.: Rearranging we get, $y + 3x = 2$

$\Rightarrow \frac{y}{2} + \frac{3x}{2} = 1$

$\therefore$ x-intercept = $\frac{2}{3}$ and y-intercept = 2

11. Answer (2)

Hint: Total displacement = zero

$\Rightarrow$ Average velocity = zero

Sol.: Average speed = $\dfrac{\text{Total distance}}{\text{Total time}}$

$$= \frac{2d}{\frac{d}{v}+\frac{d}{2v}} = \frac{4v}{3}$$

$$= 4 \times \frac{30}{3} = 40 \text{ km/h}$$

12. Answer (3)

Hint: Particle comes to rest when $v = \dfrac{dx}{dt} = 0$

Sol.: $v = 3pt^2 - 2qt = 0 \Rightarrow t = \dfrac{2q}{3p} = t_1 \Rightarrow (A)$ is correct.

($\because$ both $p, q > 0$)

$$a = 0 \Rightarrow t = \frac{2q}{6p} = \frac{q}{3p} = \frac{t_1}{2}$$

Therefore option (3) is correct.

13. Answer (3)

Hint: Lower the least count of instrument, higher the precision.

Sol.: Order of precision:

19.127 m > 18.81 m > 19.3 m > 18 m

14. Answer (2)

Hint: Equation of projectile is given by $y = x\tan\theta\left(1-\dfrac{x}{R}\right)$

Sol.: $4y = 4x - x^2 \Rightarrow y = x - \dfrac{x^2}{4} = x\left(1-\dfrac{x}{4}\right)$

On comparing, we get $\tan\theta = 1$ and range $R = 4$ m

Using $R = \dfrac{2u_x u_y}{g} \Rightarrow u_x u_y = \dfrac{40}{2} = 20 \text{ m}^2/\text{s}^2$

15. Answer (4)

Hint: $R_{min} \le R \le R_{max}$

Sol.: $|F_2 - F_1| \le R \le F_1 + F_2$

$\Rightarrow$ 2 N $\le R \le$ 8 N

16. Answer (2)

Hint: In addition/subtraction, the result would have the same decimal places as in the original number (3.3) with the least decimal places (which is one).

Sol.: $\therefore \quad 2.111 + 2.22 - 3.3 = 1.031 \approx 1.0$

17. Answer (4)

Hint: Use homogeneity of dimensions

Sol.: $[E] = [pA\omega^2] \Rightarrow [p] = \dfrac{[E]}{[A][\omega^2]}$

$$\Rightarrow [p] = \frac{[ML^2T^{-2}]}{[L][T^{-2}]} = [ML]$$

18. Answer (4)

Hint & Sol.:

Graph (1) $\Rightarrow$ Increasing acceleration ($v\uparrow$)

Graph (2) $\Rightarrow$ Decreasing acceleration ($v\uparrow$)

Graph (3) $\Rightarrow$ Decreasing retardation ($v\downarrow$)

Graph (4) $\Rightarrow$ Increasing retardation ($v\downarrow$)

19. Answer (3)

Hint: In conversion of units, $n_1u_2 = n_2u_2$ and [Pressure] = $[ML^{-1}T^{-2}]$

Sol.: $n_2 = n_1\left(\dfrac{M_1}{M_2}\right)^1\left(\dfrac{L_1}{L_2}\right)^{-1}\left(\dfrac{T_1}{T_2}\right)^{-2}$

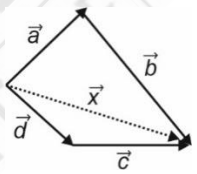
$$= 10\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)^{-1}\left(\frac{1}{4}\right)^{-2}$$

$n_2 = 10 \times 16 = 160$

20. Answer (2)

Hint: Use head to tail method of vector addition

Sol.: $\vec{a} + \vec{b} = \vec{x} = \vec{d} + \vec{c}$

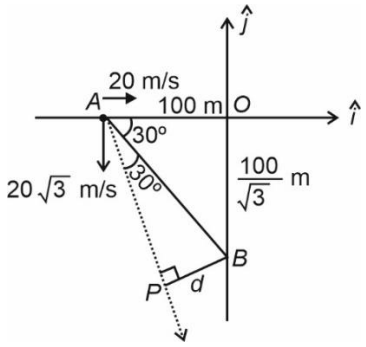


21. Answer (2)

Hint: Analyse motion of car *A* w.r.t. car *B*

Sol.: $\vec{v}_{AB} = \vec{v}_A - \vec{v}_B$

$$= \left(20\hat{i} - 20\sqrt{3}\hat{j}\right) \text{m/s}$$



$\vec{v}_{AB}$ makes angle θ with horizontal.

$$\tan\theta = \frac{20\sqrt{3}}{20} = \sqrt{3} \Rightarrow \theta = 60^\circ$$

In ΔAOB,

$$AB = \frac{AO}{\cos 30^\circ} = \frac{100}{\frac{\sqrt{3}}{2}} = \frac{200}{\sqrt{3}}\text{m}$$

The car A and car B will be closest at *P*.

$\therefore$ Time taken

$$= \frac{AP}{v_{AB}} = \frac{AB\cos 30^\circ}{\sqrt{20^2 + (20\sqrt{3})^2}} = \frac{\frac{200}{\sqrt{3}} \times \frac{\sqrt{3}}{2}}{\sqrt{400 + 1200}}$$

$$= \frac{100}{40} = \frac{10}{4} = 2.5\,\text{sec}$$

22. Answer (3)

Hint & Sol.: When the jaws of vernier touch each other, then zero error is positive if zero of vernier scale is to the right of the zero of main scale.

Zero error will be negative if zero of vernier scale is to the left of the zero of main scale.

23. Answer (3)

Hint: A vector has both magnitude as well as direction.

Sol.: Angular velocity is the only vector quantity among the given options.

24. Answer (4)

Hint & Sol.: Systematic error arise due to both instrumental error (zero error) and personal error.

25. Answer (2)

Hint: Absolute error $|\Delta x| = |x - x_{mean}|$

Sol.: $x_{mean} = \frac{x_1 + x_2 + x_3}{3} = \frac{6.41 + 6.42 + 6.39}{3}$

$$= \frac{19.22}{3} = 6.4066 \approx 6.41\,\text{m}$$

Mean absolute error = $\frac{0 + 0.02 + 0.01}{3} \approx 0.01$

26. Answer (1)

Hint & Sol: A particle thrown upwards has zero velocity at topmost point but acceleration is non-zero $\Rightarrow$ **A** is true.

If acceleration = zero, then particle will continue moving with uniform velocity $\Rightarrow$ **B** is true.

27. Answer (2)

Hint: Distance travelled in n^{th} second, $S_n = u + \frac{g}{2}(2n-1)$, where u = zero

Sol.: $S = \frac{1}{2}gn^2 \Rightarrow$ total time taken =

$$n = \sqrt{\frac{2S}{g}} = \sqrt{\frac{2 \times 176.4}{9.8}} = 6$$

$$S_n = \frac{g}{2} \times 11 = \frac{9.8 \times 11}{2} = 53.9\,\text{m}$$

28. Answer (2)

Hint: To cross in shortest possible time, the boat should have its velocity in still water $(\vec{v}_{BW})$ perpendicular to river current $(\vec{v}_R)$.

