25/06/2025

Code-A Phase-1

Aakash
Medical | IIT-JEE | Foundations

Corporate Office : AESL, 3rd Floor, Incuspaze Campus-2, Plot No. 13, Sector-18,
Udyog Vihar, Gurugram, Haryana - 122015, ***Ph.***+91-1244168300

MM : 720

Fortnightly Test for NEET-2026_RM(P1)_FT-02A

Time : 180 Min.

PHYSICS

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

CHEMISTRY

46. (4)
69. (2)

47. (2)
48. (1)
49. (1)
50. (3)
51. (1)
52. (2)
53. (3)
54. (4)
55. (3)
56. (3)
57. (4)
58. (2)
59. (3)
60. (4)
61. (4)
62. (4)
63. (1)
64. (2)
65. (3)
66. (4)
67. (2)
68. (3)
70. (2)
71. (3)
72. (3)
73. (1)
74. (4)
75. (3)
76. (2)
77. (1)
78. (2)
79. (4)
80. (3)
81. (4)
82. (4)
83. (1)
84. (4)
85. (3)
86. (3)
87. (3)
88. (4)
89. (3)
90. (2)

BOTANY

91. (3)
92. (3)
93. (2)
94. (1)
95. (3)
96. (3)
97. (2)
98. (1)
99. (2)
100. (1)
101. (1)
114. (2)
115. (2)
116. (4)
117. (3)
118. (3)
119. (4)
120. (2)
121. (3)
122. (4)
123. (3)
124. (4)

102. (2)
103. (4)
104. (3)
105. (2)
106. (4)
107. (2)
108. (3)
109. (4)
110. (2)
111. (1)
112. (3)
113. (3)
125. (1)
126. (2)
127. (3)
128. (1)
129. (3)
130. (2)
131. (4)
132. (2)
133. (2)
134. (4)
135. (2)

ZOOLOGY

136. (1)
137. (2)
138. (3)
139. (3)
140. (2)
141. (2)
142. (4)
143. (2)
144. (3)
145. (3)
146. (4)
147. (4)
148. (4)
149. (3)
150. (4)
151. (2)
152. (2)
153. (2)
154. (4)
155. (2)
156. (1)
159. (1)
160. (4)
161. (3)
162. (3)
163. (2)
164. (3)
165. (4)
166. (4)
167. (2)
168. (4)
169. (2)
170. (2)
171. (3)
172. (3)
173. (2)
174. (1)
175. (3)
176. (2)
177. (1)
178. (3)
179. (2)

157. (1)

158. (3)

180. (3)

Hints and Solutions

PHYSICS

(1) **Answer :** (2)
Hint:
$\vec{v} = \vec{u} + \vec{a}t$
Solution:
$\vec{v} = \left(4\hat{i} + 2\hat{j}\right) + 10\left(0.4\hat{i} + 0.4\hat{j}\right)$
$\vec{v} = \left(8\hat{i} + 6\hat{j}\right)$ m s^{-1}
$\left|\vec{v}\right| = \sqrt{8^2 + 6^2}$
= 10 m s^{-1}

(2) **Answer :** (4)
Hint:
$a_x = \frac{d^2x}{dt^2},\ a_y = \frac{d^2y}{dt^2}$
Solution:
$v_x = \frac{dx}{dt} = \alpha$
$a_x = \frac{dv_x}{dt} = 0$
Now, $y = \beta t$
$v_y = \frac{dy}{dt} = \beta$
$a_y = \frac{dv_y}{dt} = 0$
$a_y = 0$
Hence, a_{net} = zero

(3) **Answer :** (4)
Hint:
Addition of vectors $\overrightarrow{OA} + \overrightarrow{AB} = \overrightarrow{OB}$
Solution:
$\vec{a} + \vec{c} = \vec{b}$

(4) **Answer :** (2)
Hint:
Sum of time taken to reach at same height is equal to time period.
Solution:
$t_1 + t_2 = T$
$= \frac{2u\sin 30^\circ}{g}$
$= \frac{2\times 20}{10} \times \frac{1}{2}$
= 2 s

(5) **Answer :** (4)
Hint:
In uniform circular motion, speed of particle remains constant.
Solution:
After covering half the circular path, $\vec{v}_f = -\vec{v}_i$
Change in velocity = $\vec{v}_f - \vec{v}_i = -2\vec{v}_i$ = non-zero
Change in magnitude of velocity = $\left|\vec{v}_f\right| - \left|\vec{v}_i\right| =$ zero

(6) **Answer :** (2)
Hint:
Curved path can be a circular path or a projectile.

Solution:

A. $\left|\vec{v}\right|$ = constant in uniform circular motion.

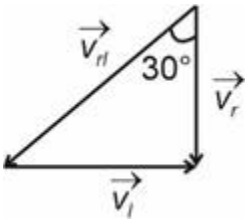
B. $\vec{v}$ is changing because object is moving along a curve.

C. $\vec{a} = \vec{g}$ in projectile motion.

D. $\left|\vec{a}\right| = g = 9.8$ m/s^2 in projectile motion.

(7) **Answer :** (4)
Hint:

Draw appropriate diagram for $\vec{v}_{rl} + \vec{v}_{l} = \vec{v}_{r}$
Solution:



$\vec{v}_r$ = velocity of hailstorm

$\vec{v}_l$ = velocity of lady

$\vec{v}_{rl}$ = velocity of hailstorm w.r.t. lady

$\sin 30^\circ = \frac{v_l}{v_{rl}} \Rightarrow \frac{1}{2} = \frac{24}{v_{rl}} \Rightarrow v_{rl} = 48$ km/hr

(8) **Answer :** (2)
Hint:

$\vec{v} = \frac{d\vec{r}}{dt}$
Solution:
Initial velocity,

$\vec{v} = \frac{d\vec{r}}{dt} = \left(10t\,\hat{k}\right)$ m/s

At t = 1s

$\therefore \left|\vec{v}\right| = 10$ m/s

(9) **Answer :** (3)
Hint:

Time taken by particle to reach maximum height = $\frac{u_y}{g}$

Solution:

Speed of particle = $\frac{2\pi R}{T}$

Now, it is projected at an angle θ with the horizontal then, $u_y = \frac{2\pi R \sin\theta}{T}$

