All India Aakash Test Series for NEET - 2020

TEST - 5 (Code-A)

Test Date : 22/12/2019

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (1)

Hint and Sol. : James Clerk Maxwell worked for the unification of electricity, magnetism and optics into electromagnetism.

2. Answer (1)

Hint : Dimensional formula of gravitational potential energy is same as that of kinetic energy.

Sol. : $[K]=\left[\frac{1}{2}MV^2\right]=[U]$

$[K] = [MV^2T^0]$

3. Answer (4)

Hint : Use the concept of distance and displacement.

Sol. : Distance = $10+\pi\left(\frac{5}{\pi}\right)+15+\pi\left(\frac{10}{\pi}\right)+20$

$\Rightarrow$ Distance = 10 + 5 + 15 + 10 + 20 = 60 m

$\text{Displacement}=10+2\times\frac{5}{\pi}+15+2\times\frac{10}{\pi}+20$

$\Rightarrow\ \text{Displacement}=\frac{600}{11}\text{ m}$

Required ratio $=\dfrac{60}{\frac{600}{11}}=\dfrac{11}{10}$

4. Answer (4)

Hint : Time of flight $(T)=\sqrt{\frac{2h}{g}},\ x=uT$

Sol. : $T=\sqrt{\frac{2h}{g}}=6$

$\Rightarrow$ h = 180 m

$x = u \times 6 = 6u$

For ΔABC

$\frac{AC}{CB}=\tan 30^\circ$

$\frac{h}{6u}=\frac{1}{\sqrt{3}}$

$\frac{180}{6u}=\frac{1}{\sqrt{3}}$

$\Rightarrow\ u=30\sqrt{3}$ m/s

5. Answer (2)

Hint : $y=x\tan\theta-\frac{gx^2}{2u^2\cos^2\theta}$

Sol. : $y=\sqrt{3}x-\frac{gx^2}{2}$

$\Rightarrow\ \sqrt{3}=\tan(\theta)$

$\Rightarrow\ \theta = 60^\circ$

and, $u^2\cos^2\theta = 1$

$\Rightarrow\ u\cos\theta = 1$

$\Rightarrow\ u\times\frac{1}{2}=1$

$\Rightarrow\ u = 2$ m/s

6. Answer (4)

Hint : $\vec{v}_{\text{bus, car}}=\vec{v}_{\text{bus}}-\vec{v}_{\text{car}}$

Sol. : $|\vec{v}_{\text{bus}}-\vec{v}_{\text{car}}|=11$ m/s

$|\vec{v}_{\text{car}}-20|=11$

$\Rightarrow\ \vec{v}_{\text{car}}-20=11$ or $\vec{v}_{\text{car}}-20=-11$

$\vec{v}_{\text{car}}=31$ m/s or $\vec{v}_{\text{car}}=9$ m/s

7. Answer (4)

Hint : Power rule of combination of errors.

Sol. : $z=\dfrac{p^{\frac{1}{3}}q}{r^{\frac{1}{2}}s^2}$

$\Rightarrow\ \frac{\Delta z}{z}\times100=\left(\frac{1}{3}\times\frac{\Delta p}{p}+\frac{\Delta q}{q}+\frac{1}{2}\frac{\Delta r}{r}+2\frac{\Delta s}{s}\right)100$

$=\frac{1}{3}\times3\%+\frac{1}{2}\%+\frac{1}{2}\times3\%+2\times1\%$

= 5%

8. Answer (3)

Hint and Sol. : Random error can be minimised by taking large number of readings.

9. Answer (3)

Hint : The zero(s) on the left of the first non zero digit are in significant.

10. Answer (3)

Hint : $v = \frac{dx}{dt} = (1 - \text{cost})$

Sol. : $v = \frac{dx}{dt} = (1 - \text{cost})$

$|v|$ is maximum when cost is minimun, i.e.(– 1)

$v_{max} = 1 - (-1) = 2$ m/s

$(v)_{t=\frac{\pi}{2}} = 1 - \cos\frac{\pi}{2} = 1$ m/s

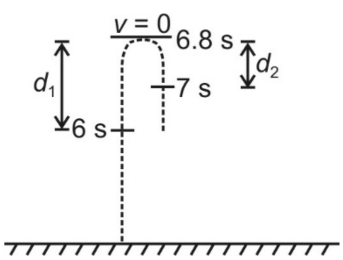
So, required ratio = 2 : 1

11. Answer (3)

Hint : Motion under gravity.

Sol. : Ball comes momentarily at rest at

$t = \frac{u}{g} = 6.8$ s



So in seventh second, ball moves 0.8 s upwards and 0.2 s downward.

$d_1 = \frac{1}{2}g(0.8)^2$

$d_2 = \frac{1}{2}g(0.2)^2$

$d_1 + d_2 = \frac{1}{2}g\{(0.8)^2 + (0.2)^2\} = 3.4$ m

12. Answer (2)

Hint and Sol. :

For velocity proportional to time, distance-time graph is a parabola. For a constant velocity, distance-time graph is a straight line.

13. Answer (4)

Hint and Sol. :

$\vec{a} = \frac{d\vec{v}}{dt}$

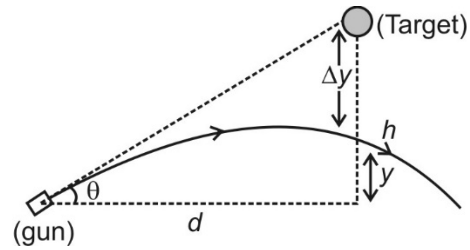
If $\vec{v}$ is constant, then $\frac{d\vec{v}}{dt} = 0$

Also, velocity may vary in direction but its magnitude (speed) may remain constant.

14. Answer (2)

Hint : Oblique projectile motion.

Sol. :



$\tan(\theta) = \frac{h}{d}$

$y = x\tan\theta - \frac{gx^2}{2u^2}(1 + \tan^2(\theta))$

$y = x\left(\frac{h}{d}\right) - \frac{gx^2}{2v_0^2}\left(1 + \frac{h^2}{d^2}\right)$

Putting $x = d$

$y = h - \frac{gd^2}{2v_0^2}\left(1 + \frac{h^2}{d^2}\right)$

$\Delta y = h - y$

$= \frac{gd^2}{2v_0^2}\left(1 + \frac{h^2}{d^2}\right)$

$= \frac{g}{2v_0^2}(d^2 + h^2)$

15. Answer (4)

Hint : Maximum displacement will be when $\frac{dx}{dt} = v = 0$

Sol. : $v = (16 - 4t) = 0$

$t = 4$ s

Displacement $= \int v dt = \int_0^4 (16 - 4t)dt$

$16t - 2t^2\Big|_0^4$

= 64 – 32 = 32 m

16. Answer (1)

Hint : $v_y = \frac{dy}{dt}$, $v_x = \frac{dx}{dt}$

Sol. : $v_x = \frac{dx}{dt} = \frac{d\left(\frac{t^2}{2}\right)}{dt} = t$

$v_y = \frac{dy}{dt} = \frac{d\left(\frac{x^2}{2}\right)}{dt} = x\frac{dx}{dt} = xt$

$\Rightarrow \quad v_y = \frac{t^3}{2}$

At $t = 2$ s

$v_x = 2$ m/s

$$v_y = \frac{2^3}{2} = 4 \text{ m/s}$$

$$v = \sqrt{2^2 + 4^2} = \sqrt{20} = 2\sqrt{5} \text{ m/s}$$

17. Answer (2)

Hint : $\int dv = \int a dt$

Sol. : $\int_0^v dv = \int_0^t a dt$

$$v = \int_0^t (\alpha t + \beta) dt$$

$$v = \frac{\alpha t^2}{2} + \beta t$$

18. Answer (1)

Hint : $\vec{v} = \frac{dx}{dt}\hat{i} + \frac{dy}{dt}\hat{j}$

Sol. : $\vec{v} = k(y\hat{i} + x\hat{j})$

On comparing

$\frac{dx}{dt} = ky$ and $\frac{dy}{dt} = kx$

Now,

$$\frac{dy}{dx} = \frac{x}{y}$$

$\Rightarrow$ $ydy = xdx$

$\Rightarrow$ $\int ydy = \int xdx$

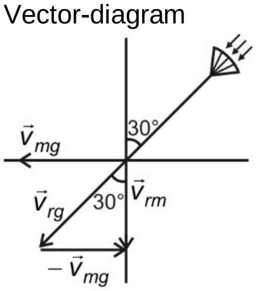
$\Rightarrow$ $\frac{y^2}{2} = \frac{x^2}{2} + C$

$\Rightarrow$ $y^2 = x^2 + \text{constant}$

19. Answer (3)

Hint : Vector-diagram

Sol. :



$$\sin 30° = \frac{|-\vec{v}_{mg}|}{|\vec{v}_{rg}|}$$

$\Rightarrow$ $v_{rg} = 20$ m/s

20. Answer (2)

Hint : $H = \frac{u^2 \sin^2\theta}{2g} + h$

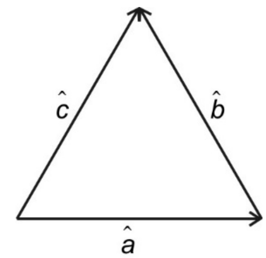
Sol. : $= \frac{100 \times \frac{9}{25}}{2 \times 10} + 20$

$$= \frac{900}{25 \times 20} + 20 = 21.8 \text{ m}$$

21. Answer (2)

Hint : Triangle law of vector addition.

Sol. :



Since all vectors are unit vectors, hence the triangle is equilateral triangle.

22. Answer (2)

Hint : River – swimmer problem and drift.

Sol. : Time of crossing (one way) $= \frac{90}{3} = 30$ s

Time of crossing (two way) = 60 s

Total drift = 5 × 60 = 300 m

23. Answer (2)

Hint and Sol. :

Since at $t = 0$, position of particle is not zero, the particle doesn't start its motion from the origin.

Since, the slope of position-time graph of the particle is constant, the velocity is uniform.

24. Answer (3)

Hint : Galileo odd number.

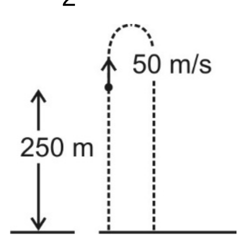
Sol. : Starting from rest, under constant acceleration, ratio of distance covered in equal interval of time is 1 : 3 : 5.

25. Answer (2)

Hint : Motion under gravity.

Sol. : $u = at = 5 \times (10) = 50$ m/s upwards

$$h = \frac{1}{2} \times (5)(10)^2 = 250 \text{ m}$$



Let time taken by ball be T

$$-h = uT - \frac{1}{2}gT^2$$

$$-250 = 50T - 5T^2$$

$$5T^2 - 50T - 250 = 0$$

$$T^2 - 10T - 50 = 0$$

$$T = \frac{10 \pm \sqrt{10^2 + 200}}{2}$$

$$= 5\left(1+\sqrt{3}\right)\text{ s}$$

26. Answer (2)

Hint and Sol. :

$1024.0 = 1.024 \times 10^3$

$\approx 1 \times 10^3$

$\therefore$ Order = 3

27. Answer (2)

Hint : In multiplication, fractional errors are added.

Sol. : $V = 7 \times 6 \times 4 = 168\ \text{m}^3$

$$\frac{\Delta l}{l} = \frac{0.07}{7} = 0.01$$

$$\frac{\Delta b}{b} = \frac{0.06}{6} = 0.01$$

$$\frac{\Delta h}{h} = \frac{0.04}{4} = 0.01$$

$$\frac{\Delta V}{V} = \frac{\Delta l}{l} + \frac{\Delta b}{b} + \frac{\Delta h}{h} = 0.03$$

$\Delta V = 0.03 \times V = 5.04\ \text{m}^3$

As volume has to be three significant figures

So, $V = (168 \pm 5)\text{m}^3$

28. Answer (3)

Hint : Least count of vernier callipers.

Sol. : 6 VSD = 4 MSD

$$1\text{VSD} = \frac{4}{6}\text{ MSD} = \frac{4}{6}\text{ mm}$$

LC = 1MSD – 1VSD

$$= 1\text{ mm} - \frac{4}{6}\text{ mm}$$

$$= \frac{2}{6}\text{ mm} = \frac{1}{3}\text{ mm}$$

29. Answer (3)

Hint : $n_1u_1 = n_2u_2$

Sol. : Dimensions of energy = $[\text{ML}^2\text{T}^{-2}]$

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

$$= 10\left(\frac{1\text{ kg}}{5\text{ kg}}\right)\left(\frac{1\text{ m}}{10\text{ m}}\right)^2\left(\frac{1\text{ s}}{5\text{ s}}\right)^{-2}$$

$$= 10 \times \frac{1}{5} \times \frac{1}{100} \times 5 \times 5$$

$$= \frac{1}{2} = 0.5$$

30. Answer (1)

Hint : Horizontal projection of a projectile.

Sol. : $T = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \times 0.2}{10}} = 0.2\text{ s}$

Now, $0.4 = u \times T = 0.2$

$u = 2$ m/s

31. Answer (3)

Hint : For same range, sum of angles of projection is 90°.