Sol.: $\vec{v}_{BW} \perp \vec{v}_R$

Time taken = $\frac{\text{width}}{v_{BW}} = \frac{1\,\text{km}}{4\,\text{km/hr}} = \frac{1}{4}\text{hr} = 15\,\text{min}$

29. Answer (2)

Hint: If $|\vec{A}| = |\vec{B}|$, then $|\vec{A} - \vec{B}| = 2A\sin\left(\frac{\theta}{2}\right)$

Sol.: As $|\vec{v}| = |\vec{u}| = v$, thus $|\vec{v} - \vec{u}| = 2v\sin\left(\frac{\theta}{2}\right)$ in uniform circular motion.

$$n = \frac{4}{3} \Rightarrow \theta = \frac{360^\circ}{n} = \frac{360^\circ \times 3}{4} = 270^\circ$$

$$\therefore |\Delta\vec{v}| = 2v\sin\left(\frac{270^\circ}{2}\right) = 2v\sin(135^\circ)$$

$$= 2v\sin 45^\circ = \sqrt{2}\,v$$

$n = 2 \Rightarrow \theta = 180^\circ \Rightarrow |\Delta\vec{v}| = 2v\sin 90^\circ = 2v$

$n = 4 \Rightarrow \theta = 90^\circ \Rightarrow |\Delta\vec{v}| = 2v\sin 45^\circ = \sqrt{2}\,v$

$n = 6 \Rightarrow \theta = 60^\circ \Rightarrow |\Delta\vec{v}| = 2v\sin 30^\circ = v$

30. Answer (1)

Hint: [Magnetic susceptibility] = $[M^0L^0T^0]$

Sol.: [Boltzmann's constant] = $[ML^2T^{-2}K^{-1}]$

[Modulus of elasticity] = $[ML^{-1}T^{-2}]$

[Planck's constant] = $[ML^2T^{-1}]$

31. Answer (1)

Hint: $[F] = [v^x\ V^y\ D^z]$ and use principle of homogeneity.

Sol.: $[MLT^{-2}] = [LT^{-1}]^x\ [L^3]^y\ [ML^{-3}]^z$

Equating the dimension on both sides, we get

$-2 = -x \Rightarrow x = 2$

$1 = z$

$1 = x + 3y - 3z$

$\Rightarrow\ 1 = 2 + 3y - 3 \Rightarrow 2 = 3y \Rightarrow y = \dfrac{2}{3}$

32. Answer (4)

Hint: Use principle of homogeneity

Sol.: Option (1) becomes $v^2 - u^2 = 2as$

Option (2) becomes $s - ut = \dfrac{1}{2}at^2$

In all 3 options, [LHS] = [RHS] $\Rightarrow$ all equations are dimensionally correct.

33. Answer (4)

Hint: [Thrust] = [ML T^{-2}]

Sol.: [Weight] = [Energy gradient] = [ML T^{-2}]

34. Answer (4)

Hint & Sol.: Path of a projectile can be a straight line if launched vertically. If launched obliquely, it will take a parabolic path.

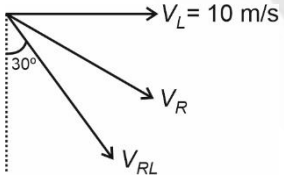
35. Answer (2)

Hint: Draw appropriate vector diagram

Use $\vec{V}_{RL} = \vec{V}_R - \vec{V}_L$

Sol.:

Case-I:



$\vec{V}_R = \vec{V}_{Rx}\hat{i} - V_{Ry}\hat{j}$

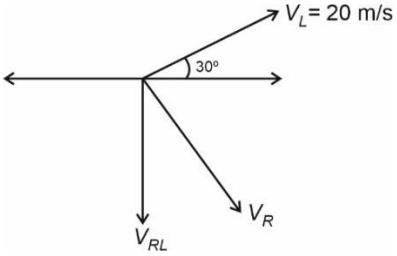
$\vec{V}_{RL} = \vec{V}_R - \vec{V}_L = V_{Rx}\hat{i} - V_{Ry}\hat{j} - 10\hat{i}$

$= (V_{Rx} - 10)\hat{i} - V_{Ry}\hat{j}$

$\tan 30^\circ = \dfrac{V_{Rx} - 10}{V_{Ry}} = \dfrac{1}{\sqrt{3}}$

$V_{Rx} - 10 = \dfrac{V_{Ry}}{\sqrt{3}}$ ...(i)

Case-II:



As per situation:

$V_{Rx} - 10\sqrt{3} = 0$

$V_{Rx} = 10\sqrt{3}$ m/s

Put V_{Rx} in (i)

$10\sqrt{3} - 10 = \dfrac{V_{Ry}}{\sqrt{3}} \Rightarrow V_{Ry} = (30 - 10\sqrt{3})$ m/s

Original speed of rain

$V_R = \left[(V_{Rx})^2 + (V_{Ry})^2\right]^{1/2}$

$V_R = \sqrt{\left(10\sqrt{3}\right)^2 + \left(30 - 10\sqrt{3}\right)^2}$

$= 10\sqrt{15 - 6\sqrt{3}}$ m/s

36. Answer (2)

Hint: In a number with decimal, the trailing zeros are significant.

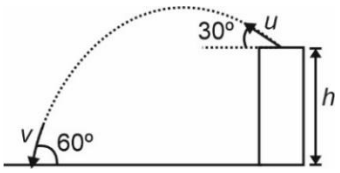
Sol.: Option (2) has 4 significant digits.

Option (1) has three significant digits while option (3) has two significant digit.

37. Answer (1)

Hint: Along the horizontal, velocity of ball remains same $\Rightarrow u\cos 30^\circ = v\cos 60^\circ \Rightarrow v = u\sqrt{3}$

Sol.: Along vertical direction, $v_y^2 = u_y^2 + 2gh$



$\Rightarrow v^2 \sin^2 60^\circ = u^2 \sin^2 30^\circ + 2gh$

$\Rightarrow 3u^2 \times \dfrac{3}{4} = \dfrac{u^2}{4} + 2g\alpha \Rightarrow \dfrac{8u^2}{4} = 2g\alpha$

$\Rightarrow u^2 = g\alpha \Rightarrow u = \sqrt{g\alpha}$

38. Answer (3)

Hint: Position $\vec{r} = \vec{r}_0 + \vec{v}_0 t + \frac{1}{2}\vec{a}t^2$, where $\vec{r}_0$ and $\vec{v}_0$ = zero

Sol.: $\vec{r} = \frac{1}{2}\left(\hat{j} + 2\hat{i}\right)16 = \left(8\hat{j} + 16\hat{i}\right)$ m

39. Answer (3)

Hint: Heat capacity $C = \frac{\text{Heat}}{\text{Change in temp}} = \frac{Q}{\Delta T}$

Sol.: $[C] = \frac{[Q]}{[\Delta T]} = \frac{[ML^2T^{-2}]}{[K]} = [ML^2T^{-2}K^{-1}]$

40. Answer (2)

Hint: For any freely falling body, $s = \frac{1}{2}gt^2$ (as $u = 0$)

Sol.: Distance fallen = $s = \frac{1}{2} \times 10 \times 10^2$

$= \frac{1000}{2} = 500$ m

41. Answer (3)

Hint: Average acceleration = $\vec{a}_{avg} = \frac{\vec{v}_2 - \vec{v}_1}{t_2 - t_1}$

Sol.: For A to B, $v_B > v_A$, a_{avg} = +

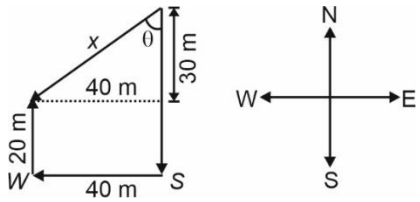
For A to C, $v_C = v_A$, $a_{avg} = 0$

For A to D, $v_D < v_A$, a_{avg} = –

42. Answer (2)

Hint: Displacement is the shortest path connecting initial and final points.

Sol.:



Displacement $x = \sqrt{30^2 + 40^2}$

$= \sqrt{50^2} = 50$ m

$\tan\theta = \frac{4}{3} \Rightarrow \theta = 53°$

43. Answer (4)

Hint: Relative error for a quantity x is given by $\frac{\Delta x}{x}$

Sol.: In series connection,

$R_{eq} = R_1 + R_2 = (60 + 30) \pm (3 + 2) = (90 \pm 5)\Omega$

$\therefore \frac{\Delta x}{x} = \frac{5}{90} = \frac{1}{18}$

44. Answer (2)

Hint: When two measured values are multiplied or divided, there must be as many significant figures retained in the final result, as are there in the original number with the least significant figures.