⇒ Time to reach maximum height = $\frac{2\pi R \sin\theta}{gT}$

(10) **Answer :** (4)
Solution:

$\frac{u^2}{g}\sin(2\theta) = R$

$\frac{10^2}{10}\sin(2\theta) = 10 \Rightarrow \sin(2\theta) = 1$

$20 = 90^\circ \Rightarrow \theta = 45^\circ$

(11) **Answer :** (2)
Solution:

$2\pi r = 44$

$2 \times \frac{22}{7} \times r = 44$ ⇒ r = 7 m

$a_c = \frac{v^2}{r} = \frac{(7)^2}{7} = 7\ \text{m/s}^2$

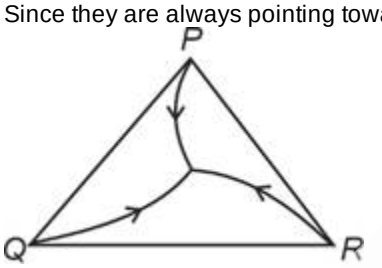
(12) **Answer :** (1)
Solution:

$h = \frac{u^2 \sin^2\theta}{2g} = \frac{u_y^2}{2g} = \frac{4\times4}{2\times10} = 0.8\,\text{m}$

(13) Answer : (2)
Hint:
For minimum time of crossing, alignment of the swimmer will be always perpendicular to river flow.
Solution:
$t_C = \frac{d}{v_{SR}}$
$t_C = \frac{200}{8}$
$\boxed{t_c = 25\,\text{s}}$
Drift = $v_{RG} \times t_c = 4 \times 25 = 100\,\text{m}$

(14) Answer : (2)
Solution:
Equation of trajectory of a projectile:
$y = x\tan\theta - \frac{gx^2}{2u^2\cos^2\theta}$
Given $y = \sqrt{3}x - 5x^2$
On comparing, we get
$\tan\theta = \sqrt{3} \Rightarrow \theta = 60^\circ$ from horizontal.
The angle of projection with vertical is
$\alpha = 90^\circ - \theta \Rightarrow \alpha = 30^\circ$

(15) Answer : (3)
Solution:
Since they are always pointing towards the next, they will meet at centroid of triangle by symmetry.



(16) Answer : (3)
Solution:
$\left|\vec{V}_{AB}\right|_{\text{Horizontal}} = \frac{30}{\sqrt{3}} \times \frac{\sqrt{3}}{2} + 60 \times \frac{1}{2} = 15 + 30 = 45\ \text{m/s}$
$d_{\text{rel}} = V_{\text{rel}} \times t \ \Rightarrow\ x = 45 \times t \ \Rightarrow\ t = \frac{x}{45}$

(17) Answer : (2)
Solution:
$S = \frac{1}{2}at^2 = \frac{1}{2}(3\hat{i} + 4\hat{j})16 = (24\hat{i} + 32\hat{j})\text{m}$

(18) Answer : (1)
Solution:
Relative velocity $\vec{V}_{AB} = \vec{V}_A - \vec{V}_B = \left(3\hat{i} - 4\hat{j}\right) - \left(\hat{i} - \hat{j}\right) = \left(2\hat{i} - 3\hat{j}\right)$ m/s

(19) Answer : (1)
Solution:
$y = ax - \frac{bx^2}{2}$
$y = x\tan\theta\ \left[1 - \frac{x}{R}\right]$
$y = ax\ \left[1 - \frac{bx}{2a}\right]$
So, $\boxed{R = \frac{2a}{b}}$

(20) Answer : (3)
Solution:

At all times, the gravitational force is only acting downwards.

(21) Answer : (2)
Hint:

Use $a_T = v\frac{dv}{ds}$ and $a = \sqrt{a_T^2 + a_R^2}$

Solution:
Given $v = \alpha\sqrt{x}$

$\frac{dv}{dx} = \frac{\alpha}{2\sqrt{x}}$

$a_T = v\frac{dv}{dx} = \alpha\sqrt{x}\frac{\alpha}{2\sqrt{x}} = \frac{\alpha^2}{2}$

$\therefore a = \sqrt{a_T^2 + \left(\frac{v^2}{R}\right)^2}$

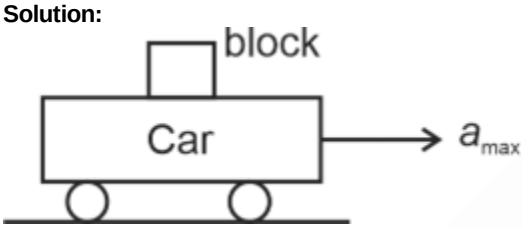
$= \sqrt{\frac{\alpha^4}{4} + \left(\frac{\alpha^2 x}{R}\right)^2}$

$= \sqrt{\frac{\alpha^4}{4} + \alpha^4\frac{x^2}{R^2}}$

$= \frac{\alpha^2}{2}\sqrt{1 + 4\left(\frac{2R^2}{R^2}\right)}$

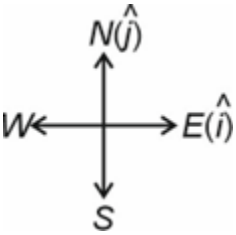
$\Rightarrow a = \frac{3}{2}\alpha^2$

(22) Answer : (2)
Solution:



$\Rightarrow (fs)_{max} = ma_{max}$
$\Rightarrow \mu mg = ma_{max}$
$\Rightarrow a_{max} = \mu g$
$= 0.25 \times 10 = 2.5\ m\ s^{-2}$

(23) Answer : (3)
Solution:



$\Delta\vec{P} = \vec{P}_f - \vec{P}_i$
$= -mu\left(\hat{j}\right) - mu\left(\hat{i}\right)$
$= mu\left(-\hat{j} - \hat{i}\right)$
& $\vec{F} = \frac{\Delta\vec{P}}{\Delta t}$
$\therefore \vec{F}$ is parallel to $\Delta\vec{P}$

(24) Answer : (3)
Solution:
Change in momentum $\Delta P = \int F\,dt =$ Area under *F-t* curve
$= \frac{1}{2} \times 2 \times 10 - \frac{1}{2} \times 4 \times 20$
=10 – 40 = –30 N s

(25) **Answer :** (4)
Solution:
If a body is in equilibrium under the action of three forces, then their resultant is zero and they form a closed triangle, so they are coplanar.