Sol. : $H_1 = \frac{u^2\sin^2(\theta_1)}{2g}$ $\qquad H_2 = \frac{u^2\sin^2\theta_2}{2g}$

Since R is same

$\Rightarrow\ \theta_1 + \theta_2 = 90°$

$$\Rightarrow\ H_1 = \frac{u^2\sin^2\theta_1}{2g},\ \ H_2 = \frac{u^2\cos^2\theta_1}{2g}$$

Multiplying

$$H_1H_2 = \frac{u^4\sin^2\theta_1\cos^2\theta_1}{4g}$$

$$\sqrt{H_1H_2} = \frac{u^2\sin\theta_1\cos\theta_1}{2g}$$

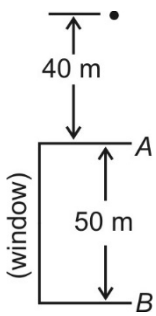
$$\sqrt{H_1H_2} = \frac{u^2\sin(2\theta_1)}{4g}$$

$$\Rightarrow\ R = 4\sqrt{H_1H_2}$$

32. Answer (3)

Hint : Motion under gravity.

Sol. :



Time taken to reach $B = \sqrt{\dfrac{2h}{g}}$

$= \sqrt{\dfrac{2\times 90}{g}}$

Time taken to reach $A = \sqrt{\dfrac{2\times 40}{g}}$

Time from A to $B = \sqrt{\dfrac{2\times 90}{10}} - \sqrt{\dfrac{2\times 40}{10}}$

$= \sqrt{18} - \sqrt{8}$

$= 3\sqrt{2} - 2\sqrt{2}$

$= \sqrt{2}$ s

33. Answer (4)

Hint : Use $a = v\dfrac{dv}{dx}$

Sol. : Given $v(x) = 2x^{-3m}$

$\dfrac{dv(x)}{dx} = 2(-3m)x^{-3m-1} = -6mx^{-3m-1}$

$a(x) = v(x)\dfrac{dv(x)}{dx} = \left(2x^{-3m}\right)\left(-6mx^{-3m-1}\right)$

$a(x) = -12mx^{-6m-1}$

34. Answer (1)

Hint :

For $\vec{A} = a_x\hat{i} + a_y\hat{j} + a_z\hat{k}$ and $\vec{B} = b_x\hat{i} + b_y\hat{j} + b_z\hat{k}$ to be parallel.

$\dfrac{a_x}{b_x} = \dfrac{a_y}{b_y} = \dfrac{a_z}{b_z}$

Sol. : $\dfrac{2}{4} = \dfrac{p}{8} = \dfrac{q}{16}$

$\Rightarrow$ p = 4 and q = 8

35. Answer (4)

Hint and Sol. :

The angle between two consecutive forces is $\dfrac{2\pi}{n}$.

Hence, the forces can be arranged to form a closed figure. Hence resultant should be zero.

36. Answer (3)

Hint : Correct length = MSR + VSR × LC – zero error.

Sol. : Correct length = 7.6 + 0.01 × 4 – (– 0.03)

= 7.6 + 0.04 + 0.03

= 7.67 cm

37. Answer (2)

Hint : Slope of position-time graph is velocity.

Sol. : $v_B = \tan(30°) = \dfrac{1}{\sqrt{3}}$ m/s

$v_A = \tan(53°) = \dfrac{4}{3}$ m/s

$\dfrac{v_A}{v_B} = \dfrac{4}{3}\times\sqrt{3} = \dfrac{4}{\sqrt{3}}$

38. Answer (2)

Hint : $T = \dfrac{2u\sin\theta}{g} = \sqrt{3}$ s

Sol. : $v_y = u_y - gt = 10\sin 60° - 10\times\sqrt{3}$

$= 5\sqrt{3} - 10\sqrt{3}$

$= -5\sqrt{3}$

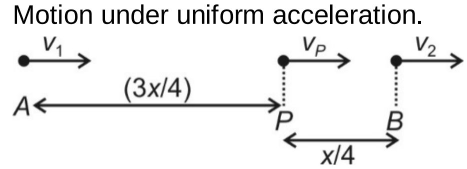
$\Rightarrow$ Body is at the same horizontal level.

So, $R_C = \dfrac{v^2}{g\cos\alpha} = \dfrac{(10)^2}{10\times\cos 60°} = 20$ m

39. Answer (1)

Hint : Motion under uniform acceleration.

Sol. :



Let acceleration be a

$v_2^2 = v_1^2 + 2ax$

$v_P^2 = v_1^2 + 2a\left(\dfrac{3x}{4}\right)$

$= v_1^2 + \dfrac{3}{4}(v_2^2 - v_1^2)$

$= \dfrac{v_1^2 + 3v_2^2}{4}$

$\Rightarrow$ $v_P = \sqrt{\dfrac{v_1^2 + 3v_2^2}{4}}$

40. Answer (2)

Hint : At highest front, only horizontal velocity remains.

Sol. : $u = \sqrt{\frac{2K}{m}}$

For maximum range $\theta = 45°$

At maximum height $v = u\cos\theta = \sqrt{\frac{K}{m}}$

41. Answer (3)

Hint : $v_{av} = \frac{\Delta S}{\Delta t}$

Sol. : $|\Delta \vec{S}| = 2R\sin\left(\frac{\theta}{2}\right)$

$= R\sin 30°$

$= R$

time taken $= \frac{L}{v_0}$

$= \frac{\pi R}{3v_0}$

$v_{av} = \frac{\Delta S}{t} = \frac{R}{\left(\frac{\pi R}{3v_0}\right)}$

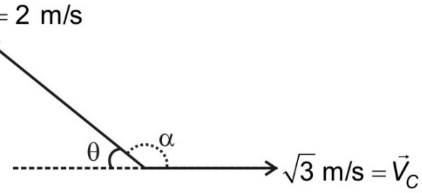
$= \frac{3v_0}{\pi}$

42. Answer (1)

Hint : Relative motion in 2 – D

Sol. : $\vec{V}_{B/G} = \vec{V}_{B/C} + \vec{V}_{C/G}$

$\vec{v}_{BC} = 2$ m/s



$2\cos(\theta) = \sqrt{3}$

$\theta = 30°$

$\Rightarrow \quad \alpha = 150°$

43. Answer (2)

Hint : $\Delta v = 2v\sin\left(\frac{\theta}{2}\right)$

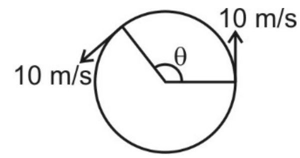
Sol. : $\omega = \frac{v}{r} = \frac{10}{5} = 2$ rad/s

$\theta = \omega t = 2 \times \frac{11}{7} = \frac{22}{7} = \pi$

$\Delta v = 2v_0 \sin\frac{\pi}{2}$

$= 2 \times 10$

$= 20$ m/s

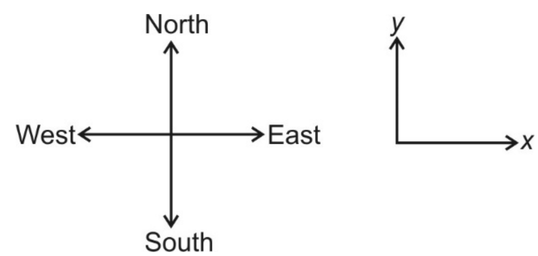


44. Answer (2)

Hint : Magnitude of change in velocity = $|\vec{v}_f - \vec{v}_i|$

Change in magnitude of velocity = $|\vec{v}_f| - |\vec{v}_i|$

Sol. :



$\vec{v}_i = 30\hat{i}$

$\vec{v}_f = 40\hat{j}$

Magnitude of change in velocity = $|40\hat{j} - 30\hat{j}|$

= 50 m/s

Change in magnitude of velocity = 40 – 30

= 10 m/s

Ratio = 5 : 1

45. Answer (4)

Hint : $|\vec{A}| = |\vec{B}|$

Sol. : $\vec{A} + \vec{B} = \vec{R}$

$\vec{A} - \vec{B} = \vec{S}$

$\vec{R}\cdot\vec{S} = (\vec{A}+\vec{B})\cdot(\vec{A}-\vec{B})$

$= \vec{A} - \vec{A}\cdot\vec{B} + \vec{B}\cdot\vec{A} - B^2$

$\vec{R}\cdot\vec{S} = A^2 - B^2 = 0$

$2RS\cos\theta = 0$

$\theta = 90°$

[CHEMISTRY]

46. Answer (3)

Hint : In case of addition, the final result should be reported based on the number carrying minimum number of decimal places to the right

Sol. : 3.26 + 0.023 = 3.28

47. Answer (2)

Hint : 1 P^{3-} ion has 18 electrons.

Sol. : 1 mol P^{3-} ions have 18 N_A electrons

48. Answer (3)

Hint : $1\,dm^3 = 1\,L$

Sol. : $\text{Molarity} = \frac{0.2}{100} = 0.002\text{ M}$

49. Answer (2)

Hint : $2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$

Sol. : $\because$ 2 mol $NaHCO_3$ gives 1 mol $CO_2(g)$

$\therefore$ 0.1 mol $NaHCO_3$ will give 0.05 mol CO_2

= 0.05 × 22.4 L CO_2 at STP

= 1.12 L

50. Answer (4)

Hint : Molecular weight = vapour density × 2

Sol. : Molecular weight of X_2 = 60

Number of mole of X_2 = $\frac{15}{60} = \frac{1}{4}$

Number of atoms $= \frac{1}{4} \times 2 \times N_A = 0.5\ N_A$

51. Answer (4)

Hint : $\text{Number of mole(s)} = \frac{\text{Number of molecules}}{N_A}$

Sol. : $\text{Mole of sugar} = \frac{3.01 \times 10^{23}}{6.02 \times 10^{23}} = 0.5$

$\text{Mole fraction of sugar} = \frac{0.5}{0.5 + 24.5} = 0.02$

52. Answer (3)

Hint : $\text{Molality} = \frac{\text{Moles of solute} \times 1000}{\text{Weight of solvent(g)}}$

Sol. : $\text{Molality} = \frac{0.1 \times 1000}{0.9 \times 18} = \frac{1000}{9 \times 18} = 6.17\text{ m}$

Molality of H^+ = 6.173 × 2 = 12.346 ≃ 12.34 m

Molality of SO_4^{2-} = 6.17 m

53. Answer (3)

Hint : Amount of metal which combines with 8 g of oxygen is known as equivalent mass of metal.

Sol. : $\because$ 16g oxygen combined with 84 g metal

$\therefore$ 8g oxygen combined with $\frac{84 \times 8}{16}$ g metal

So, equivalent mass of mass $= \frac{84 \times 8}{16} = 42$ g

Equivalent weight of metal oxide = 42 + 8 = 50

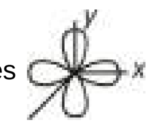
54. Answer (3)

Hint : The angular momentum of electron of hydrogen in n^{th} shell $= \frac{nh}{2\pi}$

Sol. : The angular momentum of electron in 4^{th} shell is $= \frac{4h}{2\pi} = \frac{2h}{\pi}$

55. Answer (2)

Hint : *d*-orbital has double dumb-bell shape.

Sol. : $d_{x^2-y^2}$ has 4 lobes 

56. Answer (2)

Hint : n = 4 ℓ = 3 and m = – 1, represents only one orbital.

Sol. : Any orbital can have maximum two electrons.

57. Answer (1)

Hint : Number of radial nodes = n – ℓ – 1

Sol. : Number of radial nodes in 3*d*-orbital

= 3 – 2 – 1 = 0

58. Answer (2)

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

Sol. : $\because\ \Delta p = 2\Delta x,\ \Rightarrow\ 2\Delta x \cdot \Delta x = \frac{h}{4\pi}$

$(\Delta x)^2 = \frac{h}{8\pi}$

$\Delta x = \frac{1}{2}\sqrt{\frac{h}{2\pi}}$

59. Answer (2)

Hint : Electronic configuration of Na : $1s^2 2s^2 2p^6 3s^1$

Sol. : For $3s^1$: Quantum numbers n = 3, l = 0, m = 0, s = +1/2

60. Answer (4)

Hint : de-Broglie wavelength $(\lambda) = \frac{h}{mv}$

Sol. : $\lambda = \frac{6.63 \times 10^{-34}}{10 \times 10^{-3} \times 10} = 6.63 \times 10^{-33}$ m

61. Answer (2)

Hint : Bohr radius $= 0.529\left(\dfrac{n^2}{Z}\right)$Å

Sol. : $\dfrac{(r_3)_{Li^{2+}}}{(r_1)_{Be^{3+}}} = \dfrac{\dfrac{3^2}{3}}{\dfrac{1^2}{4}} = \dfrac{3}{\dfrac{1}{4}} = 12$

$\dfrac{x}{(r_1)_{Be^{3+}}} = 12 \Rightarrow (r_1)_{Be^{3+}} = \dfrac{x}{12}$Å

62. Answer (2)

Hint : Ytterbium is lanthanide series element.