Sol.: $\frac{2.01 \times 4.04}{3.0} = \frac{8.1204}{3.0} = 2.7068 \approx 2.7$

45. Answer (3)

Hint & Sol.: Plane angle and solid angle are both dimensionless but have units (radian, steradian)

$\Rightarrow$ statement I is correct.

A unitless quantity lacks any physical dimensions.

$\Rightarrow$ statement II is also correct.

[CHEMISTRY]

46. Answer (2)

Hint: Mole fraction is temperature independent unitless quantity

Sol.:

- Mole fraction = $\frac{\text{Moles of solute}}{\text{Total moles of solution}}$
- For 1.2 molal solution, moles of solute = 1.2

Moles of solvent = $\frac{1000}{18} = 55.55$

$\therefore$ Mole fraction = $\frac{1.2}{55.55 + 1.2} = \frac{1.2}{56.75} = 0.02$

- On dilution, moles of solvent will increase and it will change mole fraction of both solute and solvent
- 100 g solution have 40 g of NaOH

Mole of NaOH = $\frac{40}{40} = 1$

Moles of H_2O = $\frac{60}{18} = 3.33$

Mole fraction of solute = $\frac{1}{1 + 3.33} = 0.23$

47. Answer (1)

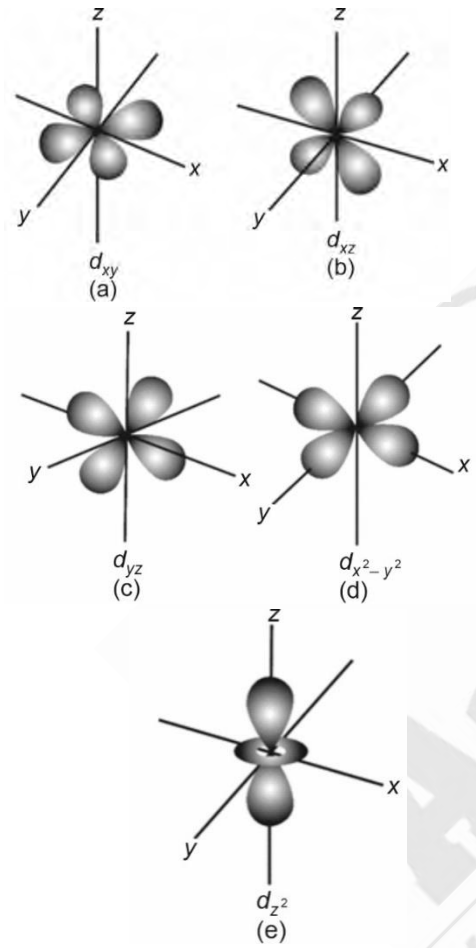
Hint & Sol.:

Series	Region
Lyman	Ultraviolet
Balmer	Visible
Paschen	Infrared
Brackett	Infrared

48. Answer (3)

Hint: d_{z^2} has electron density along the *z*-axis

Sol.:



49. Answer (4)

Hint: Number of orbitals in an energy level = n^2

Sol.:

- Total number of orbitals in fourth energy level = 4^2 = 16 (4*s*, 4*p*, 4*d*, 4*f*) orbitals
- In a *d* sub-shell total 10 electrons are present, out of which 5 have same spin.
- Energies of the orbitals in the same subshell decrease with increase in the atomic number (z_{eff})

  $E_{2s}(H) > E_{2s}(Li)$
- Orbital angular momentum = $\sqrt{l(l+1)}\hbar$

  $= \sqrt{1(1+1)}\hbar = \sqrt{2}\hbar$

50. Answer (2)

Hint: $\Delta x \cdot \Delta v \geq \dfrac{h}{4\pi m}$

Sol.: $\Delta v = \dfrac{3\times10^5 \times 0.001}{10^2 \times 10^2} \Rightarrow 3\times10^{-2}$ m/s

$$\Delta x = \frac{6.6\times10^{-34}}{4\times3.14\times9\times10^{-31}\times3\times10^{-2}}$$

$= 1.95\times10^{-3}$ m

51. Answer (3)

Hint & Sol.: CO_2 is an acidic oxide

52. Answer (2)

Hint: After removal of first electron, removal of second electron from the species becomes more difficult due to increased effective nuclear charge.

Sol.:

$\Rightarrow$ Size of anion is larger than that of parent atom due to inter-electronic repulsion.

$\Rightarrow$ Noble gases have positive value of electron gain enthalpy.

$\Rightarrow$ First ionisation enthalpy of N is greater than that of oxygen.

53. Answer (3)

Hint: Generally the value of $\Delta_{eg}H$ becomes less negative on moving down the group.

Sol.:

Elements	$\Delta_{eg}H$ (kJ mol^{-1})
Li	–60
Na	–53
K	–48
O	–141
S	–200
Se	–195
F	–328
Cl	–349
Br	–325
I	–295

54. Answer (4)

Hint: $h\nu = h\nu_0 + K.E.$

$h\nu$ = Total energy

$h\nu_0$ = Work function of metal or threshold energy

Sol.:

Metal	Work function (W_0) in eV
Mg	3.7
Cu	4.8

55. Answer (1)

Hint: Density = $\frac{\text{Mass}}{\text{Volume}}$

Sol.: Let the weight of solution = 100 g

$\therefore$ Weight of solute (H_2SO_4) = 9.8 g

Mole of solute = $\frac{9.8}{98} = 0.1$

Volume of solution = $\frac{\text{Mass}}{\text{Density}} = \frac{100\,g}{1.2\ gmL^{-1}}$

$= \frac{1000}{12} mL$

Molarity = $\frac{\text{Moles of solute}}{\text{Volume of solution(L)}}$

$= \frac{0.1\times12\times1000}{1000} \Rightarrow 1.2\ M$

56. Answer (1)

Hint & Sol.: $\Delta E = R_H Z^2\left[\frac{1}{n_i^2} - \frac{1}{n_f^2}\right]$

So, $\Delta E_{3\to4} = \frac{R_H \times 7}{hc \times 16 \times 9}$

$\Delta E_{4\to5} = \frac{hc}{\lambda_{4\to5}}$

$\Rightarrow \Delta E_{4\to5} = \frac{R_H \times 9}{hc \times 25 \times 16}$

$\frac{\Delta E_{3\to4}}{\Delta E_{4\to5}} = \frac{R_H \times 7 \times hc \times 25 \times 16}{hc \times 16 \times 9 \times R_H \times 9}$

$= \frac{175}{81}$

57. Answer (2)

Hint: $r_n = \frac{52.9\times n^2}{Z} pm$

$E_n = \frac{-2.18\times10^{-18}\times Z^2}{n^2} J$

Sol.:

$E_{Li^{2+}} = -2.18\times10^{-18}\times9 = -19.62\times10^{-18}\ J$

$r_{Li^{2+}} = \frac{52.9\times1}{3} = 17.63\ pm$

$E_{Be^{3+}} = -2.18\times10^{-18}\times16 = -34.88\times10^{-18}\ J$

$r_{Be^{3+}} = \frac{52.9\times1}{4} = 13.225\ pm$

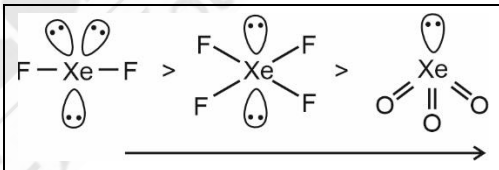
58. Answer (3)

Hint & Sol.: Dalton's theory could explain the laws of chemical combination. However, it could not explain the law of gaseous volume.

59. Answer (2)

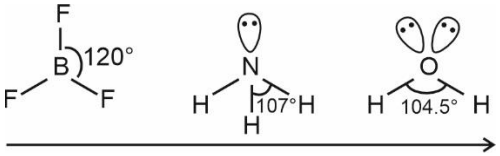
Hint: More the number of lone pairs on central atom, more will be the lone pair-lone pair repulsion.

