



Corporate Office: Aakash Tower, 8, Pusa Road, New Delhi-110005, Ph.011-47623456

## FINAL TEST SERIES for NEET-2022

MM : 720

Test - 2

Time : 3 Hrs. 20 Mins.

### Answers

1. (2)	41. (1)	81. (2)	121. (3)	161. (1)
2. (2)	42. (3)	82. (2)	122. (3)	162. (2)
3. (3)	43. (4)	83. (4)	123. (1)	163. (3)
4. (3)	44. (3)	84. (4)	124. (4)	164. (1)
5. (1)	45. (1)	85. (3)	125. (4)	165. (3)
6. (4)	46. (4)	86. (4)	126. (2)	166. (2)
7. (4)	47. (3)	87. (2)	127. (2)	167. (1)
8. (2)	48. (1)	88. (2)	128. (1)	168. (2)
9. (3)	49. (2)	89. (4)	129. (1)	169. (3)
10. (4)	50. (3)	90. (3)	130. (1)	170. (1)
11. (4)	51. (3)	91. (3)	131. (1)	171. (4)
12. (1)	52. (4)	92. (4)	132. (1)	172. (1)
13. (3)	53. (2)	93. (2)	133. (4)	173. (4)
14. (3)	54. (2)	94. (3)	134. (3)	174. (1)
15. (4)	55. (3)	95. (2)	135. (2)	175. (4)
16. (3)	56. (4)	96. (4)	136. (2)	176. (4)
17. (3)	57. (4)	97. (2)	137. (2)	177. (2)
18. (2)	58. (1)	98. (1)	138. (1)	178. (3)
19. (3)	59. (3)	99. (3)	139. (3)	179. (2)
20. (3)	60. (1)	100. (3)	140. (4)	180. (2)
21. (4)	61. (3)	101. (1)	141. (2)	181. (2)
22. (4)	62. (3)	102. (2)	142. (4)	182. (4)
23. (2)	63. (3)	103. (2)	143. (4)	183. (3)
24. (1)	64. (3)	104. (1)	144. (4)	184. (4)
25. (3)	65. (2)	105. (4)	145. (1)	185. (1)
26. (1)	66. (4)	106. (2)	146. (3)	186. (1)
27. (1)	67. (2)	107. (1)	147. (1)	187. (3)
28. (1)	68. (3)	108. (2)	148. (2)	188. (2)
29. (1)	69. (1)	109. (1)	149. (2)	189. (4)
30. (4)	70. (2)	110. (4)	150. (3)	190. (1)
31. (1)	71. (3)	111. (3)	151. (4)	191. (3)
32. (4)	72. (4)	112. (2)	152. (1)	192. (2)
33. (4)	73. (3)	113. (3)	153. (2)	193. (1)
34. (2)	74. (1)	114. (1)	154. (4)	194. (3)
35. (3)	75. (3)	115. (2)	155. (2)	195. (4)
36. (4)	76. (1)	116. (4)	156. (3)	196. (2)
37. (1)	77. (3)	117. (3)	157. (4)	197. (4)
38. (1)	78. (2)	118. (3)	158. (2)	198. (4)
39. (3)	79. (3)	119. (2)	159. (1)	199. (3)
40. (1)	80. (1)	120. (2)	160. (4)	200. (3)



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## FINAL TEST SERIES for NEET-2022

MM : 720

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### Hints and Solutions

### PHYSICS

#### SECTION - A

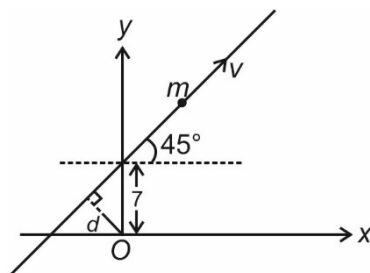
1. Answer (2)