(26) **Answer :** (3)
Solution:
Frictional force is independent of speed.

(27) **Answer :** (4)
Solution:
Impulse $J = f \cdot t$

(28) **Answer :** (3)
Solution:
$v_m = \sqrt{\mu \text{ Rg}}$
$= \sqrt{0.2 \times 32 \times 10} = 8$ m/s

(29) **Answer :** (4)
Hint:
$\overrightarrow{F}_{\text{net}} = m\overrightarrow{a}$
since F is less than m_2g, hence m_1 will move towards right.
Solution:
For block m_1 : $T - F = m_1a$ ...(i)
For block m_2 : $m_2g - T = m_2a$ ...(ii)
On solving equation (i) and (ii)
$a = \frac{m_2 g}{2(m_1+m_2)}$

(30) **Answer :** (2)
Solution:
$1 \times 3\hat{i} + 1 \times 4\hat{j} + 1 \times \overrightarrow{v}_3 = \text{zero}$
$\overrightarrow{v}_3 = -\left(3\hat{i} + 4\hat{j}\right)$ m/s
$\overrightarrow{F}_{\text{avg.}} = \frac{-\left(3\hat{i}+4\hat{j}\right)}{10^{-4}} = -\left(3\hat{i} + 4\hat{j}\right) \times 10^4$ N

(31) **Answer :** (2)
Solution:
$\theta = \tan^{-1}\left(\frac{v^2}{rg}\right)$
$= \tan^{-1}\left(\frac{400}{40\sqrt{3} \times 10}\right)$
θ = 30°

(32) **Answer :** (4)
Solution:
$\mu = \tan\theta$
$\mu' = 2\mu$
$\tan\theta' = 2\tan\theta$
$= 2\tan 30^\circ$
$\tan\theta' = \frac{2}{\sqrt{3}}$
$\theta' = \tan^{-1}\left(\frac{2}{\sqrt{3}}\right)$

(33) **Answer :** (1)
Solution:
$\overrightarrow{F} = 3\hat{i} + 4\hat{j} - 5\hat{k}$
$F = \sqrt{3^2 + 4^2 + (-5)^2} = 5\sqrt{2}$ N
$F = Ma$
$5\sqrt{2} = M\sqrt{2}$
$M = 5$ kg

(34) Answer : (3)
Solution:
2T = (60 + 40)g
2T = 100g ⇒ *T* = 50g

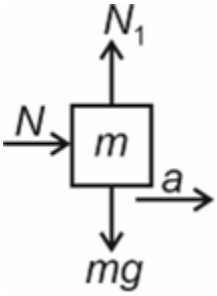
T + *N* = 60g
N = 60g – 50g = 10g

(35) Answer : (4)
Solution:
T = *mg* – *ma*
$T = \frac{75}{100}mg$
$mg - ma \leq \frac{3mg}{4} \Rightarrow a \geq \frac{g}{4}$

(36) Answer : (4)
Solution:
Centrifugal force is a pseudo-force that is applied in a rotating frame of reference.

(37) Answer : (4)
Solution:
$F = nmv$
= 10 × 0.3 × 10 = 30 N

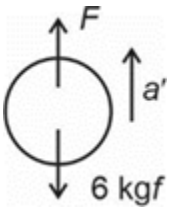
(38) Answer : (1)
Solution:



$a = \frac{F_{net}}{M+m} = \frac{100}{20+5} = 4\ \mathrm{m/s^2}$
$N = ma$
$N = 5 \times 4 = 20\ \mathrm{N}$

(39) Answer : (3)
Solution:
A body in equilibrium may remain at rest or move with constant velocity.

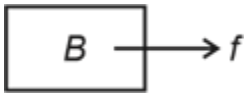
(40) Answer : (4)
Solution:
F = *Mg* + *Ma*
F = *M*(*g* + *a*)
F = 10(10 + 20) = 300 N
After mass is removed,



$300 - 6g = 6 \times a'$
$300 - 60 = 6 \times a'$
$\therefore\ a' = \frac{240}{6} = 40\ \text{m/s}^2$

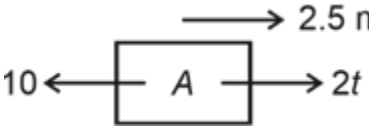
(41) Answer : (4)
Solution:
Action and reaction act on different bodies and they don't cancel each other.

(42) Answer : (1)
Solution:



$\Rightarrow f = m_B \times a$, now, $m_B \times a_B \le \mu m_A g$
$\Rightarrow\ 4 \times a_B \le \frac{1}{2} \times 2 \times 10$
$\Rightarrow\ a_B \le \frac{5}{2}\ \Rightarrow\ (a_B)_{\max} = 2.5\ \text{m/s}^2$

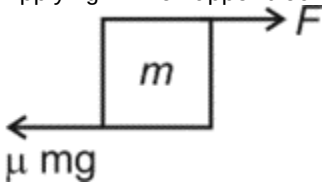
Maximum acceleration that the two block system can have, is 2.5 m/s^2



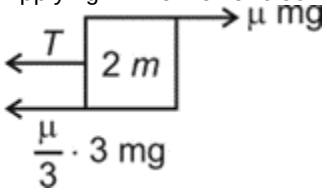
$2t - 10 = 2 \times \frac{5}{2}$
$\Rightarrow 2t - 10 = 5$
$\Rightarrow t = 7.5$ s
i.e., for $t \le 7.5$ s, both the blocks will move with same acceleration.
Beyond 7.5 s, blocks would have different acceleration.