Sol.:



Decreasing order of lp - lp repulsion

Bond type	Bond length
O – H	96 pm
C – H	107 pm
N – O	136 pm



Decreasing bond angle

Molecule	Bond enthalpy
N_2	946.0 kJ mol^{-1}
O_2	498.0 kJ mol^{-1}
H_2	435.8 kJ mol^{-1}

60. Answer (4)

Hint: *s* and *p* block elements are known as representative elements as well as main group elements.

Sol.:

- Electronegativity of C(2.5) is higher than that of Al(1.5)
- Cerium (atomic number = 58) is *f* block element and called inner transition element.
- Element X is thorium and has electronic configuration [Rn] $5f^0\ 6d^2\ 7s^2$

61. Answer (2)

Hint: Molarity = $\frac{\text{Moles of solute}}{\text{Volume of solution (L)}}$

Sol.: Moles of HCl = $\frac{0.5\times 50}{1000}$ = 0.025 mol

Moles of $CaCO_3$ = $\frac{1.5}{100} = 0.015$ mol

1 mol of $CaCO_3 \equiv$ 2 mol of HCl

$\therefore$ 0.015 mol of $CaCO_3 \equiv 2\times0.015$ mol of HCl

= 0.030 mol of HCl

Available mol of HCl = 0.025

Hence, HCl is limiting reagent

Moles of CO_2 obtained = $\frac{0.025}{2} = 0.0125$ mol

Mass of CO_2 obtained = 0.0125 × 44

= 0.55 g

62. Answer (3)

Hint: Molality = $\frac{\text{Moles of solute}}{\text{Mass of solvent (kg)}}$

Sol.: Molality = $\frac{\frac{6.02\times10^{22}}{6.02\times10^{23}}}{20\times18\times10^{-3}}$

= 0.277 m

63. Answer (1)

Hint: Number of atoms in a sample = moles × N_A × atomicity.

Sol.: Let the mass of the samples of S_2, S_4 and S_8 is x g each.

Atoms in $S_2 = \frac{x}{32\times2}\times N_A\times2 = \frac{x}{32}N_A$

Atoms in $S_4 = \frac{x}{32\times4}\times N_A\times4 = \frac{x}{32}N_A$

Atoms in $S_8 = \frac{x}{32\times8}\times N_A\times8 = \frac{x}{32}N_A$

In O_2 and $O_3 \Rightarrow$

Molecules in O_2 = $\frac{3.2}{32}\times N_A = 0.1N_A$

Molecules in O_3 = $\frac{4.8}{48}\times N_A = 0.1N_A$

64. Answer (2)

Hint: 100 g of chlorophyll contain 2.68 g of Mg

$\therefore$ 9.6 g of chlorophyll contain $\left(\frac{2.68}{100}\times9.6\right)$ g Mg

Sol.: Moles of Magnesium =

$\frac{2.68}{100}\times\frac{9.6}{24} = 0.01072$ mol

$\therefore$ Mg atoms = $0.0172\times6.022\times10^{23}$

= 6.45×10^{21}

65. Answer (2)

Hint: The simplest ratio of the elements in a compound is represented by its empirical formula

Sol.:

Elem-ents	Mass %	Moles	Simplest ratio
C	77.38	$\frac{77.38}{12} = 6.45$	$\frac{6.45}{1.07} = 6.02 \approx 6$
H	7.58	$\frac{7.58}{1} = 7.58$	$\frac{7.58}{1.07} = 7.08 \approx 7$
N	15.04	$\frac{15.04}{14} = 1.07$	$\frac{1.07}{1.07} = 1$

Empirical formula = C_6H_7N

Empirical formula mass = 72 + 7 + 14 = 93 u

66. Answer (3)

Hint: % of an element in a compound

$= \frac{\text{Mass of element}}{\text{Molar mass of compound}}\times100$

Sol.:

a. Sulphuric acid (H_2SO_4)

$$= \frac{16 \times 4}{98} \times 100 = 65.3\%$$

b. Acetic acid (CH_3COOH)

$$= \frac{16 \times 2}{60} \times 100 = 53.3\%$$

c. Carbon dioxide $= \frac{32}{44} \times 100 = 72.7\%$

d. Ethanol (C_2H_5OH) $= \frac{16}{46} \times 100 = 34.8\%$

67. Answer (1)

Hint: Only pure carbon (40%) out of 0.5 kg will take part in reactions.

Sol.: Pure carbon in coal = $\frac{0.5 \times 40}{100} = 0.2 \text{ kg} = 200 \text{ g}$

$\Rightarrow$ 30% pure carbon (60 g) forms CO_2

$\Rightarrow$ 12 g of carbon produces $\equiv$ 44 g of CO_2

Hence, 60 g of carbon produces $\equiv \frac{44}{12} \times 60 = 220$ g

Again, 140 g carbon produces CO = $\frac{28}{12} \times 140 = 326.7$ g

68. Answer (4)

Hint: $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

Sol.: 16 g methane reacts with 64 g oxygen

a. 2 g methane will react with $\frac{64}{16} \times 2 = 8$ g oxygen

Excess oxygen = 10 – 8 = 2 g

b. 80 g of oxygen will react with $\frac{16}{64} \times 80 = 20$ g of CH_4

Excess methane = 24 – 20 = 4 g

c. 3.2 g of methane will react with $\frac{64}{16} \times 3.2 = 12.8$ g

Excess of oxygen = 16 – 12.8 = 3.2 g

d. 20 g of oxygen will react with $\frac{16}{64} \times 20 = 5$ g of methane

Excess of methane = 7 – 5 = 2 g

69. Answer (3)

Hint: The orbital for which (n + l) value is more, more will be its energy

Sol.:

	Orbital	n + l value
(i)	3*d*	3 + 2 = 5
(ii)	4*p*	4 + 1 = 5
(iii)	5*s*	5 + 0 = 5
(iv)	4*f*	4 + 3 = 7

For same value of (n + l), orbital with lower n value will have less energy. Hence (iv) > (iii) > (ii) > (i)

70. Answer (4)

Hint & Sol.: Spherically symmetric state with one radial node = 2s

If energy of H-atom in its ground state is

$$E_1 = E_0 \frac{Z^2}{(1)^2} = E_0 \qquad (Z = 1)$$

So, energy of state $S \Rightarrow E_2 = E_0 \times \frac{3^2}{2^2}$

$$E_2 = E_0 \times \frac{9}{4} = 2.25\ E_0 \text{ or } 2.25\ E_1$$

71. Answer (2)

Hint: According to Aufbau's principle electrons are filled in the orbitals on the basis of increasing energy.

Sol.:

(i) Orbital with lower energy 2*s* should be fully filled before filling of 2*p* orbitals.

(ii) For the electrons in 2*p* subshell of N-atom

n = 2

l = 1

m_l = +1, 0, +1

$m_s = +\frac{1}{2}$ or $-\frac{1}{2}$

Spin quantum number for the three electrons in 2*p* orbital are same [either $+\frac{1}{2}$ or $-\frac{1}{2}$] while m value will be different.

$_{29}Cu = [Ar]\ 3d^{10}\ 4s^1$

72. Answer (2)

Hint: K.E of photoelectrons = $h\nu - h\nu_0$

Sol.: Energy (KE) of photon

$= (6 \times 10^{-16}) - (3 \times 10^{-16}) = 3 \times 10^{-16}$ J

$$\lambda = \frac{h}{\sqrt{2mKE}} = \frac{6\times10^{-34}}{\sqrt{2\times9.1\times10^{-31}\times3\times10^{-16}}}$$

$= 2.56 \times 10^{-11}$ m

$= 25.6$ pm

73. Answer (3)

Hint: Radial node = $n - l - 1$

Sol.: $4d \Rightarrow 4 - 2 - 1 = 1$

$3s \Rightarrow 3 - 0 - 1 = 2$

$5p \Rightarrow 5 - 1 - 1 = 3$

$5s \Rightarrow 5 - 0 - 1 = 4$

74. Answer (2)

Hint: ${}_4Be = 1s^2\ 2s^2$

${}_5B = 1s^2\ 2s^2\ 2p^1$

Sol.: The first ionization enthalpy of Be is greater than that of B because removal of electron from 2s orbital which is closer to nucleus, is more energetic process as compared to removal of electron from 2p orbital.