$$(\Delta \vec{p}) = \vec{p}_f - \vec{p}_i = m(\vec{v} - \vec{u})$$

$$= 0.1(-4\hat{i} - 6\hat{j})$$

$$= -(0.4\hat{i} + 0.6\hat{j}) \text{ kg m/s}$$

2. Answer (2)



Angular momentum of particle

$$L = mvr_{\perp}$$

$$= mv \cdot d = mv \frac{7}{\sqrt{2}}$$

$$\text{Hence, } L = \frac{7mv}{\sqrt{2}}$$

3. Answer (3)

$$F = v \frac{dm}{dt} = 10 \times 2 = 20 \text{ N}$$

4. Answer (3)

$$\tan 30^\circ = \frac{a}{g} \Rightarrow a = \frac{g}{\sqrt{3}}$$

5. Answer (1)

At equilibrium,

$$2T = 2mg$$

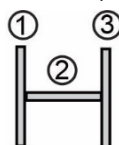
$$T = mg$$

After cutting the thread

$$2T - mg = ma$$

$$\therefore a = g \text{ upward}$$

6. Answer (4)



$$I = I_1 + I_2 + I_3$$

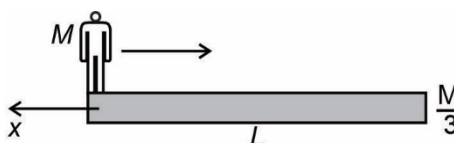
$$= 0 + \frac{ML^2}{3} + ML^2$$

$$I = \frac{4ML^2}{3}$$

7. Answer (4)

- Centre of mass of a body may lie inside, outside or on the body.
- Friction is not necessary for pure rolling.

8. Answer (2)



$$M(L - x) - \frac{Mx}{3} = 0$$

( $x$  is distance moved by the plank)

$$\Rightarrow x = \frac{3L}{4}$$

Distance moved by man w.r.t. ground

$$= L - \frac{3L}{4} = \frac{L}{4}$$

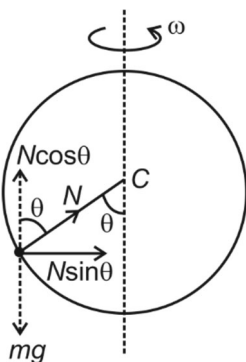
9. Answer (3)

$$T_{\max} - mg = ma_{\max}$$

$$\Rightarrow 800 - 600 = ma$$

$$\Rightarrow a_{\max} = \frac{200}{60} = 3.33 \text{ m s}^{-2}$$

10. Answer (4)



$$N \sin \theta = m \omega^2 R \sin \theta$$

$$\text{or } N = m \omega^2 R \quad \dots (i)$$

$$N \cos \theta = mg$$

$$\Rightarrow \cos \theta = \frac{mg}{N} = \frac{g}{\omega^2 R}$$

$$\Rightarrow \cos \theta = \frac{g}{\frac{2g}{R} \times R} = \frac{1}{2}$$

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

11. Answer (4)

Earth cannot be inertial frame because the earth is revolving around the sun and rotating about own axis. i.e.  $a \neq 0$ .

12. Answer (1)

In both cases acceleration is same. In case (ii), force required is less.

13. Answer (3)

$$\tau_{\text{net}} = I \alpha = 4m \left( \frac{2l}{2} \right) = \left[ \frac{4m(2l)^2}{3} \right]$$

$$4mg \times l = \frac{4m \cdot 4l^2}{3} \times \alpha$$

$$\Rightarrow \alpha = \frac{3g}{4l}$$

14. Answer (3)

Use conservation of mechanical energy between lowest point and point  $P$ .

$$\frac{1}{2} mg v^2 = mg \left( R + \frac{R}{2} \right)$$

$$v = \sqrt{3gR}$$

15. Answer (4)

Normal is always perpendicular to velocity of block in frame of lift.

So,  $P = \text{zero}$

16. Answer (3)

$$v = k\sqrt{x}$$

$$\Rightarrow v^2 = k^2 x$$

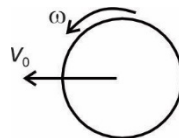
$$\Rightarrow a = \frac{k^2}{2}$$

$$\Rightarrow v = u + at = \frac{k^2 t}{2}$$

$$\Rightarrow W = \Delta K = \frac{1}{2} m v^2 = \frac{m k^4 t^2}{8}$$

17. Answer (3)

After the strike, the linear velocity is reversed and angular velocity remains unchanged.