(43) Answer : (1)
Solution:
$a_A = \frac{g}{\sqrt{2}} - \frac{0.2 \times g}{\sqrt{2}},\ a_B = \frac{g}{\sqrt{2}} - \frac{0.3 \times g}{\sqrt{2}}$
$\Rightarrow\ a_{AB} = \frac{g}{\sqrt{2}} - \frac{0.2 \times g}{\sqrt{2}} - \frac{g}{\sqrt{2}} + \frac{0.3 \times g}{\sqrt{2}} = \frac{1}{\sqrt{2}}$ m/s^2
$\Rightarrow\ S_{\text{rel}} = \frac{1}{2} \times a_{\text{rel}} \times t^2\ \Rightarrow\ \sqrt{2} = \frac{1}{2} \times \frac{1}{\sqrt{2}} \times t^2$
$\Rightarrow\ t = 2\ \text{s}$

(44) Answer : (4)
Solution:
Assuming that there is relative motion between both the blocks.
Applying FBD on upper block



Applying FBD on lower block



$T + \frac{\mu}{3} \times 3mg = \mu mg$

∴ T = 0 in all conditions

(45) Answer : (3)

Hint:

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

Solution:

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

$\vec{v} = \frac{d}{dt}(2t^2 - 4t)\hat{i} + \frac{d}{dt}(4t^2 - 8t)\hat{j}$

$\vec{v} = (4t - 4)\hat{i} + (8t - 8)\hat{j}$

If $\vec{v}$ = zero, then

$4t - 4 = 0$ and $8t - 8 = 0$

$t = 1$ s and $t = 1$ s

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

$\vec{a} = \frac{d}{dt}(4t - 4)\hat{i} + \frac{d}{dt}(8t - 8)\hat{j}$

$\vec{a} = \left(4\hat{i} + 8\hat{j}\right)$ m/s^2

Velocity of the particle will be zero at $t = 1$ s and acceleration of the particle will never be zero.

CHEMISTRY

(46) Answer : (4)

Hint:

Wavelength of photon emitted $\propto \frac{1}{Z^2}$; 'Z' is the atomic number.

Solution:

Be^{3+} ; Z = 4

∴ Transition (n = 3 to n = 2) will have shortest wavelength.

(47) Answer : (2)

Hint:

Orbital angular momentum is given as

$m_l = \sqrt{l(l+1)}\,\frac{h}{2\pi}$

Solution:

For a *d* electron, $\ell = 2$

∴ Angular momentum = $\sqrt{2(2+1)}\,\frac{h}{2\pi} = \sqrt{6}\frac{h}{2\pi}$

(48) Answer : (1)

Hint:

The square of the wave function (i.e. Ψ^2) at a point gives the probability density of the electron at that point.

Solution:

For 1*s* orbital, probability density is maximum at nucleus and decreases sharply as we move away from it.

At nodes, $|\Psi^2|$ is zero.

(49) Answer : (1)

Hint:

E.C. of Cr^{3+} is $[Ar]3d^3$, so it has 3 unpaired electrons

Solution:

Cr^{3+} $[Ar]3d^3$ 3

Mn^{2+} $[Ar]3d^5$ 5

Fe^{2+} $[Ar]3d^6$ 4

Ni^{2+} $[Ar]3d^8$ 2

(50) Answer : (3)

Hint:
According to Rutherford's atomic model
$r_{atom} = 10^{-10}$ m
$r_{nucleus} = 10^{-15}$ m
Solution:
Heisenberg's uncertainty principle is significant only for motion of microscopic objects. According to de-Broglie, every object in motion has a wave character.

(51) Answer : (1)
Hint:
For H atom energy of orbitals depend on 'n' value only.
Solution:
Order of energy of orbitals, for (H) atom 1*s* < 2*s* = 2*p* < 3*s* = 3*p* = 3*d*
For multielectron system, more the value of (n + l), higher will be the energy

$\mathrm{Orbital}$	$\mathrm{n}+\mathrm{l}$
$3d$	$3+2=5$
$4s$	$4+0=4$

(52) Answer : (2)
Hint:
$\frac{1}{\lambda}=\mathrm{R_H Z^2}\left(\frac{1}{\mathrm{n_1^2}}-\frac{1}{\mathrm{n_2^2}}\right)$, $\mathrm{n_1}=2\left(\mathrm{Balmer\ \ series}\right)$
Solution:
For second line :
$\frac{1}{\lambda}=\mathrm{R_H}\left(\frac{1}{(2)^2}-\frac{1}{(4)^2}\right)$
$=\mathrm{R_H}\cdot\frac{3}{16}$
$\lambda=\frac{16}{3\mathrm{R_H}}$
For third line
$\frac{1}{\lambda}=\mathrm{R_H}\left(\frac{1}{(2)^2}-\frac{1}{(5)^2}\right)$
$\frac{1}{\lambda}=\mathrm{R_H}\left(\frac{21}{100}\right)$
$\lambda=\frac{100}{21\mathrm{R_H}}$

$\frac{\lambda_{2^{\mathrm{nd}}\ \mathrm{line}}}{\lambda_{3^{\mathrm{rd}}\ \mathrm{line}}}=\frac{16\times21\ \mathrm{R_H}}{3\ \mathrm{R_H}\times100}=\frac{28}{25}$

(53) Answer : (3)
Solution:
$\Delta\mathrm{x}=\frac{\mathrm{h}}{4\pi\mathrm{m}\Delta\mathrm{v}}$
$\Delta\mathrm{v}=\frac{0.010\times2\times10^3}{100}=0.2$
$\therefore\quad\Delta\mathrm{x}=\frac{6.6\times10^{-34}}{4\times3.14\times9\times10^{-31}\times0.2}$
$= 3 \times 10^{-4}$ m

(54) Answer : (4)
Hint:
For the *h*-subshell, azimuthal quantum number *l* = 5 and values of *l* varies from 0 to (*n* – 1)
Solution:
For a shell having *h* subshell (*l* = 5) lowest value of *n* should be 6 as for *n* = 6, *l* = 0, 1, 2, 3, 4, 5

(55) Answer : (3)
Hint:
Moving down the group work function of metal decreases as effective nuclear charge decreases.
Solution:
Work function of Na > work function of Cs.
There is no time lag between the striking of light beam and ejection of photoelectron from metal surface.

(56) Answer : (3)
Hint:
Shape of an orbital is determined by azimuthal quantum number 'l'.
Solution:
• Be^{2+} has 2 electrons while He^{+} has only one electron.
• In n^{th} shell, total number of orbitals = n^2

(57) Answer : (4)
Hint:
'l' values vary from 0 to (n – 1)
m values vary from –l to +l
Solution:
For l = 1, m = –1, 0, +1
For n = 1, l = 0

(58) Answer : (2)
Hint:
Number of waves formed in n^{th} orbit = n
Solution:
The number of waves formed in the fourth orbit of H atom is four.