Sol. : Yb (70) : $[Xe]4f^{14}5d^06s^2$

63. Answer (4)

Hint : $\dfrac{1}{\lambda} = R_H \times Z^2\left(\dfrac{1}{n_1^2} - \dfrac{1}{n_2^2}\right)$

Sol. : For series limit of Paschen series, $n_1 = 3$ and $n_2 = \infty$

$\dfrac{1}{\lambda} = R_H \times Z^2\left(\dfrac{1}{3^2} - \dfrac{1}{\infty^2}\right) = \dfrac{R_H}{9}$

$\Rightarrow \lambda = \dfrac{9}{R_H}$

64. Answer (1)

Hint : $E = \left(\dfrac{hc}{\lambda}\right)N$

Sol. : Energy emitted in 1 second = 40 J

$40 = \left(\dfrac{hc}{\lambda}\right)N \Rightarrow 40 = \dfrac{6.63\times10^{-34}\times3\times10^8}{1200\times10^{-9}}N$

$\Rightarrow N = \dfrac{1200\times40\times10^{-9}}{6.63\times10^{-34}\times3\times10^8} = 2413.3\times10^{17}$

$= 2.4 \times 10^{20}$

65. Answer (3)

Hint : $Cr[24] : 1s^22s^22p^63s^23p^63d^54s^1$

Sol. : Orbitals with 'n + ℓ = 4' are ⇒ 3*p* and 4*s* and total electrons present in these are 7.

66. Answer (1)

Hint. : Angular momentum of orbiting electron in H-atom is quantized $\left(mvr = \dfrac{nh}{2\pi}\right)$

67. Answer (3)

Hint : On moving left to right in period, atomic size decrease due to increase in Z_{eff}.

Sol. :

Element	Li	Be	B	F
Atomic radius (pm)	152	111	88	64

68. Answer (1)

Hint : Chlorine has highest negative electron gain enthalpy.

Sol. : Cl > F > O

Elements	O	F	Cl
$\Delta_{eg}H$ (in kJ/mol)	–141	–328	–349

69. Answer (4)

Hint : Some elements of 2nd period have diagonal relationship with 3rd period.

70. Answer (2)

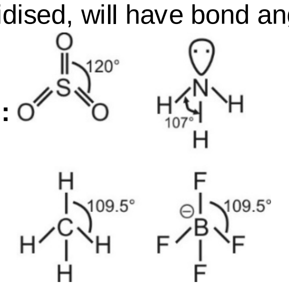
Hint : SO_3 and CO_2 are acidic oxides.

Sol. : NO is neutral oxide while Al_2O_3 is an amphoteric oxide.

71. Answer (3)

Hint : The species in which central atom is sp^2 hybridised, will have bond angle equal to 120°.

Sol. :



72. Answer (1)

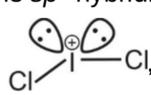
Hint : Generally molecule having highest bond polarity will have highest dipole moment.

73. Answer (2)

Hint : Both O_2^+ and N_2^- have 15 electrons each so they are isoelectronic in nature.

74. Answer (4)

Hint : ICl_2^+ is sp^3 hybridized species.

Sol. : $\overset{+}{I}Cl_2$: 

, Bent shape

75. Answer (1)

Hint : ClO_4^-, SO_3 and NO_3^- have π-bonds.

76. Answer (3)

Hint : $B.O. = \dfrac{1}{2}(N_b - N_a)$

Sol. : Electronic configuration of N_2 :

$\sigma1s^2,\ \sigma^*1s^2,\ \sigma2s^2,\ \sigma^*2s^2,$

$\pi2p_x^2 = \pi2p_y^2,\ \sigma2p_z^2$

Bond order of $N_2 = \dfrac{1}{2}(10-4) = 3$

$= 3$

77. Answer (2)

Hint : CO_2 is a symmetrical molecule.

Sol. : $\mu_{CO_2} = 0\text{ D},\ \mu_{NH_3} = 1.47\text{ D},\ \mu_{NF_3} = 0.23\text{ D}$

78. Answer (4)

Hint : If number of bonding and antibonding electrons are equal then species does not exist.

Sol. : Be_2 has equal bonding and antibonding electrons, so does not exist.

79. Answer (2)

Hint. : Lone pair involves in back bonding not considered in hybridization.

Sol. : $N(SiH_3)_3$ has back bonding.

80. Answer (1)

Hint : Species containing same number of atoms and the same number of electrons are known as isosters.

Sol. : N_2 and CO both are diatomic and have 14 electrons each.

81. Answer (4)

Hint. : Canonical structures involves only delocalization of π-electrons.

82. Answer (2)

Hint : Electron density lobes in d_{xy} orbital lies between x and y axes.

Sol. : $p_x + p_y \rightarrow$ No bond formation

$d_{xy} + d_{xy} \rightarrow$ π-bond formation

$p_x + p_x \rightarrow$ σ-bond formation

$p_x + p_z \rightarrow$ No bond formation

83. Answer (3)

Hint : XeF_4 has sp^3d^2 hybridization.

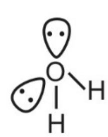
Sol. : sp^3d^2 hybrid orbitals involve s, p_x, p_y, p_z

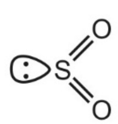
$d_{x^2-y^2}$ and d_z^2 orbitals.

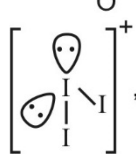
84. Answer (1)

Hint : XeF_2 has linear shape.

Sol. : I_3^- ; $[I-I-I]^-$, linear

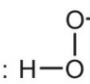
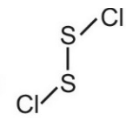
H_2O ;  , Bent

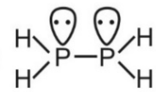
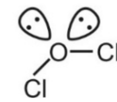
SO_2 ;  , Bent

I_3^+ ;  , Bent

85. Answer (2)

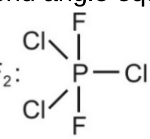
Hint : Bond connecting two atoms of different electronegativity is polar in nature.

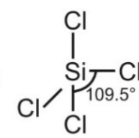
Sol. : H_2O_2 :  , S_2Cl_2 : 

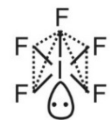
P_2H_4 :  , Cl_2O : 

86. Answer (2)

Hint : Molecule having trigonal bipyramidal shape will have bond angle equal to 90°.

Sol. : PCl_3F_2:  , 90° bond angles = 6

$SiCl_4$:  , 90° bond angle = 0

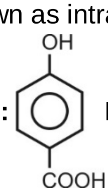
IF_5 :  , 90° bond angle = 0

87. Answer (2)

Hint : C_2 has only π bonds

88. Answer (4)

Hint : H – bonding within the same molecule is known as intramolecular H – bonding.

Sol. :  Involves intermolecular H – bonding.

89. Answer (2)

Hint : With increase in bond order bond length decreases.

Sol. :

Species	O_2^{2+}	O_2^{+}	O_2	O_2^{-}	O_2^{2-}
Bond order	3	2.5	2	1.5	1

90. Answer (2)

Hint : % Ionic character $= \dfrac{\mu_{obs}}{\mu_{theo}} \times 100$

Sol. :

$$\mu_{theo} = q \times d = 4.8 \times 10^{-10}\text{esu} \times 142 \times 10^{-10}\text{ cm}$$

$$= 4.8 \times 1.42 \times 10^{-18}\text{esu cm}$$

$$\%\text{ Ionic character} = \frac{0.78 \times 10^{-18}\text{esu cm}}{4.8 \times 1.42 \times 10^{-18}\text{esu cm}} \times 100$$

$$= \frac{0.78}{4.8 \times 1.42} \times 100 = 11.4\%$$

[BIOLOGY]

91. Answer (2)

Hint : Centromeres are primary constrictions of the chromosomes.

Sol. : The part of chromosomes beyond the secondary constriction is called satellite.

92. Answer (3)

Hint : Membrane bound organelles are not found in prokaryotes.

Sol. : *Mycoplasma* is a prokaryote.

93. Answer (1)

Hint : Cell wall and plastids are absent in animal cells.

Sol. : Microbodies are found in both plant and animal cells.

94. Answer (2)

Sol. : Based on his studies on plant tissue, Theodore Schwann (a British zoologist) concluded that presence of cell wall is unique feature of plant cells.

95. Answer (4)

Hint : Synthesis of rRNA occurs in a spherical structure found in nucleoplasm

Sol. : Nucleolus is a spherical structure found in nucleoplasm.

96. Answer (2)

Hint : Crossing over occurs during meiosis.

Sol. : Meiosis produces gametes and the process of gamete formation is called gametogenesis.

97. Answer (4)

Hint : It is preparatory phase.

Sol. : Cell cycle has two phases *i.e.*, interphase and mitotic phase. Interphase comes between two successive M phases, called preparatory phase.

98. Answer (1)

Hint : Cells in quiescent stage do not appear to exhibit division.

Sol. : The cells that do not divide, exit G_1 phase to enter an inactive stage called quiescent stage (G_0) but, these are metabolically active.

99. Answer (3)

Sol. : Number and types of living organisms is called biodiversity.

100. Answer (2)

Hint : Transport is bidirectional across nuclear pores.

Sol. : Nuclear pores are the passage through which movement of RNA and protein molecules takes place in both directions between the nucleus and cytoplasm.

101. Answer (1)

Hint : Metacentric chromosome has equal arms.

Sol. : Centromere is located in the middle of chromosome in metacentric chromosomes.

102. Answer (2)

Hint : Cell theory does not explain about organelles or cell types.

Sol. : Cell theory as understood today is (i) all living organisms are composed of cells and products of cells (ii) all cells arise from pre-existing cells.

103. Answer (3)

Hint : It is a non-membrane bound cell organelle.

Sol. : Lysosome, ER and food vacuoles all are membrane bound organelles and present only in eukaryotes.

104. Answer (2)

Sol. : Bacillus – rod like, Coccus – spherical, Vibrio – comma shaped, Spirillum – spiral.

105. Answer (1)

Hint : G_1 and G_2 are growth phases and G_0 is quiescent stage.

Sol. : DNA replication occurs during S-phase of cell cycle.

106. Answer (4)

Hint : Chromosomal condensation starts at initial stage of M phase.

Sol. : Chromosomal condensation starts during prophase of cell division and completed by metaphase stage.

107. Answer (1)

Hint : A chromosome can have two chromatids.

Sol. : Metaphasic chromosome is made up of two sister chromatids, which are held together by the centromere.

108. Answer (4)

Hint : All the ranks of classification are taxa including different species as different taxon.

Sol. : All the given *i.e.*, dogs, cats, mammals, wheat, rice, plants and animals are taxa.

109. Answer (2)

Sol. : Mesosome is infoldings of cell membrane in prokaryotes.

110. Answer (2)

Hint : Centrioles are not found in prokaryotes and higher plants.

Sol. : Basal body of bacterial flagellum is a rod-like structure which consists of rings.

111. Answer (3)

Sol. : Ribosomes of a polysome translate the mRNA into proteins.

112. Answer (3)

Hint : Basal body, hook and filament are the part of bacterial flagellum. Central hub with nine peripheral triplets is the structure of centriole.

Sol. : Axoneme is made up of 9 doublets at periphery and 2 microtubules at centre.

113. Answer (2)

Hint : Ribosomes are without any membrane.

Sol. : Ribosomes are made up of rRNAs and proteins.

114. Answer (2)

Hint : Chromosome assembly at equator occurs in metaphase.

Sol. : Splitting of centromere occurs during mitotic anaphase and meiotic anaphase II.

115. Answer (4)

Hint : The gap between meiosis I and meiosis II is interkinesis.

Sol. : During interkinesis DNA replication does not occur.

116. Answer (1)

Hint : Pairing of homologous chromosomes occurs during second stage of prophase I.

Sol. : Homologous chromosomes pair to form bivalent in zygotene stage of meiosis I.

117. Answer (4)

Hint : Order of family Poaceae is Poales.

Sol. : Family Convolvulaceae and Solanaceae are included in order Polymoniales based on the floral characters.

118. Answer (3)

Sol. : Lipid, protein, carbohydrates and cholesterol, all are present in the cell membrane.

119. Answer (2)

Hint : Majority of the chloroplast is found in tissue between upper and lower epidermis of a leaf.

Sol. : 20-40 chloroplasts per cell are present in mesophyll of leaves.

120. Answer (4)

Hint : Active transport is an energy dependent process of cell membrane.

Sol. : Cell wall protects the cells from bursting, functions as barrier to undesirable macromolecules and also protects the cell from infections.

121. Answer (3)

Hint : Carbohydrate and protein synthesis occur outside the thylakoids, grana and stroma lamellae.

Sol. : Stroma contains enzymes for carbohydrate synthesis. It has 70S ribosomes for protein synthesis.

122. Answer (2)

Sol. :

Chromatin	–	Indistinct network of nucleoprotein fibres
Euchromatin	–	Transcriptionally active
Heterochromatin	–	Transcriptionally inactive
Histone	–	Basic protein

123. Answer (1)

Hint : Recombination is the result of crossing over.