75. Answer (2)

Hint: Nickel is a transition element

Sol.:

Germanium – Metalloid

Phosphorus – Non-metal

Neodymium – Lanthanoid

76. Answer (4)

Hint: Nobelium (102) has symbol Unb

Sol.:

Element	Atomic number	IUPAC Name	Symbol
Meitnerium	109	Unnilenniun	Une
Bohrium	107	Unnilseptium	Uns
Seaborgium	106	Unnilhexium	Unh

77. Answer (3)

Hint: The minimum amount of energy required to remove an electron from the valence shell of an isolated gaseous atom in its ground state is known as ionization enthalpy.

Sol.: For conversion of an X atom into X^+ ion, x kJ energy is needed.

So, for 1 mol (N_A) atoms of X

Energy required = xN_A

Where N_A = Avogadro's number

78. Answer (4)

Hint: Nearest noble gas of Na, Mg, Al and F is Ne

Sol.:

Element	Ion formed to get Nearest noble gas configuration
Na	Na^+
Mg	Mg^{2+}
Al	Al^{3+}
F	F^-

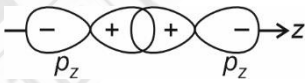
F^-, Na^+, Mg^{2+} and Al^{3+} are isoelectronic species and the order of their size is

$Al^{3+} < Mg^{2+} < Na^+ < F^-$

79. Answer (4)

Hint: Negative overlap involves the overlap of lobes of opposite sign.

Sol.:



Represents positive overlap as overlap of the lobes of same sign occurs.

80. Answer (2)

Hint & Sol: Promotion of an electron is not essential condition prior to hybridisation.

81. Answer (1)

Hint & Sol.:

Electronic configuration of F_2

$$\sigma1s^2\ \sigma^*1s^2\ \sigma2s^2\ \sigma^*2s^2\ \sigma2p_z^2\ \pi2p_x^2 \equiv \pi2p_y^2$$

$$\pi^*2p_x^2 \equiv \pi^*2p_y^2$$

82. Answer (3)

Hint: Presence of unpaired electron(s) in the species leads to paramagnetic behaviour.

Sol.:

Species	Configuration
O_2	$KK\sigma 2s^2\ \sigma^*2s^2\ \sigma 2p_z^2\ \pi 2p_x^2 \equiv \pi 2p_y^2\ \pi^*2p_x^1 \equiv \pi^*2p_y^1$
Bond order	$\frac{1}{2}(10-6)=2$
O_2^-	$KK\ \sigma 2s^2\ \sigma^*2s^2\ \sigma 2p_z^2\ \pi 2p_x^2 \equiv \pi 2p_y^2\ \pi^*2p_x^2\ \pi^*2p_y^1$
Bond order	$\frac{1}{2}(10-7)=1.5$
N_2	$KK\ \sigma 2s^2\ \sigma^*2s^2\ \pi 2p_x^2 \equiv \pi 2p_y^2\ \sigma 2p_z^2$
Bond order	$\frac{1}{2}(10-4)=3$
N_2^+	$KK\ \sigma 2s^2\ \sigma^*2s^2\ \pi 2p_x^2 \equiv \pi 2p_y^2\ \sigma 2p_z^1$
Bond order	$\frac{1}{2}(9-4)=2.5$
C_2	$KK\ \sigma 2s^2\ \sigma^*2s^2\ \pi 2p_x^2\ \pi 2p_y^2$
Bond order	$\frac{1}{2}(8-4)=2$
C_2^-	$KK\ \sigma 2s^2\ \sigma^*2s^2\ \pi 2p_x^2 \equiv \pi 2p_y^2\ \sigma 2p_z^1$
Bond order	$\frac{1}{2}(9-4)=2.5$
O_2^+	$KK\ \sigma 2s^2\ \sigma^*2s^2\ \sigma 2p_z^2\ \pi 2p_x^2 \equiv \pi 2p_y^2\ \pi^*2p_x^1$
Bond order	$\frac{1}{2}(10-5)=2.5$

P means paramagnetic

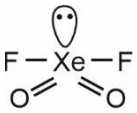
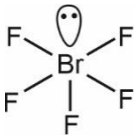
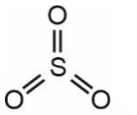
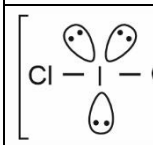
D means diamagnetic

Conversion	$O_2 \rightarrow O_2^-$		$N_2 \rightarrow N_2^+$		$C_2 \rightarrow C_2^-$		$O_2 \rightarrow O_2^+$	
Magnetic Behaviour	P	P	D	P	D	P	P	P
Bond order	2	1.5	3	2.5	2	2.5	2	2.5

83. Answer (4)

Hint: Shape of molecule/species depends on the arrangement of electron pairs (lone pairs and bond pairs) around central atom.

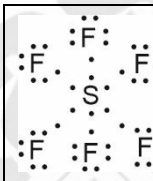
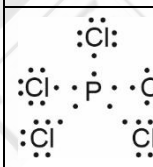
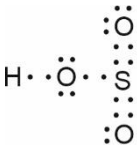
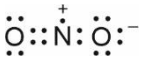
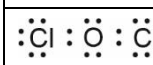
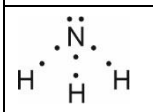
Sol.:

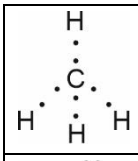
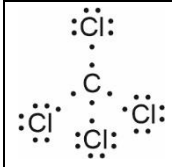
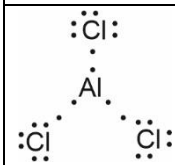
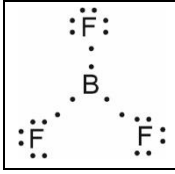
	⇒	See-saw
	⇒	Square pyramidal
	⇒	Trigonal planar
	⇒	Linear

84. Answer (2)

Hint: The species with atoms in which eight electrons are present in valence shell follow octet rule.

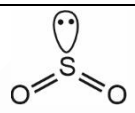
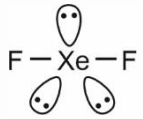
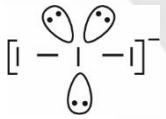
Sol.:

	⇒	Expanded octet in sulphur
	⇒	Expanded octet in phosphorus
	⇒	Expanded octet in sulphur
	⇒	Odd electron molecule
	⇒	Odd electron molecule
	⇒	Complete octet of all atoms
	⇒	Complete octet of all atoms

	⇒	Complete octet of all atoms
	⇒	Complete octet of all atoms
	⇒	Incomplete octet on Al
	⇒	Incomplete octet on B

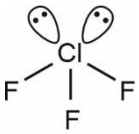
85. Answer (2)

Hint & Sol.:

CO_2	O = C = O Linear
SO_2	 Bent
XeF_2	 Linear
I_3^-	 Linear
I_3^+	 Bent

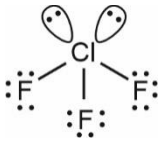
86. Answer (3)

Hint: ClF_3



T. shaped

Sol.:



Lone pairs on Cl = 2

Lone pairs on F = 3 × 3 = 9

Total lone pairs = 11

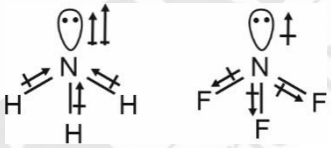
Total bond pairs = 3

87. Answer (3)

Hint: Presence of polar bonds in a polyatomic molecule does not always lead to a definite dipole moment.