(59) Answer : (3)
Hint:
Wave number $(\bar{v}) = \frac{1}{\lambda}$
Solution:
Wavelength $(\lambda) = \frac{c}{\nu}$
$\bar{v} = \frac{\nu}{c}$
$= \frac{6000 \times 10^3}{3 \times 10^8}$
= 0.02 m^{-1}

(60) Answer : (4)
Solution:
Mg : $1s^2 2s^2 2p^6 3s^2$
For *s* orbital and for one *p* orbital, the value of m is zero.
∴ Maximum number of electrons with m = 0 and $s = \frac{1}{2}$ is 4.

(61) Answer : (4)
Hint:
Photoelectric effect is the instantaneous emission of electrons from the metal surface when a photon of suitable frequency is incident on it.

(62) Answer : (4)
Hint:
$^{A}_{Z}X$
A represents mass number.
Z represents atomic number.
Solution:
$^{31}_{15}P^{3-}$
• Number of protons = Atomic number = 15
• Mass number (A) = 31 = protons + neutrons
∴ Number of neutrons = 31 – 15 = 16
• Number of electrons = 15 + 3 = 18

(63) Answer : (1)
Solution:
For Lyman series,
$n_1 = 1$, $n_2 = 2, 3, 4, ...$

(64) Answer : (2)
Solution:
In 2nd option, 2*s* is partially filled and afterwards electrons entered into next high energy level which is 2*p* violating the Aufbau rule.

(65) Answer : (3)

Hint:

$\lambda = \frac{h}{mv}$

Solution:

$\lambda = \frac{6.63\times10^{-34}}{5\times10^{-3}\times200}\ m = 6.63\times10^{-34}$ m

(66) Answer : (4)

Hint:

Characteristics of cathode rays does not depend upon the material of cathode used.

(67) Answer : (2)

Solution:

d-orbital has double dumb-bell shape.

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

(68) Answer : (3)

Hint:

$r_n = \frac{n^2}{Z}\times0.53\ \text{Å}$

Solution:

$r_{Be^{3+}} = \frac{(1)^2}{4}\times0.53$ = 0.13 Å.

(69) Answer : (2)

Hint:

Isoelectronic species have same number of electrons.

Solution: B

(70) Answer : (2)

Hint:

Total number of orbital in n^{th} shell is n^2.

Solution:

Number of atomic orbitals in 5^{th} shell = 5^2

= 25

(71) Answer : (3)

Solution:

Atom	Electronegativity
Si	1.8
C	2.5

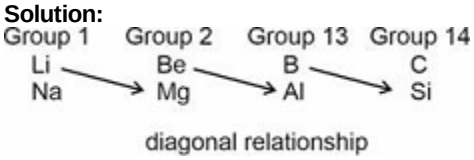
and electron gain enthalpy of F = – 328 kJ/mole and for Br = – 325 kJ/mole

(72) Answer : (3)

Hint:

First element of group I and II shows similar characteristics with second element of upcoming group which is known as diagonal relationship.

Solution:



(73) Answer : (1)

Solution:

Most electronegative is 'F', which belongs to group 17 and period 2.

(74) Answer : (4)

Solution:

N ($2s^2$, $2p^3$) has half filled electronic configuration, so, more ionisation potential than 'O' ($2s^2$, $2p^4$)

$\therefore \left.\begin{matrix}\text{N} = 11.32\ \text{eV}\\ \text{O} = 8.21\ \text{eV}\end{matrix}\right\}$

(75) Answer : (3)

Solution:

Copper → Transition metal

Fluorine → Non-metal
Silicon → Metalloid
Cerium → Lanthanoid

(76) **Answer :** (2)
Solution:
unnilquadium (104) → Rutherfordium
unnilseptium (107) → Bohrium
unnilennium (109) → Meitnerium
ununnillium (110) → Darmstadtium

(77) **Answer :** (1)
Solution:
NO, CO, N_2O are neutral oxides, while As_2O_3, Al_2O_3 are amphoteric oxide. NO_2 is acidic oxide.

(78) **Answer :** (2)
Solution:
Element (Z = 44) : [Kr] $4d^7 5s^1$

(79) **Answer :** (4)
Hint:
Boron does not have *d*-orbital.
Solution:
For alkali metals, as the shell size for valence electron increases the ionisation energy decreases.

(80) **Answer :** (3)
Solution:
The correct order of electronegativity is
Si < C < N < O

(81) **Answer :** (4)
Solution:
As third ionisation potential of metal is very high hence it will behave as divalent metal cation. The formula of the halide will be MX_2.

(82) **Answer :** (4)
Solution:
Ne has highest +ve electron gain enthalpy (+116 kJ/mol).

(83) **Answer :** (1)
Hint:
s and *p*-block elements are known as representative elements.
Solution:
• V and Ni belongs to *d*-block.
• Gd belongs to *f*-block while As belongs to *p*-block.
∴ As is a representative element

(84) **Answer :** (4)
Solution:
The negative ion is always larger than that of the corresponding atom for isoelectronic species.
∴ Correct order of ionic radius is $N^{3-} > O^{2-} > Na^+ > Mg^{2+}$

(85) **Answer :** (3)
Solution:
Na^+ ⇒ Noble gas configuration and highest effective nuclear charge due to presence of positive charge.
Na → One electron in the outermost shell [Ne]$3s^1$, easy to remove.

(86) **Answer :** (3)
Hint:
In a period the electronegativity generally increases as we move from left to right
Solution:
Correct order of electronegativity value of the third period elements
Cl > S > P > Si > Al > Mg > Na

(87) **Answer :** (3)
Solution:
Second electron affinity is endothermic.

(88) Answer : (4)
Solution:
For isoelectronic species, higher is the negative charge, larger is the size of ion

(89) Answer : (3)
Solution:
Number of nucleons = n + z, Number of neutrons = 32 – 16 =16
Number of nucleons = n + z = y
31 = 16 + z Period – 3
Z = 15 Group -15

(90) Answer : (2)
Solution:
103 : Unt : Unniltrium.