$$I = m v_0 R + I_c \omega$$

$$I = m v_0 R + \frac{2}{3} m R^2 \left( \frac{v_0}{R} \right)$$

$$I = \frac{5}{3} m v_0 R$$

18. Answer (2)

$$w = Pt$$

$$\text{or } \frac{1}{2} m v^2 = Pt$$

$$\text{or } v = \sqrt{\frac{2Pt}{m}}$$

$$\frac{ds}{dt} = \sqrt{\frac{2Pt}{m}}$$

$$s = \int_0^t \sqrt{\frac{2Pt}{m}} dt$$

$$\text{or } s \propto t^{3/2}$$

19. Answer (3)

$$\tau = I\alpha$$

$$\tau = \frac{I\omega}{t}, I = \frac{ML^2}{12} + M\left(\frac{3L}{2}\right)^2 = \frac{7ML^2}{3}$$

$$\tau = \frac{7ML^2\omega}{3t}$$

20. Answer (3)

$$\frac{1}{2}mv^2 = \frac{1}{2}kx^2$$

$$2 \times 4 = 200 \times x^2$$

$$\therefore x^2 = \frac{4}{100}$$

$$\Rightarrow x = \frac{2}{10}$$

$$\therefore x = 20 \text{ cm}$$

21. Answer (4)

$$\vec{\tau} = I\vec{\alpha}$$

$$4Fr \sin 45^\circ = Mr^2 \times \alpha$$

$$4 \times 1 \times \frac{1}{\sqrt{2}} = 2 \times 0.5 \times \alpha$$

$$\alpha = 2\sqrt{2} \text{ rad/s}^2$$

22. Answer (4)

Point of contact will be the instantaneous centre of rotation. About this ring will be in pure rotational motion.

$\Rightarrow$  Velocity of any point on the ring  $v = r\omega$ , where  $r$  is the distance of points from C

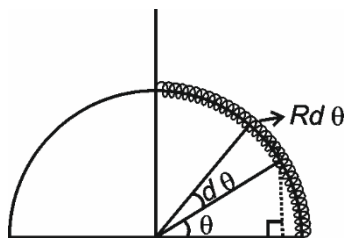
Hence,

$$V_O = r\omega = v$$

$$V_N = 2r\omega = 2v$$

$$v_M = \sqrt{2}r\omega = \sqrt{2}v$$

23. Answer (2)



$$dm = \frac{2m}{\pi R} \times Rd\theta$$

$$dm = \frac{2m}{\pi} d\theta$$

$$\therefore (P.E)_{dm} = dU = dm g R \sin \theta$$

$$U = \int dU = \int_0^{\pi/2} \frac{2m}{\pi} g R \sin \theta \cdot d\theta$$

$$U = \frac{2mgR}{\pi} [-\cos \theta]_0^{\pi/2} = \frac{2mgR}{\pi} [1]$$

$$\therefore U = \frac{2mgR}{\pi}$$

24. Answer (1)

$$x(t) = 2t + 3t^2 + 5t^3$$

$$v(t) = 2 + 6t + 15t^2$$

$$a(t) = 0 + 6 + 30t$$

$$a(t = 1 \text{ s}) = 36 \text{ m/s}^2$$

$$F = 36 \times 1 = 36 \text{ N}$$

25. Answer (3)

When raindrop falls, first speed increases, and after sometime speed is constant.

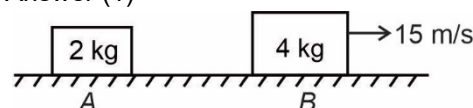
26. Answer (1)

$$F_{th} - mg = ma$$

$$F_{th} - 30000g = 30000a$$

$$F_{th} = 30000(g + a) = 30000(9.8 + 4.9) = 441 \text{ kN}$$

27. Answer (1)



$$\vec{v}_{cm} = \frac{m_1 \vec{v}_1 + m_2 \vec{v}_2}{m_1 + m_2}$$

$$= \frac{4 \times 15\hat{i} + 0}{6}$$

$$= 10\hat{i}$$

Hence  $v_{cm} = 10 \text{ m/s}$  eastward.