Sol. : Recombination is completed by the end of pachytene stage of prophase-I.

124. Answer (4)

Hint : Pollen mother cell is diploid which undergoes G_1 phase, S phase and then G_2 phase.

Sol. : Pollen grain (haploid) = 20 pg

Amount of DNA in pollen mother cell (diploid) in G_1 phase= 40 pg, in S phase = 80 pg and in G_2 phase = 80 pg.

125. Answer (3)

Hint : Cell division will occur for eight times.

Sol. : Number of generations $= \frac{160}{20} = 8$

Number of cells = $2^8 \times 10^3$ per ml.

= 256×10^3 cells/ml

126. Answer (3)

Hint : Account of habitat and distribution of plants in a given area is called flora.

Sol. : Information of any one taxon is called monograph.

127. Answer (2)

Hint : Lysosomal enzymes are active at acidic pH. ER is involved in both protein and lipid synthesis.

128. Answer (3)

Hint : Aleuroplast – protein storage

Amyloplast – starch storage

Sol. : Oils and fats are stored in elaioplasts.

129. Answer (2)

Hint : Mitochondria are the power house of the cell.

Sol. : Mitochondria contains 70S ribosomes, circular DNA along with few RNA molecules.

130. Answer (1)

Hint : Ribosomes, microbodies, lysosomes do not increase in number by fission.

Sol. : Mitochondria divide by fission.

131. Answer (2)

Hint : Hydrolytic digestive enzymes are present in lysosome that digest almost all types of macromolecules present in food.

Sol. : Enzymes of lysosomes can digest proteins, carbohydrates, lipids, and nucleic acids.

132. Answer (3)

Sol. : Chromatin is composed of DNA, basic protein histone, non-histone proteins and RNA.

133. Answer (2)

Sol. :

Leptotene – compaction of choromosomes
Diplotene – chiasmata formation,
Pachytene – use of recombinase enzyme
Diakinesis – terminalisation of chiasmata.

134. Answer (4)

Hint : Meristematic cells are responsible for the growth of plants.

Sol. : Mitotic division occurs in meristematic cells.

135. Answer (1)

Hint : Systematics = Taxonomy + Phylogeny.

Sol. : Systematics takes into account evolutionary relationships between organisms.

136. Answer (3)

Hint : These are required in small quantities.

Sol. : Mineral ions such as Ca^{++}, Mg^{++} and Cl^{-} can be absorbed in original form. Bread and meat are rich sources of carbohydrates and proteins respectively. They need to be hydrolysed into simple absorbable forms. Spinach contains cellulose which can't be digested in human alimentary canal.

137. Answer (2)

Hint : These structures are formed during lipid digestion.

Sol. : Lipids upon digestion in duodenum enter intestinal cells and are reconstituted to form chylomicrons that pass into lacteals.

138. Answer (2)

Hint : These are located in crypts of Lieberkuhn.

Sol. : Lysozyme is secreted by paneth cells. Hormones acting locally are released by Argentaffin cells. Secretions of parietal and peptic cells are HCl and pepsinogen respectively.

139. Answer (4)

Hint : Milk contains fats, carbohydrates and proteins.

Sol. : Nucleic acids are missing in milk hence nucleases have no substrate to act on in milk. Casein, fats and lactose in milk can be acted upon by rennin, lipase and lactase respectively.

140. Answer (1)

Hint : Identify a gastric enzyme.

Sol. : Proteolytic enzyme pepsin works optimally at pH 1.8. Enzymes of succus entericus work effectively under alkaline conditions.

141. Answer (1)

Hint : Establish enzyme, substrate, product relationship.

Sol. : Maltase will act on maltose to yield glucose. Amylopsin/pancreatic amylase and salivary amylase act on starch to produce maltose.

142. Answer (3)

Hint : Cardiac portion of this organ receives food from food pipe.

Sol. : Based on type of attachment, teeth are the codont in humans. Tongue comprises voluntary muscle fibres. Lingual frenulum attaches tongue to floor of buccal cavity.

143. Answer (4)

Hint : Ampulla of Vater.

Sol. : Gastro-oesophageal sphincter regulates the opening of oesophagus into stomach. The opening of stomach into duodenum is guarded by pyloric sphincter. Ileo-caecal valve prevents backflow of undigested food from caecum to ileum.

144. Answer (2)

Hint : It is a part of hind brain.

Sol. : Vomiting is a reflex action controlled by vomit center in medulla oblongata. Hypothalamus controls feeling of satiety and hunger.

145. Answer (2)

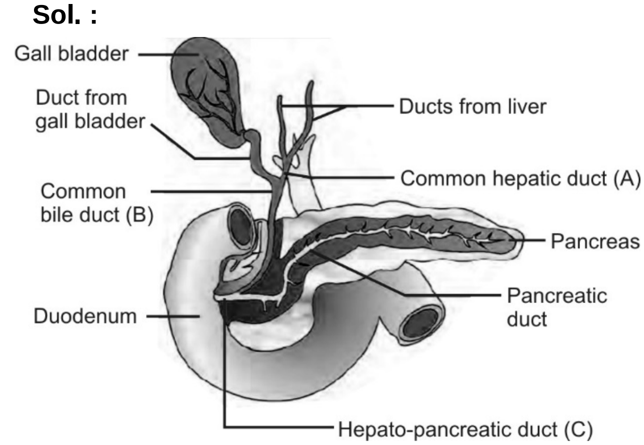
Hint : This white fibrous tissue is associated with mammalian liver.

Sol. : Glisson's capsule invaginates to divide liver into many lobules. Brunner's glands are mucus secreting glands found in submucosal layer. Folding of mucosal layer yields villi and crypts.

146. Answer (4)

Hint : Duct which open into duodenum carries both bile and pancreatic juice.

Sol. :



147. Answer (2)

Hint : This process is facilitated by blood.

Sol. : Deglutition is a term for swallowing while defecation refers to egestion of undigested food. Peristalsis involves contraction and relaxation of muscles that facilitate passage of food in alimentary canal.

148. Answer (1)

Hint : Proton pump inhibitor will increase pH by reducing acid production.

Sol. : Decline in [H^+] levels will affect the pH rendering pepsin ineffective as it requires high [H^+] or low pH to work. Trypsin, sucrase and nuclease work under alkaline conditions.

149. Answer (4)

Hint : It is a constituent of succus entericus.

Sol. : $\underset{\text{(inactive)}}{\text{Trypsinogen}} \xrightarrow[\text{pH = 7.8}]{\text{Enterokinase}} \underset{\text{(active)}}{\text{Trypsin}}$

150. Answer (2)

Hint : This enzyme is also named amylopsin.

Sol. : Salivary amylase and pancreatic amylase yield maltose but not glucose.

$\text{Maltose} \xrightarrow{\text{Maltase}} \text{Glucose} + \text{Glucose}$

$\text{Lactose} \xrightarrow{\text{Lactase}} \text{Glucose} + \text{Galactose}$

$\text{Sucrose} \xrightarrow{\text{Sucrase}} \text{Glucose} + \text{Fructose}$

151. Answer (4)

Hint : It's a long coiled portion.

Sol. : Jejunum absorbs nearly 5500 ml of water each day in man while colon and ileum absorb 1300 ml and 2000 ml of water respectively.

152. Answer (4)

Hint : This is characterised by simultaneous deficiency of proteins and calories.

Sol. : Kwashiorkar is characterised by protein deficiency in a child more than one year in age.

153. Answer (3)

Hint : Oxyntic cells secrete HCl.

Sol. : Damage to these cells will prevent absorption of iron leading to iron deficiency hence anemia will occur. Emulsification of lipids is unaffected. Digestion of proteins and nucleic acids will occur at alkaline pH in small intestine.

154. Answer (1)

Hint : This plot is used to confirm the structure of proteins.

Sol. : A Ramachandran plot, is a way to visualize energetically allowed regions for backbone dihedral angles ψ(psi) against ϕ(phi) of amino acid residues in protein structure.

155. Answer (2)

Hint : It is obtained in acid insoluble fraction upon homogenisation of living tissue.

Sol. : Lecithin is a phospholipid that works as a lung surfactant. It is composed of fatty acids, glycerol and choline which is a nitrogenous base linked to phosphoric acid and further esterified to glycerol.

156. Answer (2)

Hint : Holoenzyme is a conjugated protein composed of both proteinaceous and non-protein parts.

Sol. : Coenzyme or metal ion that is tightly bound to enzyme protein is called prosthetic group.

157. Answer (2)

Hint : Identify a nitrogenous base.

Sol. : Both ribose and deoxyribose are pentose sugars. Guanine is a purine found in both DNA and RNA as is phosphoric acid.

158. Answer (3)

Hint : It is also called table sugar.

Sol. : Reducing sugars have a free aldehyde or keto group. Sucrose lacks both, hence, it is a non-reducing sugar.

159. Answer (3)

Hint : Oxidoreductases are classified under first class by enzyme commission.

Sol. : According to IUB, the first digit of E.C. number represents the enzyme activity and its class. Cytochrome oxidase belongs to the first class thus its E.C. number will likely be 1.9.3.1.

160. Answer (2)

Hint : K_m is the substrate concentration at which enzyme attains half maximal velocity.

Sol. : During competitive inhibition, V_{max} value remains unaffected. K_m value increases as more substrate is required for overcoming the inhibition.

161. Answer (2)

Hint : This bond is found between two sugar molecules.

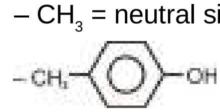
Sol. : Peptide bonds are formed between amino acids alanine and glycine. Glucose units can be linked by glycosidic bonds. Guanine and cytosine on opposite strands interact through hydrogen bonds.

162. Answer (4)

Hint : Presence of additional carboxyl group on the side chain indicates acidic nature.

Sol. : – CH_2OH = alcoholic side chain

– CH_3 = neutral side chain



= phenolic side chain

163. Answer (4)

Hint : This level of organisation is necessary for biological activities of most proteins.

Sol. : Quaternary structure is exhibited by proteins that have more than one polypeptide chain. Active site is formed by folding of protein chain at tertiary level.

164. Answer (1)

Hint : Chargaff's rule.

Sol. : [A] = [T] = 18%

Since, [G] = [C] = 32%

Total purine content [A] + [G] = 50%

165. Answer (2)

Hint : Identify a homopolymer.

Sol. : Insulin is a heteropolymer of amino acids, Glycogen and starch are polymers of glucose.

166. Answer (1)

Hint : Forms cell wall of fungi.

Sol. : It is a structural polymer of NAG.

167. Answer (4)

Hint : Protein that can bind specifically to certain sugars.

Sol. : Concanavalin A is a carbohydrate binding protein that binds specifically to certain sugars. Abrin is a toxin, vinblastin is a drug and morphine is an alkaloid.

168. Answer (3)

Hint. : Starch contains complex helices.

Sol. : After catalysis, ES complex releases free enzyme and product. Cellulose does not contain complex helices.

169. Answer (4)

Hint : Stinging cells are present in animals of this phylum.

Sol. : Cnidarians exhibit tissue level of organisation.

170. Answer (2)

Hint : These cells are tall and have basal nuclei.

Sol. : Cilia facilitate movement of mucus in a specific direction.

171. Answer (4)

Hint : Multiple elongated processes extend from these cells.

Sol. : Schwann cells/neurolemmocytes form myelin sheath around neurons of PNS. Microglial cells are scavengers in neural system.

172. Answer (1)

Hint : Myelin sheath is composed of lipids such as sphingosine.

Sol. : Presence of lipids gives a white appearance to these neurons. Non-myelinated/non-medullated fibres appear grey in colour. Neurilemma is the outermost protective covering formed by Schwann cells.

173. Answer (2)

Hint : Smooth muscle fibres are involuntary.

Sol. : Visceral/smooth muscle fibres are involuntary, non-striated, fusiform and unbranched. Gap junctions are present.

174. Answer (3)

Hint : Cardiac muscle fibres.

Sol. : Cardiac muscle fibres are found in heart. Presence of intercalated discs is their distinguishing feature.

175. Answer (2)

Hint : White fibrous cartilage.

Sol. : Elastic cartilage is present at tip of nose and in epiglottis while hyaline cartilage is present in rings of trachea.

176. Answer (2)

Hint : The suffix 'blast' supports formation.

Sol. : Lamellae refers to arrangement of matrix in a long mammalian bone. Chondroclasts are cartilage dissolving cells. Chondrocytes are mature cells found in a cartilage.

177. Answer (4)

Hint : Cells of this type of fatty tissue are multilocular.

Sol. : Brown adipose tissue is responsible for providing heat to the body of a new born.

178. Answer (3)

Hint : Corresponding cells in blood are called basophils.

Sol. : Mast cells contain granules of heparin, histamine and serotonin.

179. Answer (1)

Hint : Hemidesmosomes connect cells with basement membrane.

Sol. : Anchoring/adhering junctions include macula adherens also called desmosomes that join adjacent cells in tissues. Tight junctions prevent leakage of substances from lumen into blood/ECF.

180. Answer (1)

Hint : Brush bordered epithelium (BBE) increases surface area for absorption.