BOTANY

(91) Answer : (3)
Solution:
In both anaphase-I and mitotic anaphase, chromosomes move towards opposite poles with the help of spindle fibres.

(92) Answer : (3)
Solution:
Zygotene – Synapsis between homologous chromosome occurs.
Pachytene – Recombination between homologous chromosomes occurs
Diplotene – Chiasmata is visible
Diakinesis – Terminalisation of chiasmata occurs

(93) Answer : (2)
Hint:
The correct sequence of different stages of prophase I is as follows:
Leptotene → Zygotene → Pachytene → Diplotene → Diakinesis.
Solution:
(1) Condensation and coiling of chromatin fibres begins during leptotene.
(2) Synapsis of homologous chromosomes occur during zygotene.
(3) Exchange of genetic material between non- sister chromatids of homologous chromosomes occurs during pachytene.
(4) Chiasmata can be observed during diplotene.
(5) Disintegration of nuclear envelope can be observed during diakinesis.

(94) Answer : (1)
Solution:
Spindle fibres begins to form during prophase and they attach to the kinetochore of the chromosomes during metaphase.

(95) Answer : (3)
Solution:
During interkinesis, there is no replication of DNA.

(96) Answer : (3)
Hint:
Diagram is of telophase II.
Solution:
Four dissimilar daughter cells are formed after meiosis I and II.
All the cells are haploid.
Each cell has recombined chromatids.
Each cell has monads.

(97) Answer : (2)
Solution:
Prophase of mitosis can be characterised by:
- Untangling of chromosomes
- Condensation of chromosomal material
- Spireme stage

(98) Answer : (1)
Solution:
The centrioles in the animal cells begin to move towards the opposite poles during prophase.

(99) Answer : (2)
Solution:
Meiosis produces gametes for sexual reproduction.

(100) Answer : (1)
Solution:
Centrioles are responsible for aster formation in animal cells and they duplicate during S phase of interphase and during interkinesis or intra-meiotic interphase.

(101) Answer : (1)
Solution:
Actual cell division occurs in M-phase. Cells are metabolically active in G_0-phase.

(102) Answer : (2)
Solution:
Tetrad consists of a pair of homologous chromosomes or four chromatids. It is clearly visible in the pachytene stage.

(103) Answer : (4)
Hint:
Telophase II is the last stage of meiosis II.
Solution:
Meiosis ends with telophase II in which the two groups of chromosomes get enclosed by separate nuclear envelope.

(104) Answer : (3)
Solution:
Prophase I is complex and prolonged and divided into five substages. In both of them disappearance of nuclear membrane is observed.

(105) Answer : (2)
Solution:
S phase is also known as synthesis phase, and it occurs between G_1 and G_2 phase.

(106) Answer : (4)
Solution:
Yeast can progress through the cell cycle in only about 90 minutes. The interphase lasts more than 95% of the duration of cell cycle.
For yeast, less than 4.5 minutes are required to complete M phase.

(107) Answer : (2)
Hint:
Anaphase promoting complex (APC) is a protein degradation machinery necessary for proper mitosis of animals cells.
Solution:
APC is involved in division of centromere which results in separation of sister chromatids. Complex structure formed during synapsis is called synaptonemal complex. The site where crossing over occurs, forms a recombination nodule during pachytene stage.

(108) Answer : (3)
Solution:
Cell cycle is divided into two basics phases *i.e.*, interphase and M phase.

(109) Answer : (4)
Hint:
Mitosis is called as equational division.
Solution:
After mitosis, the resultant daughter cells have same amount of DNA as in the parent cell.

(110) Answer : (2)
Solution:
During zygotene, chromosome synapsis is accompanied by the formation of complex structure called synaptonemal complex.
Recombination between homologous chromosomes is completed by the end of pachytene.
In oocytes of some vertebrates, diplotene can last for months or years.
By the end of diakinesis, the nucleolus disappears and the nuclear envelope also breaks down.

(111) Answer : (1)
Solution:
The complete disintegration of the nuclear envelope marks the start of second phase of mitosis, hence all chromosomes are spread through the cytoplasm of the cell.

(112) Answer : (3)

Solution:
In anaphase I chromosomes reduce to half but centromeres do not split.

(113) Answer : (3)
Hint:
Both diakinesis and prophase II represent transition to metaphase.
Solution:
Disappearance of nuclear envelope and establishment of meiotic spindle are common events between diakinesis and prophase II of meiosis.

(114) Answer : (2)
Solution:
Cells do not proliferate at G_0 stage.

(115) Answer : (2)
Solution:
Primata is an order and Insecta is a class.

(116) Answer : (4)
Solution:
Syncytium are single cell containing large number of nuclei. It is formed if karyokinesis is not followed by cytokinesis.

(117) Answer : (3)
Solution:
A bivalent (tetrad) is a pair of homologous chromosomes made up of 4 chromatids.

(118) Answer : (3)
Solution:
M-phase is the most dramatic period of the cell cycle, involving a major reorganisation of virtually all components of the cell.

(119) Answer : (4)
Hint:
Replication of DNA occurs in S-phase.
Solution:
G_1 phase
Nucleotide synthesis, Duplication of membranous organelles
G_2 phase
- Duplication of chloroplast
- Tubulin protein synthesis
- Membranous organelle duplication like mitochondria and Golgi complex

(120) Answer : (2)
Solution:
Interphase is also called the resting phase.
ATP synthesis occurs during the process of karyokinesis also.
Karyokinesis is not associated with the resting phase and takes place in M phase.

(121) Answer : (3)
Solution:
Congression of chromosomes takes place during metaphase stage.

(122) Answer : (4)
Solution:
A division is group of related classes.

(123) Answer : (3)
Solution:
Consciousness is a defining feature of a living organism.
Prokaryotes are truly living organisms; they can also sense and respond to environmental cues.

(124) Answer : (4)
Solution:
During prophase, each centrosome radiates out microtubules called asters.

(125) Answer : (1)

Hint:
Liquid endosperm of coconut exemplifies multinucleate condition.