Sol.: In a polyatomic molecule, if bond dipoles get cancelled by one-another then net dipole moment becomes zero.

In NH_3, the bond dipoles (N – H bonds) and dipole due to lone pair are aligned in same direction while its in opposite direction in NF_3.



Hence $\mu_{NF_3} < \mu_{NH_3}$

88. Answer (3)

Hint:

$$\% \text{ ionic character} = \frac{\text{Observed dipole moment}}{\text{Calculated dipole moment}} \times 100$$

Sol.: $\mu = q \times d \Rightarrow \mu_{calculated} = 1.6 \times 10^{-19} \times 9.17 \times 10^{-11}$

$= 1.4672 \times 10^{-29}$ C m

$$\therefore \% \text{ ionic character} = \frac{6.1 \times 10^{-30}}{1.4672 \times 10^{-29}} \times 100$$

$= 41.6\%$

Hence % covalent character = 100 – 41.6

$= 58.4\%$

89. Answer (2)

Hint: According to Fajans rule, as the size of cation decreases and charge on it increases, its tendency to polarise anion increases, hence covalent character of compound increases.

Sol.: Increasing covalent character:

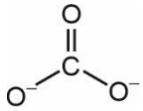
$MgCl_2 < AlCl_3$

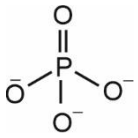
90. Answer (4)

Hint: For the species like CO_3^{2-} ion,

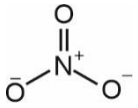
Bond order = $\frac{\text{Total number of covalent bonds}}{\text{Total No. of } \sigma \text{ bonds}}$

Sol.:

1. $CO_3^{2-} \Rightarrow$  B.O $= \frac{4}{3} = 1.33$

2. $PO_4^{3-} \Rightarrow$  B.O $= \frac{5}{4} = 1.25$

3. $CO \Rightarrow$  B.O = 3

4. $NO_3^- \Rightarrow$  B.O $= \frac{4}{3} = 1.33$

[BOTANY]

91. Answer (4)

Hint.: Gap 1 phase is interval between M-phase and S phase

Sol.: M-phase – Equational division

Gap-2-phase – Protein synthesis

Synthesis phase – Duplication of chromosomes

92. Answer (4)

Hint.: Between telophase I and prophase II, metabolic stage like cytokinesis and interkinesis are present.

Sol.: Replication of DNA does not take place during interkinesis.

93. Answer (3)

Hint.: Cell wall maintains the shape of the cell.

Sol.: Cell wall allows the materials to pass in and out of the cell.

94. Answer (4)

Hint.: Double metaphasic plate is formed during metaphase I.

Sol.: In metaphase II, the univalent chromosomes align themselves at the equator and microtubules attach to kinetochores of sister chromatids.

95. Answer (3)

Hint.: Gametes are haploid cells formed from specialised diploid cells.

Sol.: In animal cells, cytokinesis is achieved by the formation of furrow in the plasma membrane.

96. Answer (2)

Hint.: Terminalisation of chiasmata occurs in last stage of prophase I of meiosis I. In this phase, the chromosomes are fully condensed.

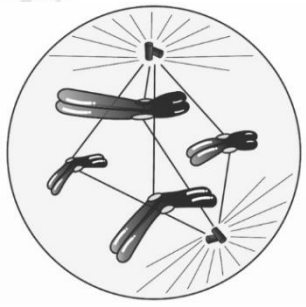
Sol.: During leptotene, the chromosomes become gradually visible under light microscope. The correct sequence of phases of prophase I is as follows:

Leptotene → Zygotene → Pachytene → Diplotene → Diakinesis

97. Answer (3)

Hint.: Metaphase is characterised by the alignment of chromosome at the equator.

Sol.:



Transition to Metaphase

98. Answer (2)

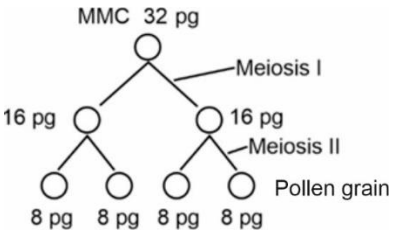
Hint : Microtubules attach to the kinetochore of chromosome during second phase of karyokinesis.

Sol.: Microtubules of the spindle fibres attach to the kinetochore during metaphase.

99. Answer (3)

Hint.: Pollen mother cell is diploid while pollen grain is haploid.

Sol.:



100. Answer (2)

Hint.: The cell exit the G_1 stage to enter an inactive stage.

Sol.: In G_0 phase or quiescent stage the cell remains metabolically active but do not proliferate unless they are called on to do so.

101. Answer (2)

Hint.: It occurs after separation of homologous chromosomes.

Sol.: Following telophase I when cytokinesis begins, it is marked by formation of dyad of cells.

102. Answer (1)

Hint : Prophase – Chromosomes appear like ball of wool.

Sol.: Metaphase – Chromosome align at the equator.

Anaphase – Formation of interzonal fibres takes place.

Telophase – Nucleolus, Golgi bodies, and ER reappear.

103. Answer (2)

Hint.: The cristae are infoldings of inner membrane and are formed towards the matrix which increase the surface area for enzyme action.

Sol.: Matrix contains single circular dsDNA, a few RNA molecules and 70S ribosomes.

104. Answer (3)

Hint.: Flagella are longer in size.

Sol.: Cilia help in locomotion, feeding and circulation.

105. Answer (2)

Hint.: Nucleolus is a spherical structure found in the nucleoplasm.

Sol.: Nucleolus is the site for ribosomal RNA synthesis.

106. Answer (2)

Sol.: Cell growth results in disturbing the ratio between the nucleus and the cytoplasm. It therefore becomes essential for the cell to divide to restore the nucleo-cytoplasmic ratio.

107. Answer (3)

Hint.: Period of cell cycle varies from organism to organism and also from cell to cell.

Sol.: A yeast cell divides once in 90 minutes and a typical human cell divides approximately every 24 hours.

108. Answer (4)

Hint.: It is the fourth stage of prophase I.

Sol.: In oocytes of some vertebrates, diplotene lasts for month or years. It is called dictyotene stage.

109. Answer (4)

Hint.: Mitosis is called equational division because the two daughter cells have the same number of chromosomes as present in the parent cell.

Sol.: Meiosis provides a chance for the formation of new combinations of chromosomes.

110. Answer (3)

Hint.: M phase or mitotic phase is the phase where actual cell division occurs involving a major reorganisation of virtually all components of the cell.

Sol.: Meiosis involves two sequential cycles of nuclear division but only one cycle of DNA replication.

111. Answer (2)

Hint.: Lipids in plasma membrane have polar head and non-polar tail.

Sol.: Lipids are arranged within the membrane with the polar head towards the outer sides and tails towards the inner sides.

The ratio of proteins and lipids varies considerably in different cell types.

112. Answer (2)

Hint.: Chromatophores are membranous extensions into cytoplasm which contains pigments.

Sol.: Chloroplast contain DNA, RNA, pigments and other proteins. Secondary cell wall is formed on the innerside of the primary wall.

113. Answer (4)

Hint.: Root cap cells are rich in Golgi bodies which secrete mucilage for the lubrication of root tip.

Sol.: Endoplasmic reticulum without ribosomes is SER.

114. Answer (3)

Hint.: This organelle is also known as 'suicidal bags'

Sol.: Lysosomes are formed by the process of packaging in the Golgi apparatus. They are rich in hydrolytic enzymes.

115. Answer (1)

Hint.: Gas vacuole in prokaryotes provide buoyancy.

Sol.: Contractile vacuoles are present in *Amoeba*, helps in excretion and osmoregulation.

116. Answer (3)

Hint.: In metacentric chromosomes, the centromere is present at the centre.

Sol.: In acrocentric chromosomes, the centromere is present very close to one end of the chromosome and they appear J-shaped during anaphase.

117. Answer (3)

Hint.: Reserve material in prokaryotic cells are stored in the cytoplasm in the form of inclusion bodies.