28. Answer (1)

$$T = \frac{u}{g} + \frac{2eu}{g} + \frac{2e^2u}{g} + \dots \infty \left[ u = \sqrt{\frac{2h}{g}} \right]$$

$$T = \frac{u}{g} \left( \frac{1+e}{1-e} \right) = \left( \frac{1+e}{1-e} \right) \sqrt{\frac{2h}{g}}$$

29. Answer (1)

Angular momentum about a point on ground is conserved

$$mv_0 R - l\omega_0 = 0$$

$$mv_0 R - \frac{mR^2}{2} \omega_0 = 0 \Rightarrow \frac{v_0}{R\omega_0} = \frac{1}{2}$$

30. Answer (4)

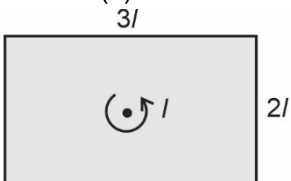
Initially angle between  $\vec{v}$  and  $m\vec{g}$  is greater than  $\pi/2$  and after maximum height angle will be less than  $\pi/2$  and angle is continuously changing.

31. Answer (1)

$$K = mad$$

$$\Rightarrow K \propto d$$

32. Answer (4)



$$I = m \left[ \frac{l^2 + b^2}{12} \right]$$

$$= m \left[ \frac{9l^2 + 4l^2}{12} \right]$$

$$= \frac{13ml^2}{12}$$

33. Answer (4)

Since wall is smooth hence blocks will fall due to own weight and system cannot be in equilibrium.

34. Answer (2)

Due to force couple

$$a_{\text{com}} = 0 \text{ and } v_{\text{com}} = \text{constant}$$

$\therefore$  Translation  $KE = \text{constant}$ .

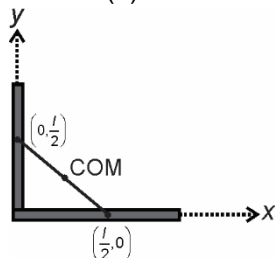
35. Answer (3)

$$\omega = \int_0^2 (2t - t^2) dt = \left( t^2 - \frac{t^3}{3} \right)_0^2 = \left( 4 - \frac{8}{3} \right)$$

$$= \frac{4}{3} \text{ rad/s}$$

### SECTION - B

36. Answer (4)



$$x_{\text{cm}} = \frac{m_1 x_1 + m_2 x_2}{m_1 + m_2}$$

$$x_{\text{cm}} = \frac{\frac{m\ell}{2} + m \times 0}{m + m} = \frac{\ell}{4}$$

$$y_{\text{cm}} = \frac{m_1 y_1 + m_2 y_2}{m_1 + m_2 + m_3}$$

$$= \frac{m \times 0 + m \times \frac{\ell}{2}}{m + m} = \frac{\ell}{4}$$

37. Answer (1)

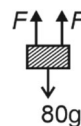
$$\text{Area} = \Delta K$$

$$\Rightarrow K_f - K_i = 36 \Rightarrow K_f - 400 = 36$$

$$\Rightarrow K_f = 436 \text{ J}$$

38. Answer (1)

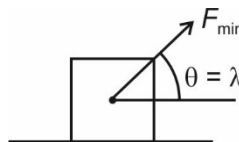
Consider platform + man as a system



$$F + F = (60 + 20)g$$

$$F = 40 \text{ kgf}$$

39. Answer (3)



$$F_{\text{min}} = \frac{\mu mg}{\sqrt{1 + \mu^2}}$$

40. Answer (1)

$$W = \int_0^{3a} F dx = \left[ \frac{f_0 x^2}{2a} - f_0 x \right]_0^{3a} = \frac{3f_0 a}{2}$$

41. Answer (1)

$$h_{\text{total}} = h + 2e^2 h + 2e^4 h + 2e^6 h + \dots$$

$$h_{\text{total}} = \frac{1 + e^2}{1 - e^2} h$$

$$\Rightarrow h_{\text{total}} = \frac{5}{3} h$$

42. Answer (3)

$$K = \frac{1}{2} m v^2 + \frac{1}{2} I \omega^2$$

$$K = \frac{1}{2} m v^2 + \frac{1}{2} \times \frac{2}{5} m R^2 \times \frac{v^2}{R^2}$$

$$K = \frac{7}{10} m v^2 = \frac{7 \times 2 \times 10 \times 10}{10}$$

$$K = 140 \text{ J}$$

43. Answer (4)

$$\text{Since } E = K + U$$

$$K = E - U$$

$K$  cannot be negative, hence  $U$  should not be greater than  $E$ .