Sol. : Brush bordered epithelium increases reabsorption in PCT of nephron and absorption in intestine.

❑ ❑ ❑

All India Aakash Test Series for NEET - 2020

TEST - 5 (Code-B)

Test Date : 22/12/2019

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (4)

Hint : $|\vec{A}| = |\vec{B}|$

Sol. : $\vec{A} + \vec{B} = \vec{R}$

$\vec{A} - \vec{B} = \vec{S}$

$\vec{R} \cdot \vec{S} = (\vec{A} + \vec{B}) \cdot (\vec{A} - \vec{B})$

$= \vec{A} - \vec{A} \cdot \vec{B} + \vec{B} \cdot \vec{A} - B^2$

$\vec{R} \cdot \vec{S} = A^2 - B^2 = 0$

$2RS\cos\theta = 0$

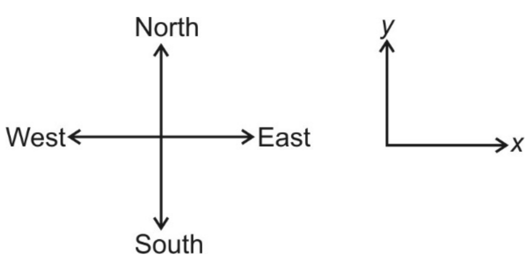
$\theta = 90°$

2. Answer (2)

Hint : Magnitude of change in velocity = $|\vec{v}_f - \vec{v}_i|$

Change in magnitude of velocity = $|\vec{v}_f| - |\vec{v}_i|$

Sol. :



$\vec{v}_i = 30\hat{i}$

$\vec{v}_f = 40\hat{j}$

Magnitude of change in velocity = $|40\hat{j} - 30\hat{j}|$

= 50 m/s

Change in magnitude of velocity = 40 – 30

= 10 m/s

Ratio = 5 : 1

3. Answer (2)

Hint : $\Delta v = 2v \sin\left(\frac{\theta}{2}\right)$

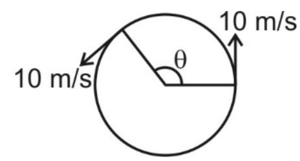
Sol. : $\omega = \frac{v}{r} = \frac{10}{5} = 2 \text{ rad/s}$

$\theta = \omega t = 2 \times \frac{11}{7} = \frac{22}{7} = \pi$

$\Delta v = 2v_0 \sin\frac{\pi}{2}$

= 2 × 10

= 20 m/s

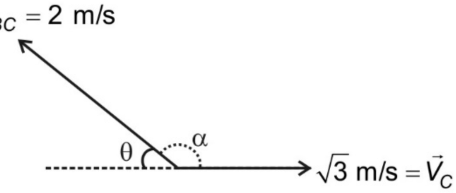


4. Answer (1)

Hint : Relative motion in 2 – D

Sol. : $\vec{V}_{B/G} = \vec{V}_{B/C} + \vec{V}_{C/G}$

$\vec{v}_{BC} = 2 \text{ m/s}$



$2\cos(\theta) = \sqrt{3}$

$\theta = 30°$

$\Rightarrow \alpha = 150°$

5. Answer (3)

Hint : $v_{av} = \frac{\Delta S}{\Delta t}$

Sol. : $|\Delta\vec{S}| = 2R\sin\left(\frac{\theta}{2}\right)$

$= R\sin 30°$

$= R$

time taken $= \frac{L}{v_0}$

$= \frac{\pi R}{3v_0}$

$v_{av} = \frac{\Delta S}{t} = \frac{R}{\left(\frac{\pi R}{3v_0}\right)}$

$= \frac{3v_0}{\pi}$

6. Answer (2)

Hint : At highest front, only horizontal velocity remains.

Sol. : $u=\sqrt{\dfrac{2K}{m}}$

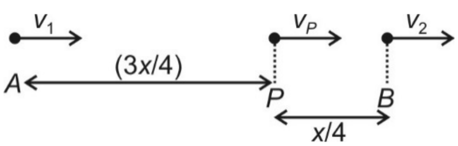
For maximum range $\theta = 45°$

At maximum height $v = u\cos\theta = \sqrt{\dfrac{K}{m}}$

7. Answer (1)

Hint : Motion under uniform acceleration.

Sol. :



Let acceleration be a

$$v_2^2 = v_1^2 + 2ax$$

$$v_P^2 = v_1^2 + 2a\left(\frac{3x}{4}\right)$$

$$= v_1^2 + \frac{3}{4}(v_2^2 - v_1^2)$$

$$= \frac{v_1^2 + 3v_2^2}{4}$$

$$\Rightarrow \quad v_P = \sqrt{\frac{v_1^2 + 3v_2^2}{4}}$$

8. Answer (2)

Hint : $T = \dfrac{2u\sin\theta}{g} = \sqrt{3}$ s

Sol. : $v_y = u_y - gt = 10\sin 60° - 10\times\sqrt{3}$

$$= 5\sqrt{3} - 10\sqrt{3}$$

$$= -5\sqrt{3}$$

$\Rightarrow$ Body is at the same horizontal level.

So, $R_C = \dfrac{v^2}{g\cos\alpha} = \dfrac{(10)^2}{10\times\cos 60°} = 20$ m

9. Answer (2)

Hint : Slope of position-time graph is velocity.

Sol. : $v_B = \tan(30°) = \dfrac{1}{\sqrt{3}}$ m/s

$v_A = \tan(53°) = \dfrac{4}{3}$ m/s

$$\frac{v_A}{v_B} = \frac{4}{3}\times\sqrt{3} = \frac{4}{\sqrt{3}}$$

10. Answer (3)

Hint : Correct length = MSR + VSR × LC – zero error.

Sol. : Correct length = 7.6 + 0.01 × 4 – (– 0.03)

= 7.6 + 0.04 + 0.03

= 7.67 cm

11. Answer (4)

Hint and Sol. :

The angle between two consecutive forces is $\dfrac{2\pi}{n}$.

Hence, the forces can be arranged to form a closed figure. Hence resultant should be zero.

12. Answer (1)

Hint :

For $\vec{A} = a_x\hat{i} + a_y\hat{j} + a_z\hat{k}$ and $\vec{B} = b_x\hat{i} + b_y\hat{j} + b_z\hat{k}$ to be parallel.

$$\frac{a_x}{b_x} = \frac{a_y}{b_y} = \frac{a_z}{b_z}$$

Sol. : $\dfrac{2}{4} = \dfrac{p}{8} = \dfrac{q}{16}$

$\Rightarrow$ $p = 4$ and $q = 8$

13. Answer (4)

Hint : Use $a = v\dfrac{dv}{dx}$

Sol. : Given $v(x) = 2x^{-3m}$

$$\frac{dv(x)}{dx} = 2(-3m)x^{-3m-1} = -6mx^{-3m-1}$$

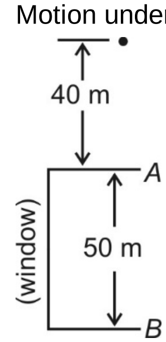
$$a(x) = v(x)\frac{dv(x)}{dx} = \left(2x^{-3m}\right)\left(-6mx^{-3m-1}\right)$$

$$a(x) = -12mx^{-6m-1}$$

14. Answer (3)

Hint : Motion under gravity.

Sol. :



Time taken to reach $B = \sqrt{\dfrac{2h}{g}}$

$$= \sqrt{\frac{2\times 90}{g}}$$

Time taken to reach $A = \sqrt{\frac{2\times 40}{g}}$

Time from A to B $= \sqrt{\frac{2\times 90}{10}} - \sqrt{\frac{2\times 40}{10}}$

$= \sqrt{18} - \sqrt{8}$

$= 3\sqrt{2} - 2\sqrt{2}$

$= \sqrt{2}$ s

15. Answer (3)

Hint : For same range, sum of angles of projection is 90°.

Sol. : $H_1 = \frac{u^2\sin^2(\theta_1)}{2g}$ $\quad H_2 = \frac{u^2\sin^2\theta_2}{2g}$

Since R is same

$\Rightarrow$ $\theta_1 + \theta_2 = 90°$

$\Rightarrow$ $H_1 = \frac{u^2\sin^2\theta_1}{2g}$, $H_2 = \frac{u^2\cos^2\theta_1}{2g}$

Multiplying

$$H_1H_2 = \frac{u^4\sin^2\theta_1\cos^2\theta_1}{4g}$$

$$\sqrt{H_1H_2} = \frac{u^2\sin\theta_1\cos\theta_1}{2g}$$

$$\sqrt{H_1H_2} = \frac{u^2\sin(2\theta_1)}{4g}$$

$\Rightarrow$ $R = 4\sqrt{H_1H_2}$

16. Answer (1)

Hint : Horizontal projection of a projectile.

Sol. : $T = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2\times 0.2}{10}} = 0.2$ s

Now, 0.4 = $u \times T$ = 0.2

u = 2 m/s

17. Answer (3)

Hint : $n_1u_1 = n_2u_2$

Sol. : Dimensions of energy = $[ML^2T^{-2}]$

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

$$= 10\left(\frac{1\text{ kg}}{5\text{ kg}}\right)\left(\frac{1\text{ m}}{10\text{ m}}\right)^2\left(\frac{1\text{ s}}{5\text{ s}}\right)^{-2}$$

$$= 10\times\frac{1}{5}\times\frac{1}{100}\times 5\times 5$$

$$= \frac{1}{2} = 0.5$$

18. Answer (3)

Hint : Least count of vernier callipers.

Sol. : 6 VSD = 4 MSD

1VSD $= \frac{4}{6}$ MSD $= \frac{4}{6}$ mm

LC = 1MSD – 1VSD

$= 1\text{ mm} - \frac{4}{6}\text{ mm}$

$= \frac{2}{6}\text{ mm} = \frac{1}{3}\text{ mm}$

19. Answer (2)

Hint : In multiplication, fractional errors are added.

Sol. : $V = 7 \times 6 \times 4 = 168$ m^3

$$\frac{\Delta l}{l} = \frac{0.07}{7} = 0.01$$

$$\frac{\Delta b}{b} = \frac{0.06}{6} = 0.01$$

$$\frac{\Delta h}{h} = \frac{0.04}{4} = 0.01$$

$$\frac{\Delta V}{V} = \frac{\Delta l}{l} + \frac{\Delta b}{b} + \frac{\Delta h}{h} = 0.03$$

$\Delta V = 0.03 \times V = 5.04$ m^3

As volume has to be three significant figures

So, $V = (168 \pm 5)$m^3

20. Answer (2)

Hint and Sol. :

$1024.0 = 1.024 \times 10^3$

$\approx 1 \times 10^3$

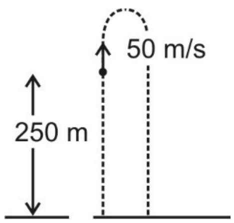
$\therefore$ Order = 3

21. Answer (2)

Hint : Motion under gravity.

Sol. : $u = at = 5 \times (10) = 50$ m/s upwards

$$h = \frac{1}{2} \times (5)(10)^2 = 250 \text{ m}$$



Let time taken by ball be T

$$-h = uT - \frac{1}{2}gT^2$$

$$-250 = 50T - 5T^2$$

$$5T^2 - 50T - 250 = 0$$

$$T^2 - 10T - 50 = 0$$

$$T = \frac{10 \pm \sqrt{10^2 + 200}}{2}$$

$$= 5(1 + \sqrt{3}) \text{ s}$$

22. Answer (3)

Hint : Galileo odd number.

Sol. : Starting from rest, under constant acceleration, ratio of distance covered in equal interval of time is 1 : 3 : 5.

23. Answer (2)

Hint and Sol. :

Since at $t = 0$, position of particle is not zero, the particle doesn't start its motion from the origin.

Since, the slope of position-time graph of the particle is constant, the velocity is uniform.

24. Answer (2)

Hint : River – swimmer problem and drift.

Sol. : Time of crossing (one way) $= \frac{90}{3} = 30$ s

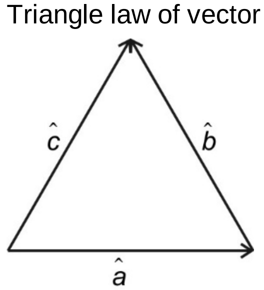
Time of crossing (two way) = 60 s

Total drift = 5 × 60 = 300 m

25. Answer (2)

Hint : Triangle law of vector addition.

Sol. :



Since all vectors are unit vectors, hence the triangle is equilateral triangle.