Sol.: During translation many ribosomes form a chain on a common messenger RNA and form polysome.

118. Answer (2)

Hint.: Slime layer protects the cell from loss of water and nutrients.

Sol.: The cytoplasm is the main arena of cellular activities in all living cells.

119. Answer (2)

Hint.: Pili are elongated tubular structures made up of a special protein and are involved in mating process.

Sol.: The fimbriae are small bristle-like fibres sprouting out of the cell. They are known to help in attaching the bacteria to rocks in streams and also to the host tissues.

120. Answer (2)

Hint.: Unicellular organisms are capable of independent existence.

Sol.: Anything less than a complete structure of a cell does not ensure independent living. Hence, cell is the fundamental structural and functional unit of all living organisms.

121. Answer (4)

Hint.: The endoplasmic reticulum which is free of ribosomes is known as smooth endoplasmic reticulum.

Sol.: RER provides precursors of enzymes for the formation of lysosomes in Golgi complex.

122. Answer (3)

Hint.: The shape of white blood cells is amoeboid.

Sol.: Shape of mesophyll cell is round and oval.

123. Answer (1)

Hint.: Robert Hooke studied and discovered the cell from a thin slice of cork but that was the 'dead cell'.

Sol.: Antonie Von Leeuwenhoek first saw and described a living cell.

Rudolf Virchow – Explained *Omnis-cellula e cellula.*

Flemming – Gave the term chromatin.

124. Answer (3)

Hint.: Metaphase is the best stage to study morphology of chromosome.

Sol.: Anaphase is the best stage to study shape of the chromosomes.

125. Answer (3)

Hint.: The non-dividing cell enters the quiescent stage or G_0 stage of the cell cycle.

Sol.: Mitochondria, chloroplast and Golgi bodies duplicate in G_2 phase.

126. Answer (2)

Hint.: The homologous chromosomes come to lie side by side in pairs and this pairing is known as synapsis.

Sol.: Crossing over takes place in pachytene. The phenomenon of bringing the chromosomes on the equator of spindle is called congression and it occurs in metaphase stage.

127. Answer (4)

Hint.: Ribosomes were discovered by George Palade.

Sol.: Fluid mosaic model was proposed by Singer and Nicolson.

128. Answer (4)

Hint.: The membranous cell organelles which function in a coordinated manner, constitute an endomembrane system.

Sol.: The endomembrane system include ER, Golgi complex, lysosomes and vacuoles.

129. Answer (1)

Hint.: Biological names are Latinised or derived from Latin language irrespective of their origin.

Sol.: The first word in biological name represents the genus while the second component represents the specific epithet.

130. Answer (3)

Hint.: Structure labelled as I and II are peroxisomes and lysosome respectively.

Sol.: Structure IV is Golgi apparatus, primarily performs the function of packaging materials.

131. Answer (2)

Hint.: Kingdom is the highest category in taxonomic hierarchy with related phylum or division.

Sol.: Taxonomic categories showing hierarchical arrangement of taxa w.r.t. mango in ascending order from species to kingdom is

Mangifera → Anacardiaceae → Sapindales → Dicotyledonae → Angiospermae → Plantae

132. Answer (2)

Hint.: Housefly belongs to phylum Arthropoda.

Sol.: Human beings belong to order Primata.

133. Answer (2)

Hint.: The ribosomes in eukaryotes are of 80S type.

Sol.: The ribosomes that are attached to nuclear envelope is 60S (large subunit of 80S ribosome)

134. Answer (3)

Hint.: Species is the lowest and basic taxonomic category of classification.

Sol.: Scientific name of wheat is

Triticum	*aestivum*
↓	↓
Genus	Species

135. Answer (2)

Hint.: Interphase nucleus is a nucleus of a cell when it is not dividing.

Sol.: Interphase nucleus has one or more non-membrane bound spherical bodies called nucleoli.

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136. Answer (2)

Hint: Molecular weight of lipids does not exceed 800 Da

Sol.: The acid-insoluble fraction has only four types of organic compounds. Except lipids, all are polymeric substances. With the exception of lipids, others have molecular weights in the range of 10,000 Daltons and above.

137. Answer (3)

Hint: Absent in animals.

Sol.: Collagen is the most abundant protein in the animal world and RuBisCO is the most abundant protein in the whole of the biosphere. Trypsin is a protein digesting enzyme. GLUT-4 enables glucose transport into cells. Chitin is a complex homopolysaccharide which forms the exoskeleton of arthropods.

138. Answer (1)

Hint: Cardiac muscle fibres are uninucleated and branched.

Sol.: Cardiac muscle fibres are striated, branched uninucleated and involuntary.

Skeletal muscle fibres are striated, unbranched multinucleated and voluntary.

Smooth/visceral muscle fibres are unstriated, unbranched, uninucleated and involuntary.

139. Answer (2)

Hint : Towards synaptic vesicles

Sol.: When a neuron is stimulated suitably, an electrical disturbance is generated which swiftly travels along its plasma membrane towards nerve endings.

140. Answer (4)

Hint: Pyrimidines are single ringed structures.

Sol.: Adenine, guanine, cytosine, thymine and uracil are nitrogenous bases associated with nucleic acids. Adenine and guanine are substituted purines while cytosine, uracil and thymine are substituted pyrimidines.

141. Answer (2)

Hint: Stored in liver

Sol.: Cellulose, starch and glycogen are homopolymers of glucose. Cellulose is a structural polysaccharide while starch and glycogen are storage polysaccharides in plants and animals, respectively. Inulin is a polymer of fructose.

142. Answer (3)

Hint: Exclude specialised connective tissues

Sol.: Areolar tissue is a type of loose connective tissue present beneath the skin. Often it serves as a support framework for epithelium.

143. Answer (2)

Hint: Loose connective tissue.

Sol.: Cartilage, bones and blood are various types of specialised connective tissue. Areolar tissue is included under the category of loose connective tissue.

144. Answer (3)

Hint: Location of compound epithelium

Sol.: The compound epithelium covers the dry surface of the skin, the moist surface of buccal cavity, pharynx, inner lining of ducts of salivary glands and of pancreatic ducts.

Ciliated epithelium is present in the lining of fallopian tube and bronchioles.

145. Answer (4)

Hint: Secretion is main function of simple cuboidal epithelium

Sol.: Compound epithelium is made of more than one layer (multi-layered) of cells that are tightly packed and thus has a limited role in secretion and absorption. Their main function is to provide protection against chemical, mechanical, thermal and osmotic stresses.

146. Answer (2)

Hint: Glucose is 6C compound while pyruvic acid is 3C compound.

Sol.: Change of glucose into pyruvic acid is a metabolic pathway in which one molecule of glucose changes into 2 molecules of pyruvic acid through different enzyme catalysed metabolic reactions.

147. Answer (4)

Hint: One of the co-factor

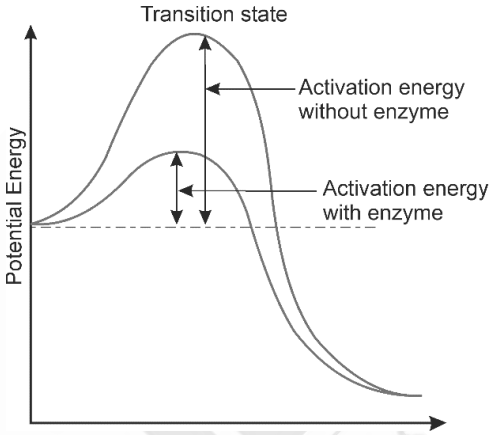
Sol.: Co-enzymes are the organic compounds but their association with the apoenzyme is only transient.

Metal ions are inorganic compounds.

148. Answer (3)

Hint: Enzymes lower the activation energy.

Sol.:



149. Answer (4)

Hint: Diterpenes are terpenoids.

Sol.: Concanavalin A is categorised under lectins. Monoterpenes and diterpenes are terpenoids.