Solution:
In some organisms karyokinesis is not followed by cytokinesis as a result of which multinucleate condition arises leading to the formation of syncytium (*e.g.*, liquid endosperm in coconut).

(126) Answer : (2)

Solution:
First letter of the second word of biological name is small, as it represents the specific epithet.

(127) Answer : (3)

Solution:
The abbreviated form of author is not printed in italics and specific epithet starts with a small letter.

(128) Answer : (1)

Hint:
Botanical name of wheat is *Triticum aestivum*

Solution:
Wheat belongs to Family- Poaceae

(129) Answer : (3)

Solution:
Hominidae is family of *Homo sapiens.*
Primata is an order.
Mammalia and Insecta are classes.
Angiospermae is a division of Plantae.

(130) Answer : (2)

Hint:
Organism which are either sterile or infertile, do not reproduce.

Solution:
Reproduction can be regarded as a characteristic of living organisms but it is not their exclusive defining characteristic because few organisms such as mule and worker-bees do not reproduce at all.

(131) Answer : (4)

Solution:
Lower the taxa, more are the characteristics that the members within the taxon share.
As we go higher from species to kingdom, the number of common characteristics goes on decreasing.

(132) Answer : (2)

Solution:
Taxonomy is derived from two Greek words '*taxis*' and '*nomos*'.

(133) Answer : (2)

Solution:
Worker bees are sterile.

(134) Answer : (4)

Solution:
Mango and brinjal belong to the order Sapindales and Polymoniales respectively.
Wheat belongs to the class Monocotyledonae.

(135) Answer : (2)

Solution:
Species is the basic unit.

ZOOLOGY

(136) Answer : (1)

Solution:
A nucleotide has three chemically distinct components. One is a heterocyclic compound, the second is a pentose sugar and the third, a phosphoric acid.

(137) Answer : (2)

Solution:
In a triglyceride molecule, three fatty acid molecules are linked to a glycerol molecule by three ester bonds.

(138) Answer : (3)
Solution:
Transferases catalyse the transfer of a group, G(other than hydrogen) between a pair of substrate S and S'.

(139) Answer : (3)
Solution:
Palmitic acid and arachidonic acid are fatty acids.

(140) Answer : (2)
Solution:
$E + S \rightleftharpoons ES \rightarrow EP \rightarrow E + P$

(141) Answer : (2)
Solution:
Ribozyme – RNA behaving like enzymes.
Other given enzymes are proteinaceous.

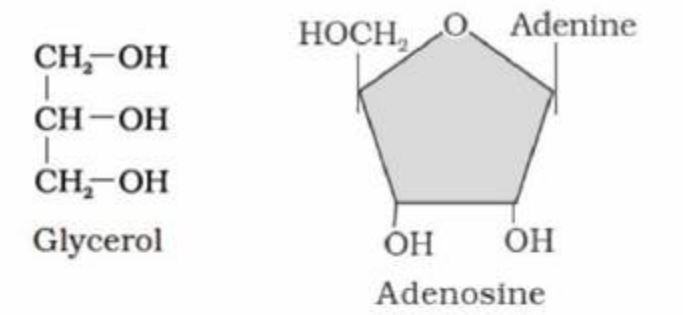
(142) Answer : (4)
Solution:
Apoenzyme combines with cofactor to form holoenzyme.

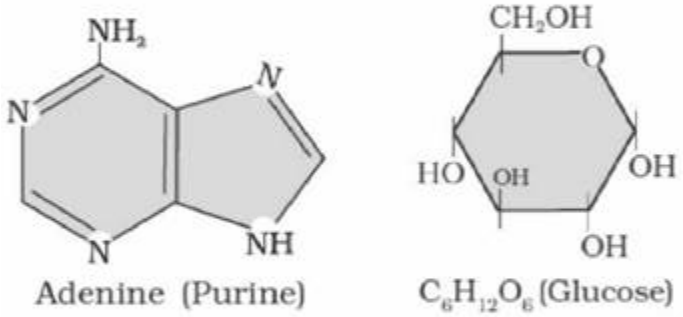
(143) Answer : (2)
Solution:
The heterocyclic compounds in nucleic acids are the nitrogenous bases named adenine, guanine, uracil, cytosine, and thymine. Adenine and Guanine are substituted purines while the rest are substituted pyrimidines

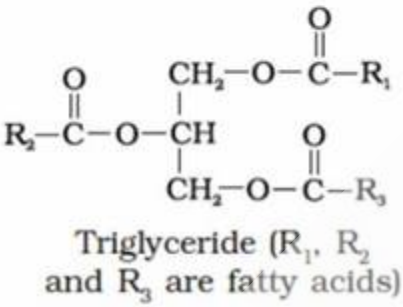
(144) Answer : (3)
Hint:
Equals to the number of fingers in each hand of man.
Solution:
Living organisms have a number of carbon compounds in which heterocyclic rings can be found. Some of these are nitrogen bases–adenine, guanine, cytosine, uracil and thymine. Cholesterol possesses homocyclic ring. Lecithin does not show a ring structure.

(145) Answer : (3)
Hint:
Enzyme molecules are fewer than substrate molecules.
Solution:
When the substrate concentration increases, the velocity of the enzymatic reaction increases at first. After reaching the maximum velocity (V_{max}), the velocity stays stationary in spite of an increase in the concentration of substrate.
This is because the enzyme molecules are fewer than the substrate molecules and after saturation of these molecules, there are no free enzyme molecules to bind with the additional substrate molecules.

(146) Answer : (4)
Hint:
Number of hydroxyl groups in glycerol = 3
Solution:







(147) Answer : (4)

Solution:

Enzymes lower the energy level of transition state.

(148) Answer : (4)

Solution:

Enzyme-substrate complex passes through transition state to produce product and enzyme again becomes free.

(149) Answer : (3)

Solution:

Each enzyme shows its highest activity at a particular temperature and pH called the optimum temperature and optimum pH. Activity declines both below and above the optimum value.

(150) Answer : (4)

Solution:

In an enzyme catalysed reaction, during the state where substrate is bound to the enzyme's active site, a new structure of the substrate called transition state structure is formed.

Transition state is an unstable structure with high energy. Stability is inversely proportional to the energy status of a molecule.