44. Answer (3)

$$\Delta \vec{r} = (1-1)\hat{i} + (5-0)\hat{j} + (3-1)\hat{k}$$

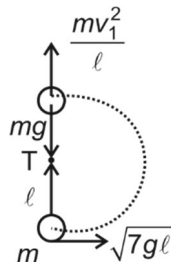
$$= (0\hat{i} + 5\hat{j} + 2\hat{k})\text{m}$$

$$\vec{F} = (2\hat{i} + 3\hat{j} + 2\hat{k})\text{N}$$

$$W = \vec{F} \cdot \Delta \vec{r} = (2\hat{i} + 3\hat{j} + 2\hat{k}) \cdot (5\hat{j} + 2\hat{k})$$

$$= 15 + 4 = 19\text{ J}$$

45. Answer (1)



From energy conservation

$$\frac{1}{2}mv_1^2 + mg \cdot 2l = \frac{1}{2}mv^2$$

$$\frac{1}{2}mv_1^2 = \frac{7}{2}mg\ell - 2mg\ell$$

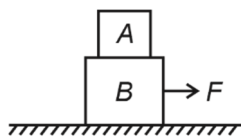
$$mv_1^2 = 3mg\ell \quad \dots(1)$$

Now,

$$T = \frac{mv_1^2}{\ell} - mg = \frac{3mg\ell}{\ell} - mg$$

$$T = 2mg$$

46. Answer (4)



When A & B just move separately

$$\text{For A} \Rightarrow \mu mg = ma$$

$$\Rightarrow \frac{1}{2} \times 40 = 4a$$

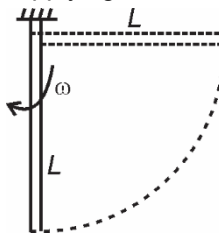
$$\Rightarrow a = 5\text{ m/s}^2$$

$$\text{So, } F_{\min} = (8+4) \times 5$$

$$= 60\text{ N}$$

47. Answer (3)

Applying conservation of mechanical energy



$$0 + 0 = -mg\frac{L}{2} + \frac{1}{2}I\omega^2$$

$$\Rightarrow \frac{1}{2} \cdot \left( \frac{mL^2}{3} \right) \omega^2 = mg\frac{L}{2}$$

$$\Rightarrow \omega = \sqrt{\frac{3g}{L}}$$

Now, velocity of other end of rod  $v = \omega r = \omega L$

$$= \sqrt{3gL}$$

48. Answer (1)

For cylinder

$$a = \frac{g \sin \theta}{1 + \frac{k^2}{R^2}} = \frac{2}{3}g \sin \theta \quad \left[ \because k = \frac{R}{\sqrt{2}} \right]$$

$$\ell = \frac{1}{2}at^2$$

$$\frac{h}{\sin \theta} = \frac{1}{2} \left( \frac{2}{3}g \sin \theta \right) t^2$$

$$t = \frac{1}{\sin \theta} \sqrt{\frac{3h}{g}}$$

49. Answer (2)

$$k = \frac{1}{2}Mv^2$$

$$k_1 = \frac{1}{2} \frac{3m}{4} (2v)^2$$

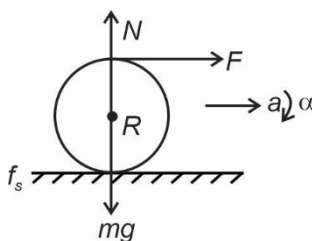
$$= 3k$$

50. Answer (3)

$$F + f_s = ma \quad \dots(1)$$

$$(F - f_s)R = I\alpha$$

$$F - f_s = \frac{Ia}{R^2}$$



$$F - f_s = \left( \frac{2MR^2}{5R^2} \right) a$$

$$F - f_s = \frac{2}{5} ma \quad \dots(2)$$

$$\left[ I = \frac{2}{5} mR^2, a = R\alpha \right]$$

On solving (1) and (2)

$$2F = \frac{7}{5} ma$$

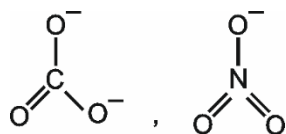
$$a = \frac{10F}{7m} = \frac{10}{7m} \cdot 4mg$$

$$= \frac{40g}{7}$$

## CHEMISTRY

### SECTION - A

51. Answer (3)

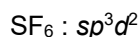
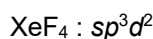


52. Answer (4)

Greater the bond order lesser is the bond length.