26. Answer (2)

Hint : $H = \frac{u^2 \sin^2 \theta}{2g} + h$

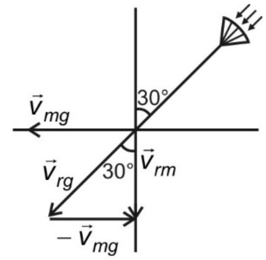
Sol. : $= \frac{100 \times \frac{9}{25}}{2 \times 10} + 20$

$$= \frac{900}{25 \times 20} + 20 = 21.8 \text{ m}$$

27. Answer (3)

Hint : Vector-diagram

Sol. :



$$\sin 30° = \frac{|-\vec{v}_{mg}|}{|\vec{v}_{rg}|}$$

$\Rightarrow$ $v_{rg} = 20$ m/s

28. Answer (1)

Hint : $\vec{v} = \frac{dx}{dt}\hat{i} + \frac{dy}{dt}\hat{j}$

Sol. : $\vec{v} = k(y\hat{i} + x\hat{j})$

On comparing

$\frac{dx}{dt} = ky$ and $\frac{dy}{dt} = kx$

Now,

$$\frac{dy}{dx} = \frac{x}{y}$$

$\Rightarrow$ $ydy = xdx$

$\Rightarrow$ $\int ydy = \int xdx$

$\Rightarrow$ $\frac{y^2}{2} = \frac{x^2}{2} + C$

$\Rightarrow$ $y^2 = x^2$ + constant

29. Answer (2)

Hint : $\int dv = \int adt$

Sol. : $\int_0^v dv = \int_0^t adt$

$$v = \int_0^t (\alpha t + \beta)dt$$

$$v = \frac{\alpha t^2}{2} + \beta t$$

30. Answer (1)

Hint : $v_y = \frac{dy}{dt},\ v_x = \frac{dx}{dt}$

Sol. : $v_x = \frac{dx}{dt} = \frac{d\left(\frac{t^2}{2}\right)}{dt} = t$

$v_y = \frac{dy}{dt} = \frac{d\left(\frac{x^2}{2}\right)}{dt} = x\frac{dx}{dt} = xt$

$\Rightarrow\ v_y = \frac{t^3}{2}$

At t = 2 s

v_x = 2 m/s

$v_y = \frac{2^3}{2} = 4$ m/s

$v = \sqrt{2^2 + 4^2} = \sqrt{20} = 2\sqrt{5}$ m/s

31. Answer (4)

Hint : Maximum displacement will be when $\frac{dx}{dt} = v = 0$

Sol. : $v = (16 - 4t) = 0$

t = 4 s

Displacement $= \int v dt = \int_0^4 (16 - 4t)dt$

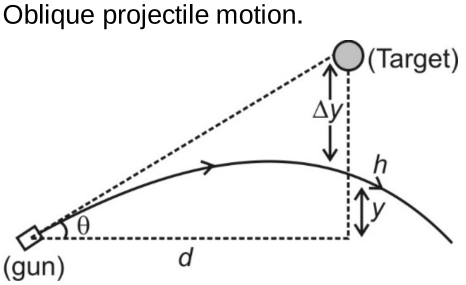
$16t - 2t^2\Big|_0^4$

= 64 – 32 = 32 m

32. Answer (2)

Hint : Oblique projectile motion.

Sol. :



$\tan(\theta) = \frac{h}{d}$

$y = x\tan\theta - \frac{gx^2}{2u^2}(1+\tan^2(\theta))$

$y = x\left(\frac{h}{d}\right) - \frac{gx^2}{2v_0^2}\left(1+\frac{h^2}{d^2}\right)$

Putting $x = d$

$y = h - \frac{gd^2}{2v_0^2}\left(1+\frac{h^2}{d^2}\right)$

$\Delta y = h - y$

$= \frac{gd^2}{2v_0^2}\left(1+\frac{h^2}{d^2}\right)$

$= \frac{g}{2v_0^2}\left(d^2+h^2\right)$

33. Answer (4)

Hint and Sol. :

$\vec{a} = \frac{d\vec{v}}{dt}$

If $\vec{v}$ is constant, then $\frac{d\vec{v}}{dt} = 0$

Also, velocity may vary in direction but its magnitude (speed) may remain constant.

34. Answer (2)

Hint and Sol. :

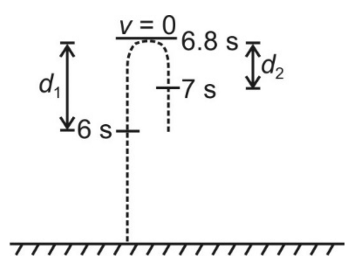
For velocity proportional to time, distance-time graph is a parabola. For a constant velocity, distance-time graph is a straight line.

35. Answer (3)

Hint : Motion under gravity.

Sol. : Ball comes momentarily at rest at

$t = \frac{u}{g} = 6.8$ s



So in seventh second, ball moves 0.8 s upwards and 0.2 s downward.

$d_1 = \frac{1}{2}g(0.8)^2$

$d_2 = \frac{1}{2}g(0.2)^2$

$d_1 + d_2 = \frac{1}{2}g\{(0.8)^2 + (0.2)^2\} = 3.4$ m

36. Answer (3)

Hint : $v = \frac{dx}{dt} = (1 - \text{cost})$

Sol. : $v = \frac{dx}{dt} = (1 - \cos t)$

$|v|$ is maximum when cost is minimun, i.e.(– 1)

$v_{max} = 1 - (-1) = 2$ m/s

$(v)_{t=\frac{\pi}{2}} = 1 - \cos\frac{\pi}{2} = 1$ m/s

So, required ratio = 2 : 1

37. Answer (3)

Hint : The zero(s) on the left of the first non zero digit are in significant.

38. Answer (3)

Hint and Sol. : Random error can be minimised by taking large number of readings.

39. Answer (4)

Hint : Power rule of combination of errors.

Sol. : $z = \frac{p^{\frac{1}{3}}q}{r^{\frac{1}{2}}s^2}$

$\Rightarrow \frac{\Delta z}{z} \times 100 = \left(\frac{1}{3} \times \frac{\Delta p}{p} + \frac{\Delta q}{q} + \frac{1}{2}\frac{\Delta r}{r} + 2\frac{\Delta s}{s}\right)100$

$= \frac{1}{3} \times 3\% + \frac{1}{2}\% + \frac{1}{2} \times 3\% + 2 \times 1\%$

= 5%

40. Answer (4)

Hint : $\vec{v}_{\text{bus, car}} = \vec{v}_{\text{bus}} - \vec{v}_{\text{car}}$

Sol. : $|\vec{v}_{\text{bus}} - \vec{v}_{\text{car}}| = 11$ m/s

$|\vec{v}_{\text{car}} - 20| = 11$

$\Rightarrow \vec{v}_{\text{car}} - 20 = 11$ or $\vec{v}_{\text{car}} - 20 = -11$

$\vec{v}_{\text{car}} = 31$ m/s or $\vec{v}_{\text{car}} = 9$ m/s

41. Answer (2)

Hint : $y = x\tan\theta - \frac{gx^2}{2u^2\cos^2\theta}$

Sol. : $y = \sqrt{3}x - \frac{gx^2}{2}$

$\Rightarrow \sqrt{3} = \tan(\theta)$

$\Rightarrow \theta = 60°$

and, $u^2\cos^2\theta = 1$

$\Rightarrow u\cos\theta = 1$

$\Rightarrow u \times \frac{1}{2} = 1$

$\Rightarrow u = 2$ m/s

42. Answer (4)

Hint : Time of flight $(T) = \sqrt{\frac{2h}{g}},\ x = uT$

Sol. : $T = \sqrt{\frac{2h}{g}} = 6$

$\Rightarrow h = 180$ m

$x = u \times 6 = 6u$

For ΔABC

$\frac{AC}{CB} = \tan 30°$

$\frac{h}{6u} = \frac{1}{\sqrt{3}}$

$\frac{180}{6u} = \frac{1}{\sqrt{3}}$

$\Rightarrow u = 30\sqrt{3}$ m/s

43. Answer (4)

Hint : Use the concept of distance and displacement.

Sol. : Distance = $10 + \pi\left(\frac{5}{\pi}\right) + 15 + \pi\left(\frac{10}{\pi}\right) + 20$

$\Rightarrow$ Distance = 10 + 5 + 15 + 10 + 20 = 60 m

$\text{Displacement} = 10 + 2 \times \frac{5}{\pi} + 15 + 2 \times \frac{10}{\pi} + 20$

$\Rightarrow \text{Displacement} = \frac{600}{11}$ m

Required ratio $= \frac{60}{\frac{600}{11}} = \frac{11}{10}$

44. Answer (1)

Hint : Dimensional formula of gravitational potential energy is same as that of kinetic energy.

Sol. : $[K] = \left[\frac{1}{2}MV^2\right] = [U]$

$[K] = [MV^2T^0]$

45. Answer (1)

Hint and Sol. : James Clerk Maxwell worked for the unification of electricity, magnetism and optics into electromagnetism.

[CHEMISTRY]

46. Answer (2)

Hint : % Ionic character $= \frac{\mu_{obs}}{\mu_{theo}} \times 100$

Sol. :

$$\mu_{theo} = q \times d = 4.8 \times 10^{-10} \text{esu} \times 142 \times 10^{-10} \text{ cm}$$
$$= 4.8 \times 1.42 \times 10^{-18} \text{esu cm}$$
$$\% \text{ Ionic character} = \frac{0.78 \times 10^{-18} \text{esu cm}}{4.8 \times 1.42 \times 10^{-18} \text{esu cm}} \times 100$$
$$= \frac{0.78}{4.8 \times 1.42} \times 100 = 11.4\%$$

47. Answer (2)

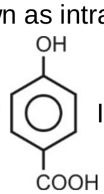
Hint : With increase in bond order bond length decreases.

Sol. :

Species	O_2^{2+}	O_2^{+}	O_2	O_2^{-}	O_2^{2-}
Bond order	3	2.5	2	1.5	1

48. Answer (4)

Hint : H – bonding within the same molecule is known as intramolecular H – bonding.

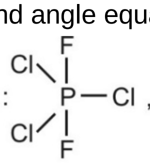
Sol. :  Involves intermolecular H – bonding.

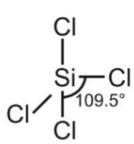
49. Answer (2)

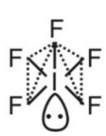
Hint : C_2 has only π bonds

50. Answer (2)

Hint : Molecule having trigonal bipyramidal shape will have bond angle equal to 90°.

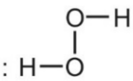
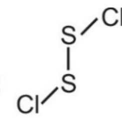
Sol. : PCl_3F_2:  , 90° bond angles = 6

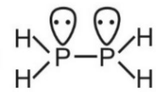
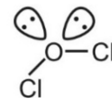
$SiCl_4$:  , 90° bond angle = 0

IF_5 :  , 90° bond angle = 0

51. Answer (2)

Hint : Bond connecting two atoms of different electronegativity is polar in nature.

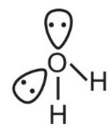
Sol. : H_2O_2 :  , S_2Cl_2: 

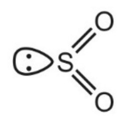
P_2H_4 :  , Cl_2O: 

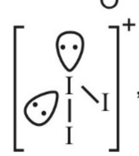
52. Answer (1)

Hint : XeF_2 has linear shape.

Sol. : I_3^- ; $[I - I - I]^-$, linear

H_2O ;  , Bent

SO_2 ;  , Bent

I_3^+ ;  , Bent

53. Answer (3)

Hint : XeF_4 has sp^3d^2 hybridization.

Sol. : sp^3d^2 hybrid orbitals involve s, p_x, p_y, p_z $d_{x^2-y^2}$ and d_z^2 orbitals.

54. Answer (2)

Hint : Electron density lobes in d_{xy} orbital lies between x and y axes.

Sol. : $p_x + p_y \rightarrow$ No bond formation

$d_{xy} + d_{xy} \rightarrow \pi$-bond formation

$p_x + p_x \rightarrow \sigma$-bond formation

$p_x + p_z \rightarrow$ No bond formation

55. Answer (4)

Hint. : Canonical structures involves only delocalization of π-electrons.

56. Answer (1)

Hint : Species containing same number of atoms and the same number of electrons are known as isosters.

Sol. : N_2 and CO both are diatomic and have 14 electrons each.

57. Answer (2)

Hint. : Lone pair involves in back bonding not considered in hybridization.

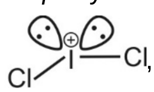
Sol. : $N(SiH_3)_3$ has back bonding.

58. Answer (4)
Hint : If number of bonding and antibonding electrons are equal then species does not exist.
Sol. : Be_2 has equal bonding and antibonding electrons, so does not exist.