(151) Answer : (2)

Solution:

Haem is the prosthetic group in enzyme peroxidase and catalase.

Zinc is the co-factor for the proteolytic enzyme 'Carboxypeptidase', NAD is the co-enzyme which contains niacin.

(152) Answer : (2)

Solution:

In the absence of enzyme, this reaction is very slow. However, by using the enzyme, the reaction speeds dramatically with 600,000 molecules being formed every second.

(153) Answer : (2)

Hint:

Acts as intercellular ground substance

Solution:

Collagen is the most abundant animal protein. It is oriented differently in dense irregular connective tissues, that are present beneath the skin.

Collagen is absent in blood, as they lack fibre secreting cells.

Collagen is a structural heteropolymer.

(154) Answer : (4)

Hint:

β-plated sheets are placed under the same category.

Solution:

An alpha helix represents the secondary structure of proteins in which the amino acid chain is arranged in a spiral. An adult human haemoglobin represents the quaternary structure of a protein.

The sequence of amino acids *i.e*. the positional information in a protein, is given by its primary structure.

(155) Answer : (2)

Solution:

- The prosthetic group may be organic or inorganic. They bound tightly to the apoenzyme.
- Co-enzymes are organic compounds but their association with the apoenzyme is only transient.

(156) Answer : (1)

Solution:

The structure which shows that which is the first amino acid, which is the second and so on *i.e.*, the sequence of amino acids is called the primary structure.

(157) Answer : (1)

Solution:

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

(158) Answer : (3)

Solution:

Glycerol is a simple lipid represented by trihydroxy propane.

(159) Answer : (1)

Solution:

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

(160) Answer : (4)

Solution:

Tryptophan, phenylalanine and tyrosine are aromatic amino acids. Glutamic acid is an acidic amino acid. Lysine is a basic amino acid, whereas valine is a neutral amino acid.

(161) Answer : (3)

Solution:

Larynx is a cartilaginous box which helps in sound production and hence called the sound box. During swallowing, glottis can be covered by a thin elastic cartilaginous flap called epiglottis. The trachea, primary, secondary and tertiary bronchi and initial bronchioles are supported by incomplete cartilaginous rings. Alveoli are vascularised bag-like structures.

(162) Answer : (3)

Solution:

Volume of air inspired or expired during a normal respiration is called tidal volume. It is approx. 500 mL *i.e*., a healthy man can inspire or expire approximately 6000 to 8000 mL of air per minute. This is known as minute volume of respiration which can be represented by Tidal volume X Breathing rate.

(163) Answer : (2)
Solution:
VC is equal to sum of ERV + TV + IRV.

(164) Answer : (3)
Hint:
We cannot directly alter the pulmonary volume.
Solution:
The anatomical set up of lungs in thorax is such that any change in the volume of the thoracic cavity will be reflected in the pulmonary cavity. We have two lungs which are covered by a double layered pleura. The outer pleural membrane is in close contact with the thoracic lining whereas the inner pleural membrane is in contact with the lung surface.

(165) Answer : (4)
Hint:
Sternum is present on mid-ventral line.
Solution:
Thoracic chamber is formed dorsally by vertebral column, ventrally by sternum, laterally by ribs and on lower side by diaphragm.

(166) Answer : (4)
Solution:
EC=1500-1600 mL
IRV-2500-3000 mL
IC-3000-3500 mL
ERV= 1000-1100 mL

(167) Answer : (2)
Solution:
Internal intercostal muscles and abdominal muscles are example of additional muscles which help in forceful expiration.

(168) Answer : (4)
Hint:
Buccal cavity opens into it
Solution:
The nasal chamber opens into pharynx, a portion of which is the common passage for food and air. The pharynx opens through the larynx region into the trachea.

(169) Answer : (2)
Solution:
On an average, a healthy adult human breathes 12-16 times/minute.

(170) Answer : (2)
Solution:
During inspiration, there is negative pressure in lungs with respect to atmospheric pressure.
The muscles involved in normal inspiration are diaphragm and external intercostal muscles.
Contraction of diaphragm causes it to become flat and there is increase in the volume of thoracic chamber in the antero-posterior axis.

(171) Answer : (3)
Solution:
It is a feature of pharynx.
Larynx is a cartilaginous box which helps in sound production, hence called sound box. During swallowing, glottis can be covered by a thin elastic cartilaginous flap called epiglottis to prevent the entry of food into larynx. Pharynx is the common passage for food and air.

(172) Answer : (3)
Solution:
Diffusion of O_2 and CO_2 across alveolar surface is not a function of conducting part of respiratory tract.

(173) Answer : (2)
Solution:
All steps involved in human respiration is
(i) Breathing or pulmonary ventilation
(ii) Diffusion of gases across alveolar membrane
(iii) Transport of gases through blood
(iv) Diffusion of gases between blood and tissue
(v) Utilization of O_2 by the cells for catabolic reactions

(174) Answer : (1)

Solution:
Spirometer is used to estimate the volume of air involved in breathing movements which helps in clinical assessment of pulmonary functions.
Simple spirometer can measure all other lung volumes and capacities except FRC, RV and TLC.

(175) Answer : (3)
Solution:
Trachea divides at the level of 5^{th} thoracic vertebra.

(176) Answer : (2)
Solution:
Functional residual capacity is defined as the volume of air that will remain in the lungs after a normal expiration. This includes expiratory reserve volume and residual volume.
FRC = ERV + RV = 2500 mL

(177) Answer : (1)
Solution:
Expiratory Capacity (EC) : Total volume of air a person can expire after a normal inspiration. This includes tidal volume and expiratory reserve volume (TV+ERV).

(178) Answer : (3)
Solution:
During normal inspiration and expiration in humans, diaphragm and external intercostal muscles are involved.
Abdominal and internal intercostal muscles are actively involved in forceful inspiration.

(179) Answer : (2)
Solution:
During swallowing glottis can be covered by a thin elastic cartilaginous flap called epiglottis to prevent the entry of food into the larynx.

(180) Answer : (3)
Solution:
We have two lungs which are covered by a double layered pleura, with pleural fluid between them. It reduces friction on the lung-surface. The outer pleural membrane is in close contact with the thoracic lining whereas the inner pleural membrane is in contact with the lung surface.