	$O_2^+$	$O_2$	$O_2^-$
B.O =	2.5	2	1.5

53. Answer (2)



54. Answer (2)

- $\Delta_f H^\circ$  of element in its reference state is taken as zero
- Reference state of hydrogen is  $H_2(g)$
- $\Delta_f H^\circ$  for  $H(g) = +217.97 \text{ kJ mol}^{-1}$

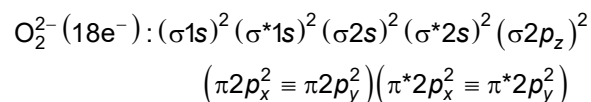
55. Answer (3)

$$U_{\text{rms}} = \sqrt{\frac{3RT}{M}} \propto \sqrt{\frac{T}{M}}$$

$$\frac{U_{\text{rms}}(H_2)}{U_{\text{rms}}(O_2)} = \sqrt{\frac{T_{H_2}}{M_{H_2}} \times \frac{M_{O_2}}{T_{O_2}}}$$

$$\frac{U_{\text{rms}}(H_2)}{U_{\text{rms}}(O_2)} = \sqrt{\frac{50 \times 32}{2 \times 800}} = 1:1$$

56. Answer (4)



Number of antibonding electrons = 8

57. Answer (4)

- For most of the ionic compounds,  $\Delta_{\text{sol}} H^\circ$  is positive.
- Max born and Fritz Haber gave Born-Haber cycle method based on Hess's law for the calculation of lattice enthalpy.

58. Answer (1)

$$\sqrt{\frac{3RT_1}{M_1}} = \sqrt{\frac{2RT_2}{M_2}}$$

$$\Rightarrow \frac{3R \times 330}{33} = \frac{2R \times 60}{M_2}$$

$$\Rightarrow M_2 = \frac{2R \times 60}{3R \times 330} \times \frac{33}{1} = 4$$

59. Answer (3)

Bond order of  $N_2$  is 3 but that of  $N_2^+$  is 2.5, hence bond length of  $N_2^+$  is greater than  $N_2$ .

60. Answer (1)



$$\Delta n_g = (2) - (1) = 1$$

$$\therefore \Delta H = \Delta U + \Delta n_g RT = \Delta U + RT$$

$$\therefore \Delta H - \Delta U = RT > 0$$

61. Answer (3)

In  $B_2H_6$ , octet is incomplete hence it is an electron deficient molecule.

62. Answer (3)

Heat is a path function means depends on the path followed by the system.

63. Answer (3)

HCl and  $H_2S$  both are polar molecules

64. Answer (3)

$$P_{CO} = x_{CO} P_T$$



$$\text{Mole of CO} = \frac{a}{28}$$

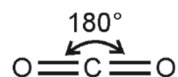
$$\text{Mole of N}_2 = \frac{a}{28}$$

$$\text{Total mole} = \frac{a}{28} + \frac{a}{28} = \frac{a}{14}$$

$$P_{\text{CO}} = \frac{\frac{a}{28}}{\frac{a}{14}} \times P_T$$

$$= \frac{a}{28} \times \frac{14}{a} \times 0.5 = 0.25 \text{ atm}$$

65. Answer (2)



66. Answer (4)

$$\Delta U = Q + W = (+500) + (-100) = 400 \text{ J}$$

67. Answer (2)

$$\Delta G^\circ = -2.303 RT \log K$$

68. Answer (3)

Intramolecular hydrogen bond is formed when hydrogen atom is in between the two highly electronegative (F, O, N) atoms present within the same molecule.

69. Answer (1)

For diatomic gas  $\gamma = 1.4$

70. Answer (2)

$$T_i = \frac{2a}{Rb}$$

$$T_B = \frac{a}{Rb}$$

$$\therefore \frac{T_i}{T_B} = \frac{2a}{Rb} \times \frac{Rb}{a}$$

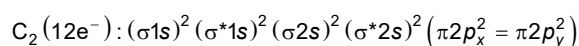
$$T_i = 2T_B$$

71. Answer (3)

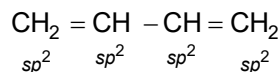
Gibbs energy depends on the size (mass) of a system so it is an extensive property.

72. Answer (4)

In  $\text{C}_2$  only  $\pi$  bond is present.