59. Answer (2)
Hint : CO_2 is a symmetrical molecule.
Sol. : $\mu_{CO_2} = 0\text{ D},\ \mu_{NH_3} = 1.47\text{ D},\ \mu_{NF_3} = 0.23\text{ D}$

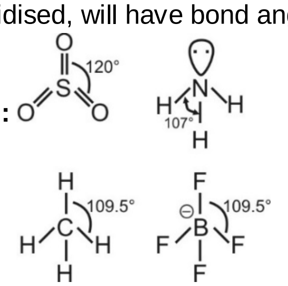
60. Answer (3)
Hint : $B.O. = \frac{1}{2}(N_b - N_a)$
Sol. : Electronic configuration of N_2 :
$$\sigma 1s^2,\ \sigma^* 1s^2,\ \sigma 2s^2,\ \sigma^* 2s^2,$$
$$\pi 2p_x{}^2 = \pi 2p_y{}^2,\ \sigma 2p_z{}^2$$
Bond order of $N_2 = \frac{1}{2}(10 - 4) = 3$
$= 3$

61. Answer (1)
Hint : ClO_4^-, SO_3 and NO_3^- have π-bonds.

62. Answer (4)
Hint : ICl_2^+ is sp^3 hybridized species.
Sol. : $\overset{+}{I}Cl_2$: , Bent shape

63. Answer (2)
Hint : Both O_2^+ and N_2^- have 15 electrons each so they are isoelectronic in nature.

64. Answer (1)
Hint : Generally molecule having highest bond polarity will have highest dipole moment.

65. Answer (3)
Hint : The species in which central atom is sp^2 hybridised, will have bond angle equal to 120°.
Sol. : 

66. Answer (2)
Hint : SO_3 and CO_2 are acidic oxides.
Sol. : NO is neutral oxide while Al_2O_3 is an amphoteric oxide.

67. Answer (4)
Hint : Some elements of 2nd period have diagonal relationship with 3rd period.

68. Answer (1)
Hint : Chlorine has highest negative electron gain enthalpy.
Sol. : Cl > F > O

Elements	O	F	Cl
$\Delta_{eg}H$ (in kJ/mol)	–141	–328	–349

69. Answer (3)
Hint : On moving left to right in period, atomic size decrease due to increase in Z_{eff}.
Sol. :

Element	Li	Be	B	F
Atomic radius (pm)	152	111	88	64

70. Answer (1)
Hint. : Angular momentum of orbiting electron in H-atom is quantized $\left(mvr = \frac{nh}{2\pi}\right)$

71. Answer (3)
Hint : $Cr[24] : 1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$
Sol. : Orbitals with 'n + ℓ = 4' are $\Rightarrow$ 3*p* and 4*s* and total electrons present in these are 7.

72. Answer (1)
Hint : $E = \left(\frac{hc}{\lambda}\right)N$
Sol. : Energy emitted in 1 second = 40 J
$$40 = \left(\frac{hc}{\lambda}\right)N \Rightarrow 40 = \frac{6.63 \times 10^{-34} \times 3 \times 10^8}{1200 \times 10^{-9}}N$$
$$\Rightarrow N = \frac{1200 \times 40 \times 10^{-9}}{6.63 \times 10^{-34} \times 3 \times 10^8} = 2413.3 \times 10^{17}$$
$= 2.4 \times 10^{20}$

73. Answer (4)
Hint : $\frac{1}{\lambda} = R_H \times Z^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$
Sol. : For series limit of Paschen series, n_1 = 3 and $n_2 = \infty$
$$\frac{1}{\lambda} = R_H \times Z^2\left(\frac{1}{3^2} - \frac{1}{\infty^2}\right) = \frac{R_H}{9}$$
$$\Rightarrow \lambda = \frac{9}{R_H}$$

74. Answer (2)
Hint : Ytterbium is lanthanide series element.
Sol. : Yb (70) : $[Xe]4f^{14}5d^0 6s^2$

75. Answer (2)
Hint : Bohr radius $= 0.529\left(\frac{n^2}{Z}\right)$Å

Sol. : $\dfrac{(r_3)_{Li^{2+}}}{(r_1)_{Be^{3+}}} = \dfrac{\frac{3^2}{3}}{\frac{1^2}{4}} = \dfrac{3}{\frac{1}{4}} = 12$

$\dfrac{x}{(r_1)_{Be^{3+}}} = 12 \Rightarrow (r_1)_{Be^{3+}} = \dfrac{x}{12}$ Å

76. Answer (4)

Hint : de-Broglie wavelength $(\lambda) = \dfrac{h}{mv}$

Sol. : $\lambda = \dfrac{6.63\times10^{-34}}{10\times10^{-3}\times10} = 6.63\times10^{-33}$ m

77. Answer (2)

Hint : Electronic configuration of Na : $1s^2 2s^2 2p^6 3s^1$

Sol. : For $3s^1$: Quantum numbers n = 3, l = 0, m = 0, s = +1/2

78. Answer (2)

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

Sol. : $\because\ \Delta p = 2\Delta x,\ \Rightarrow\ 2\Delta x \cdot \Delta x = \dfrac{h}{4\pi}$

$(\Delta x)^2 = \dfrac{h}{8\pi}$

$\Delta x = \dfrac{1}{2}\sqrt{\dfrac{h}{2\pi}}$

79. Answer (1)

Hint : Number of radial nodes = n – ℓ – 1

Sol. : Number of radial nodes in 3*d*-orbital
= 3 – 2 – 1 = 0

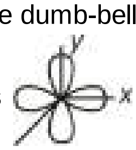
80. Answer (2)

Hint : n = 4 ℓ = 3 and m = – 1, represents only one orbital.

Sol. : Any orbital can have maximum two electrons.

81. Answer (2)

Hint : *d*-orbital has double dumb-bell shape.

Sol. : $d_{x^2-y^2}$ has 4 lobes 

82. Answer (3)

Hint : The angular momentum of electron of hydrogen in n^th shell $= \dfrac{nh}{2\pi}$

Sol. : The angular momentum of electron in 4^th shell is $= \dfrac{4h}{2\pi} = \dfrac{2h}{\pi}$

83. Answer (3)

Hint : Amount of metal which combines with 8 g of oxygen is known as equivalent mass of metal.

Sol. : $\because$ 16g oxygen combined with 84 g metal

$\therefore$ 8g oxygen combined with $\dfrac{84\times8}{16}$ g metal

So, equivalent mass of mass $= \dfrac{84\times8}{16} = 42$ g

Equivalent weight of metal oxide = 42 + 8 = 50

84. Answer (3)

Hint : Molality $= \dfrac{\text{Moles of solute}\times1000}{\text{Weight of solvent(g)}}$

Sol. : Molality $= \dfrac{0.1\times1000}{0.9\times18} = \dfrac{1000}{9\times18} = 6.17$ m

Molality of H^+ = 6.173 × 2 = 12.346 ≃ 12.34 m

Molality of SO_4^{2-} = 6.17 m

85. Answer (4)

Hint : Number of mole(s) $= \dfrac{\text{Number of molecules}}{N_A}$

Sol. : Mole of sugar $= \dfrac{3.01\times10^{23}}{6.02\times10^{23}} = 0.5$

Mole fraction of sugar $= \dfrac{0.5}{0.5+24.5} = 0.02$

86. Answer (4)

Hint : Molecular weight = vapour density × 2

Sol. : Molecular weight of X_2 = 60

Number of mole of X_2 = $\dfrac{15}{60} = \dfrac{1}{4}$

Number of atoms $= \dfrac{1}{4}\times2\times N_A = 0.5\ N_A$

87. Answer (2)

Hint : $2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$

Sol. : $\because$ 2 mol $NaHCO_3$ gives 1 mol CO_2(g)

$\therefore$ 0.1 mol $NaHCO_3$ will give 0.05 mol CO_2
= 0.05 × 22.4 L CO_2 at STP
= 1.12 L

88. Answer (3)

Hint : $1\text{dm}^3 = 1\text{L}$

Sol. : Molarity $= \dfrac{0.2}{100} = 0.002$ M

89. Answer (2)

Hint : 1 P^{3-} ion has 18 electrons.

Sol. : 1 mol P^{3-} ions have 18 N_A electrons

90. Answer (3)

Hint : In case of addition, the final result should be reported based on the number carrying minimum number of decimal places to the right

Sol. : 3.26 + 0.023 = 3.28

[BIOLOGY]

91. Answer (1)

Hint : Systematics = Taxonomy + Phylogeny.

Sol. : Systematics takes into account evolutionary relationships between organisms.

92. Answer (4)

Hint : Meristematic cells are responsible for the growth of plants.

Sol. : Mitotic division occurs in meristematic cells.

93. Answer (2)

Sol. :

Leptotene – compaction of choromosomes

Diplotene – chiasmata formation,

Pachytene – use of recombinase enzyme

Diakinesis – terminalisation of chiasmata.

94. Answer (3)

Sol. : Chromatin is composed of DNA, basic protein histone, non-histone proteins and RNA.

95. Answer (2)

Hint : Hydrolytic digestive enzymes are present in lysosome that digest almost all types of macromolecules present in food.

Sol. : Enzymes of lysosomes can digest proteins, carbohydrates, lipids, and nucleic acids.

96. Answer (1)

Hint : Ribosomes, microbodies, lysosomes do not increase in number by fission.

Sol. : Mitochondria divide by fission.

97. Answer (2)

Hint : Mitochondria are the power house of the cell.

Sol. : Mitochondria contains 70S ribosomes, circular DNA along with few RNA molecules.

98. Answer (3)

Hint : Aleuroplast – protein storage

Amyloplast – starch storage

Sol. : Oils and fats are stored in elaioplasts.

99. Answer (2)

Hint : Lysosomal enzymes are active at acidic pH. ER is involved in both protein and lipid synthesis.

100. Answer (3)

Hint : Account of habitat and distribution of plants in a given area is called flora.

Sol. : Information of any one taxon is called monograph.

101. Answer (3)

Hint : Cell division will occur for eight times.

Sol. : Number of generations $= \frac{160}{20} = 8$

Number of cells = $2^8 \times 10^3$ per ml.

$= 256 \times 10^3$ cells/ml

102. Answer (4)

Hint : Pollen mother cell is diploid which undergoes G_1 phase, S phase and then G_2 phase.

Sol. : Pollen grain (haploid) = 20 pg

Amount of DNA in pollen mother cell (diploid) in G_1 phase= 40 pg, in S phase = 80 pg and in G_2 phase = 80 pg.

103. Answer (1)

Hint : Recombination is the result of crossing over.

Sol. : Recombination is completed by the end of pachytene stage of prophase-I.

104. Answer (2)

Sol. :

Chromatin	–	Indistinct network of nucleoprotein fibres
Euchromatin	–	Transcriptionally active
Heterochromatin	–	Transcriptionally inactive
Histone	–	Basic protein

105. Answer (3)

Hint : Carbohydrate and protein synthesis occur outside the thylakoids, grana and stroma lamellae.

Sol. : Stroma contains enzymes for carbohydrate synthesis. It has 70S ribosomes for protein synthesis.

106. Answer (4)

Hint : Active transport is an energy dependent process of cell membrane.

Sol. : Cell wall protects the cells from bursting, functions as barrier to undesirable macromolecules and also protects the cell from infections.

107. Answer (2)

Hint : Majority of the chloroplast is found in tissue between upper and lower epidermis of a leaf.

Sol. : 20-40 chloroplasts per cell are present in mesophyll of leaves.

108. Answer (3)

Sol. : Lipid, protein, carbohydrates and cholesterol, all are present in the cell membrane.

109. Answer (4)

Hint : Order of family Poaceae is Poales.

Sol. : Family Convolvulaceae and Solanaceae are included in order Polymoniales based on the floral characters.

110. Answer (1)

Hint : Pairing of homologous chromosomes occurs during second stage of prophase I.

Sol. : Homologous chromosomes pair to form bivalent in zygotene stage of meiosis I.

111. Answer (4)

Hint : The gap between meiosis I and meiosis II is interkinesis.

Sol. : During interkinesis DNA replication does not occur.

112. Answer (2)

Hint : Chromosome assembly at equator occurs in metaphase.

Sol. : Splitting of centromere occurs during mitotic anaphase and meiotic anaphase II.

113. Answer (2)

Hint : Ribosomes are without any membrane.

Sol. : Ribosomes are made up of rRNAs and proteins.

114. Answer (3)

Hint : Basal body, hook and filament are the part of bacterial flagellum. Central hub with nine peripheral triplets is the structure of centriole.

Sol. : Axoneme is made up of 9 doublets at periphery and 2 microtubules at centre.

115. Answer (3)

Sol. : Ribosomes of a polysome translate the mRNA into proteins.

116. Answer (2)

Hint : Centrioles are not found in prokaryotes and higher plants.

Sol. : Basal body of bacterial flagellum is a rod-like structure which consists of rings.

117. Answer (2)

Sol. : Mesosome is infoldings of cell membrane in prokaryotes.

118. Answer (4)

Hint : All the ranks of classification are taxa including different species as different taxon.

Sol. : All the given *i.e.*, dogs, cats, mammals, wheat, rice, plants and animals are taxa.

119. Answer (1)

Hint : A chromosome can have two chromatids.

Sol. : Metaphasic chromosome is made up of two sister chromatids, which are held together by the centromere.

120. Answer (4)

Hint : Chromosomal condensation starts at initial stage of M phase.

Sol. : Chromosomal condensation starts during prophase of cell division and completed by metaphase stage.

121. Answer (1)

Hint : G_1 and G_2 are growth phases and G_0 is quiescent stage.

Sol. : DNA replication occurs during S-phase of cell cycle.

122. Answer (2)

Sol. : Bacillus – rod like, Coccus – spherical, Vibrio – comma shaped, Spirillum – spiral.

123. Answer (3)

Hint : It is a non-membrane bound cell organelle.