150. Answer (4)

Hint: Tile-like appearance

Sol.: The squamous epithelium is made of a single thin layer of flattened cells with irregular boundaries. They are found in the walls of blood vessels and air sacs of lungs.

Tall and slender cells are found in simple columnar epithelium.

151. Answer (2)

Hint: Exclude endocrine secretions

Sol.: Exocrine glands secrete saliva, oil, earwax, milk, *etc.* Insulin and adrenaline are the hormones secreted from endocrine glands.

152. Answer (2)

Hint: Simple epithelium is classified on this basis.

Sol.: PCT of nephron has cuboidal epithelium while columnar epithelium is found in the lining of stomach and intestine. Epithelial cells of both PCT and intestine has microvilli on their free surfaces. They help in absorption.

153. Answer (4)

Hint: Feature of loose connective tissue

Sol.: The epithelial tissue has a free surface, which faces either a body fluid or the outside environment and thus provides a covering or a lining for some parts of the body. The cells are compactly packed with little intercellular matrix.

154. Answer (1)

Hint: No free enzyme molecules are left.

Sol.: With the increase in substrate concentration, the velocity of enzymatic reaction rises first. The reaction ultimately reaches V_{max}, which is not exceeded by any further rise in the concentration of the substrate. This is because all the enzyme molecules are fully saturated with substrate molecules.

155. Answer (4)

Hint: Exclude neutral amino acids

Sol.: Tryptophan, phenylalanine and tyrosine are aromatic amino acids. Glutamic acid is an acidic amino acid. Alanine and glycine are neutral amino acids.

156. Answer (2)

Hint: Class IV enzymes

Sol.: The mentioned reaction is catalysed by carbonic anhydrase which is a lyase. Lyases catalyse the removal of groups from substrates by mechanism other than hydrolysis leaving double bonds. The E.C. number of lyases starts with 4.

157. Answer (4)

Hint: Exclude specialised connective tissue

Sol.: Ligaments and tendons are dense regular connective tissue. In these tissues, the collagen fibres are present in rows between many parallel bundles of fibres. Ligaments connect bones to bones while tendons connect bones to muscles.

158. Answer (4)

Hint: Neurons are the units of neural system.

Sol.: Neurons, the unit of neural system, are excitable cells. The neuroglial cells which constitute more than one-half the volume of neural tissue protect and support neurons.

159. Answer (2)

Hint: Cardiac muscle fibres are striated.

Sol.: Skeletal muscle such as biceps and cardiac muscles have striated muscle fibres. Unstriated muscle fibres are present in stomach wall and walls of blood vessels.

160. Answer (3)

Hint: Think about blood

Sol.: In all connective tissues except blood and lymph, fibroblasts are present.

Only neurons and muscle fibres show the property of excitability.

Modified polysaccharides, which accumulate between cells and fibres act as matrix which is involved in linking and supporting other tissues/organs.

161. Answer (4)

Hint: Contains a ring in its structure

Sol.: 'R' group in the serine is hydroxymethyl, hence it is an alcoholic amino acid. Based on the number of amino and carboxyl groups, amino acids are acidic (*e.g.,* glutamic acid), basic (*e.g.*, lysine) and neutral (*e.g.,* valine). Tyrosine. tryptophan and phenylalanine are aromatic amino acids.

162. Answer (3)

Hint: Identify a nitrogen base.

Sol.: When nitrogen bases are found attached to pentose sugar, they are called nucleosides. Adenine, guanine, cytosine, thymine and uracil are nitrogen bases while adenosine, guanosine, cytidine, thymidine and uridine are nucleosides.

163. Answer (1)

Hint: Water is the maximum amongst all.

Sol.:

Component	% of the total cellular mass
Water	70-90
Proteins	10-15
Carbohydrates	3
Lipids	2
Nucleic acids	5-7
Ions	1

164. Answer (2)

Hint: Ghee is insoluble in water.

Sol.: Gingelly oil has lower melting point hence remains as oil in winters. Lipids are generally water insoluble.

Two fatty acids are found esterified with glycerol in a diglyceride molecule and three fatty acids are present in a triglyceride molecule.

165. Answer (4)

Hint: Communication junction in cardiac muscles allow cells to contract as a unit.

Sol.: In nearly all the animal tissues, cell junctions provide structural and functional links between their individual cells.

166. Answer (4)

Hint: Identify a fibre.

Sol.: Elastin is a connective tissue fibre that is absent in blood. Formed elements like RBCs, WBCs and platelets are components of blood.

167. Answer (3)

Hint: Exclude skeletal tissues

Sol.: The cells of adipose tissue are specialised to store fats. The excess of nutrients which are not used immediately are converted into fats and are stored in adipocytes.

168. Answer (2)

Hint: Exclude the feature associated with cartilage

Sol.: Bones have hard and non-pliable matrix. The bone cells *i.e.,* osteocytes are present in lacunae. Limb bones serve the weight bearing functions. The bone marrow in some bones is the site of erythropoiesis.

169. Answer (4)

Hint: Proteins are heteropolymers.

Sol.: The amino acids can be essential or non-essential. The non-essential amino acids are those which our body can make while we get essential amino acids through our diet/food. A protein is a heteropolymer and not a homopolymer.

170. Answer (3)

Hint: Most abundant protein in the animal world

Sol.: Collagen acts as the intercellular ground substance.

Protein	**Functions**
Collagen	Intercellular ground substance
Trypsin	Enzyme
Insulin	Hormone
Antibody	Fights infectious agents
Receptor	Sensory reception (smell, taste, hormone, etc.)
GLUT-4	Enables glucose transport into cells

171. Answer (2)

Hint: Equal to the number of ear ossicles in one ear in a man.

Sol.: Each molecule of adenylic acid contains one adenine, one ribose and H_3PO_4. Out of these components, adenine has two heterocyclic rings and ribose also has a heterocyclic ring. Hence, we can say that each adenylic acid contains three heterocyclic rings in its structure.

172. Answer (3)

Hint: Gums are polymeric substances.

Sol.:

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

173. Answer (2)

Hint: COOH group is present at the right side.

Sol.: In a linear protein chain, the left end represents the first/N-terminal amino acid while the right end represents the last/C-terminal amino acid.

174. Answer (2)

Hint: Competitive inhibitor closely resembles the substrate in structure.

Sol.: Malonate is a competitive inhibitor of enzyme succinic dehydrogenase. Malonate closely resembles the substrate succinate in structure.

Zinc acts as the co-factor for carboxypeptidase. Co-enzyme NADP contains niacin.

175. Answer (4)

Hint: Prosthetic groups are tightly bound to the apoenzyme.

Sol.: Haem is the prosthetic group which is present in enzymes named peroxidase and catalase. Prosthetic groups are tightly bound to the apoenzyme.

176. Answer (1)

Hint: High energy states are unstable

Sol.: In an enzyme catalysed reaction, the substrate bound to the active site of an enzyme results in the formation of a new structure of substrate called transition state structure. It is an unstable high energy state.

177. Answer (3)

Hint: Features of loose connective tissue

Sol.: Areolar tissue and adipose tissue are the types of loose connective tissue. Both of them are present beneath the skin. Mast cells, fibroblasts, adipocytes, macrophages, all are present here.

Osteocytes are bone cells while chondrocytes are cartilage cells.

178. Answer (3)

Hint: Inter-costal muscles help in breathing

Sol.: The action of muscles moves the body to adjust to the changes in the environment and to maintain the positions of various parts of the body. In general, muscles play an active role in all the movements of the body.

179. Answer (2)

Hint: Complex homopolysaccharide

Sol.: Exoskeleton of arthropods has a complex polysaccharide called chitin. Glycogen and inulin are polymers of glucose and fructose, respectively. Insulin is a protein.

180. Answer (3)

Hint: Some nucleic acids behave like enzymes

Sol.: Almost all enzymes are proteins. There are some nucleic acids like RNA that behave like enzymes. They are called ribozymes.

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