Sol. : Lysosome, ER and food vacuoles all are membrane bound organelles and present only in eukaryotes.

124. Answer (2)

Hint : Cell theory does not explain about organelles or cell types.

Sol. : Cell theory as understood today is (i) all living organisms are composed of cells and products of cells (ii) all cells arise from pre-existing cells.

125. Answer (1)

Hint : Metacentric chromosome has equal arms.

Sol. : Centromere is located in the middle of chromosome in metacentric chromosomes.

126. Answer (2)

Hint : Transport is bidirectional across nuclear pores.

Sol. : Nuclear pores are the passage through which movement of RNA and protein molecules takes place in both directions between the nucleus and cytoplasm.

127. Answer (3)

Sol. : Number and types of living organisms is called biodiversity.

128. Answer (1)

Hint : Cells in quiescent stage do not appear to exhibit division.

Sol. : The cells that do not divide, exit G_1 phase to enter an inactive stage called quiescent stage (G_0) but, these are metabolically active.

129. Answer (4)

Hint : It is preparatory phase.

Sol. : Cell cycle has two phases *i.e.*, interphase and mitotic phase. Interphase comes between two successive M phases, called preparatory phase.

130. Answer (2)

Hint : Crossing over occurs during meiosis.

Sol. : Meiosis produces gametes and the process of gamete formation is called gametogenesis.

131. Answer (4)

Hint : Synthesis of rRNA occurs in a spherical structure found in nucleoplasm

Sol. : Nucleolus is a spherical structure found in nucleoplasm.

132. Answer (2)

Sol. : Based on his studies on plant tissue, Theodore Schwann (a British zoologist) concluded that presence of cell wall is unique feature of plant cells.

133. Answer (1)

Hint : Cell wall and plastids are absent in animal cells.

Sol. : Microbodies are found in both plant and animal cells.

134. Answer (3)

Hint : Membrane bound organelles are not found in prokaryotes.

Sol. : *Mycoplasma* is a prokaryote.

135. Answer (2)

Hint : Centromeres are primary constrictions of the chromosomes.

Sol. : The part of chromosomes beyond the secondary constriction is called satellite.

136. Answer (1)

Hint : Brush bordered epithelium (BBE) increases surface area for absorption.

Sol. : Brush bordered epithelium increases reabsorption in PCT of nephron and absorption in intestine.

137. Answer (1)

Hint : Hemidesmosomes connect cells with basement membrane.

Sol. : Anchoring/adhering junctions include macula adherens also called desmosomes that join adjacent cells in tissues. Tight junctions prevent leakage of substances from lumen into blood/ECF.

138. Answer (3)

Hint : Corresponding cells in blood are called basophils.

Sol. : Mast cells contain granules of heparin, histamine and serotonin.

139. Answer (4)

Hint : Cells of this type of fatty tissue are multilocular.

Sol. : Brown adipose tissue is responsible for providing heat to the body of a new born.

140. Answer (2)

Hint : The suffix 'blast' supports formation.

Sol. : Lamellae refers to arrangement of matrix in a long mammalian bone. Chondroclasts are cartilage dissolving cells. Chondrocytes are mature cells found in a cartilage.

141. Answer (2)

Hint : White fibrous cartilage.

Sol. : Elastic cartilage is present at tip of nose and in epiglottis while hyaline cartilage is present in rings of trachea.

142. Answer (3)

Hint : Cardiac muscle fibres.

Sol. : Cardiac muscle fibres are found in heart. Presence of intercalated discs is their distinguishing feature.

143. Answer (2)

Hint : Smooth muscle fibres are involuntary.

Sol. : Visceral/smooth muscle fibres are involuntary, non-striated, fusiform and unbranched. Gap junctions are present.

144. Answer (1)

Hint : Myelin sheath is composed of lipids such as sphingosine.

Sol. : Presence of lipids gives a white appearance to these neurons. Non-myelinated/non-medullated fibres appear grey in colour. Neurilemma is the outermost protective covering formed by Schwann cells.

145. Answer (4)

Hint : Multiple elongated processes extend from these cells.

Sol. : Schwann cells/neurolemmocytes form myelin sheath around neurons of PNS. Microglial cells are scavengers in neural system.

146. Answer (2)

Hint : These cells are tall and have basal nuclei.

Sol. : Cilia facilitate movement of mucus in a specific direction.

147. Answer (4)

Hint : Stinging cells are present in animals of this phylum.

Sol. : Cnidarians exhibit tissue level of organisation.

148. Answer (3)

Hint. : Starch contains complex helices.

Sol. : After catalysis, ES complex releases free enzyme and product. Cellulose does not contain complex helices.

149. Answer (4)

Hint : Protein that can bind specifically to certain sugars.

Sol. : Concanavalin A is a carbohydrate binding protein that binds specifically to certain sugars. Abrin is a toxin, vinblastin is a drug and morphine is an alkaloid.

150. Answer (1)

Hint : Forms cell wall of fungi.

Sol. : It is a structural polymer of NAG.

151. Answer (2)

Hint : Identify a homopolymer.

Sol. : Insulin is a heteropolymer of amino acids, Glycogen and starch are polymers of glucose.

152. Answer (1)

Hint : Chargaff's rule.

Sol. : [A] = [T] = 18%

Since, [G] = [C] = 32%

Total purine content [A] + [G] = 50%

153. Answer (4)

Hint : This level of organisation is necessary for biological activities of most proteins.

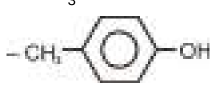
Sol. : Quaternary structure is exhibited by proteins that have more than one polypeptide chain. Active site is formed by folding of protein chain at tertiary level.

154. Answer (4)

Hint : Presence of additional carboxyl group on the side chain indicates acidic nature.

Sol. : $-CH_2OH$ = alcoholic side chain

$-CH_3$ = neutral side chain


= phenolic side chain

155. Answer (2)

Hint : This bond is found between two sugar molecules.

Sol. : Peptide bonds are formed between amino acids alanine and glycine. Glucose units can be linked by glycosidic bonds. Guanine and cytosine on opposite strands interact through hydrogen bonds.

156. Answer (2)

Hint : K_m is the substrate concentration at which enzyme attains half maximal velocity.

Sol. : During competitive inhibition, V_{max} value remains unaffected. K_m value increases as more substrate is required for overcoming the inhibition.

157. Answer (3)

Hint : Oxidoreductases are classified under first class by enzyme commission.

Sol. : According to IUB, the first digit of E.C. number represents the enzyme activity and its class. Cytochrome oxidase belongs to the first class thus its E.C. number will likely be 1.9.3.1.

158. Answer (3)

Hint : It is also called table sugar.

Sol. : Reducing sugars have a free aldehyde or keto group. Sucrose lacks both, hence, it is a non-reducing sugar.

159. Answer (2)

Hint : Identify a nitrogenous base.

Sol. : Both ribose and deoxyribose are pentose sugars. Guanine is a purine found in both DNA and RNA as is phosphoric acid.

160. Answer (2)

Hint : Holoenzyme is a conjugated protein composed of both proteinaceous and non-protein parts.

Sol. : Coenzyme or metal ion that is tightly bound to enzyme protein is called prosthetic group.

161. Answer (2)

Hint : It is obtained in acid insoluble fraction upon homogenisation of living tissue.

Sol. : Lecithin is a phospholipid that works as a lung surfactant. It is composed of fatty acids, glycerol and choline which is a nitrogenous base linked to phosphoric acid and further esterified to glycerol.

162. Answer (1)

Hint : This plot is used to confirm the structure of proteins.

Sol. : A Ramachandran plot, is a way to visualize energetically allowed regions for backbone dihedral angles ψ(psi) against ϕ(phi) of amino acid residues in protein structure.

163. Answer (3)

Hint : Oxyntic cells secrete HCl.

Sol. : Damage to these cells will prevent absorption of iron leading to iron deficiency hence anemia will occur. Emulsification of lipids is unaffected. Digestion of proteins and nucleic acids will occur at alkaline pH in small intestine.

164. Answer (4)

Hint : This is characterised by simultaneous deficiency of proteins and calories.

Sol. : Kwashiorkor is characterised by protein deficiency in a child more than one year in age.

165. Answer (4)

Hint : It's a long coiled portion.

Sol. : Jejunum absorbs nearly 5500 ml of water each day in man while colon and ileum absorb 1300 ml and 2000 ml of water respectively.

166. Answer (2)

Hint : This enzyme is also named amylopsin.

Sol. : Salivary amylase and pancreatic amylase yield maltose but not glucose.

$$\text{Maltose} \xrightarrow{\text{Maltase}} \text{Glucose} + \text{Glucose}$$

$$\text{Lactose} \xrightarrow{\text{Lactase}} \text{Glucose} + \text{Galactose}$$

$$\text{Sucrose} \xrightarrow{\text{Sucrase}} \text{Glucose} + \text{Fructose}$$

167. Answer (4)

Hint : It is a constituent of succus entericus.

Sol. : $\underset{\text{(inactive)}}{\text{Trypsinogen}} \xrightarrow[\text{pH = 7.8}]{\text{Enterokinase}} \underset{\text{(active)}}{\text{Trypsin}}$

168. Answer (1)

Hint : Proton pump inhibitor will increase pH by reducing acid production.

Sol. : Decline in [H^+] levels will affect the pH rendering pepsin ineffective as it requires high [H^+] or low pH to work. Trypsin, sucrase and nuclease work under alkaline conditions.

169. Answer (2)

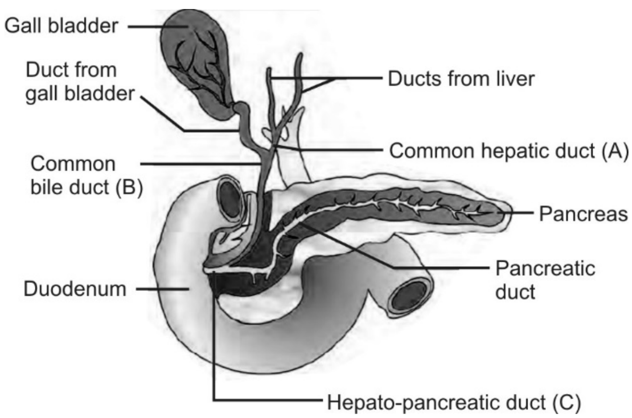
Hint : This process is facilitated by blood.

Sol. : Deglutition is a term for swallowing while defecation refers to egestion of undigested food. Peristalsis involves contraction and relaxation of muscles that facilitate passage of food in alimentary canal.

170. Answer (4)

Hint : Duct which open into duodenum carries both bile and pancreatic juice.

Sol. :



171. Answer (2)

Hint : This white fibrous tissue is associated with mammalian liver.

Sol. : Glisson's capsule invaginates to divide liver into many lobules. Brunner's glands are mucus secreting glands found in submucosal layer. Folding of mucosal layer yields villi and crypts.

172. Answer (2)

Hint : It is a part of hind brain.

Sol. : Vomiting is a reflex action controlled by vomit center in medulla oblongata. Hypothalamus controls feeling of satiety and hunger.

173. Answer (4)

Hint : Ampulla of Vater.

Sol. : Gastro-oesophageal sphincter regulates the opening of oesophagus into stomach. The opening of stomach into duodenum is guarded by pyloric sphincter. Ileo-caecal valve prevents backflow of undigested food from caecum to ileum.

174. Answer (3)

Hint : Cardiac portion of this organ receives food from food pipe.

Sol. : Based on type of attachment, teeth are the codont in humans. Tongue comprises voluntary muscle fibres. Lingual frenulum attaches tongue to floor of buccal cavity.

175. Answer (1)

Hint : Establish enzyme, substrate, product relationship.

Sol. : Maltase will act on maltose to yield glucose. Amylopsin/pancreatic amylase and salivary amylase act on starch to produce maltose.

176. Answer (1)

Hint : Identify a gastric enzyme.

Sol. : Proteolytic enzyme pepsin works optimally at pH 1.8. Enzymes of succus entericus work effectively under alkaline conditions.

177. Answer (4)

Hint : Milk contains fats, carbohydrates and proteins.

Sol. : Nucleic acids are missing in milk hence nucleases have no substrate to act on in milk. Casein, fats and lactose in milk can be acted upon by rennin, lipase and lactase respectively.

178. Answer (2)

Hint : These are located in crypts of Lieberkuhn.

Sol. : Lysozyme is secreted by paneth cells. Hormones acting locally are released by Argentaffin cells. Secretions of parietal and peptic cells are HCl and pepsinogen respectively.

179. Answer (2)

Hint : These structures are formed during lipid digestion.

Sol. : Lipids upon digestion in duodenum enter intestinal cells and are reconstituted to form chylomicrons that pass into lacteals.

180. Answer (3)

Hint : These are required in small quantities.

Sol. : Mineral ions such as Ca^{++}, Mg^{++} and Cl^- can be absorbed in original form. Bread and meat are rich sources of carbohydrates and proteins respectively. They need to be hydrolysed into simple absorbable forms. Spinach contains cellulose which can't be digested in human alimentary canal.

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