73. Answer (3)



74. Answer (1)

$\text{CH}_3\text{CHO}$  forms intermolecular hydrogen bond with water hence its solubility will be maximum in water.

75. Answer (3)

$$KE = \frac{3}{2} KT$$

$$= \frac{3}{2} \times \frac{R}{N_A} \times T$$

$$= \frac{3}{2} \times \frac{8.314}{6.02 \times 10^{23}} \times 303$$

$$= 627.7 \times 10^{-23}$$

$$KE = 6.28 \times 10^{-21} \text{ J}$$

76. Answer (1)

Stronger the hydrogen bond, higher will be the surface tension.

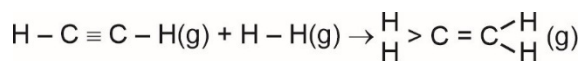
77. Answer (3)

Compound	Hybridization
$\text{XeO}_3$	$sp^3$
$\text{PCl}_3\text{F}_2$	$sp^3d$
$\text{XeOF}_4$	$sp^3d^2$
$\text{ClF}_3$	$sp^3d$

78. Answer (2)

$\Delta_f H^\circ$  is defined when one mole of a compound is formed from its elements in their most stable states of aggregation.

79. Answer (3)



$$\Delta_f H = \Sigma(\text{BE})_R - \Sigma(\text{BE})_P$$

$$= (2 \text{ BE}_{\text{C-H}} + \text{BE}_{\text{C} \equiv \text{C}} + \text{BE}_{\text{H-H}}) -$$

$$(4 \text{ BE}_{\text{C-H}} + \text{BE}_{\text{C} = \text{C}})$$

$$= (2 \times 414 + 827 + 430) - (4 \times 414 + 606)$$

$$= -177 \text{ kJ mol}^{-1}$$

80. Answer (1)

$$W = -P(V_2 - V_1) = -1(10 - 1) = -9 \text{ L-atm}$$

81. Answer (2)

$$V_2 = V + \frac{30 \text{ V}}{100} = 1.3 \text{ V}$$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}, \text{ So, } \frac{T_2}{T_1} = \frac{1.3 \text{ V}}{V} = 1.3$$

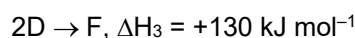
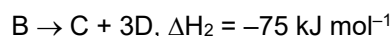
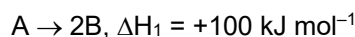
$$\therefore T_2 = 1.3 T_1$$

$$\text{Increase in temperature} = T_2 - T_1$$

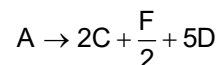
$$= 1.3 T_1 - T_1 = 0.3 T_1$$

$$\text{Percentage increase} = \frac{0.3 T_1}{T_1} \times \frac{100}{1} = 30\%$$

82. Answer (2)



Applying (i) + 2 × (ii) +  $\frac{1}{2}$  (iii), we get



$$\Delta H = \Delta H_1 + 2\Delta H_2 + \frac{\Delta H_3}{2}$$

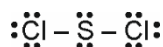
$$= 100 + 2(-75) + \frac{1}{2} (130)$$

$$= 15 \text{ kJ mol}^{-1}$$

83. Answer (4)

Bond	N $\equiv$ N	C $\equiv$ N	C $\equiv$ C	C $\equiv$ O
Mean bond enthalpy (kJ mol <sup>-1</sup> )	946	891	837	1070

84. Answer (4)



SCl<sub>2</sub> follows octet rule

85. Answer (3)

Bond type	Covalent bond length (pm)
C – H	107
N – O	136

C – C	154
C – O	143

**SECTION - B**

86. Answer (4)

SF<sub>6</sub> is octahedral in shape hence all S–F bond lengths in SF<sub>6</sub> are equal.

87. Answer (2)

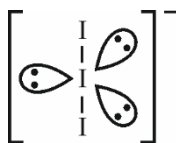
**Molecule** **Dipole moment  $\mu$ (D)**

NH<sub>3</sub> 1.47

NF<sub>3</sub> 0.23

- In case of NH<sub>3</sub>, the orbital dipole due to lone pair is in the same direction at the resultant dipole moment of N – H bonds.
- In NF<sub>3</sub>, the orbital dipole is in the direction opposite to the resultant dipole moment of three N – F bonds.

88. Answer (2)



I<sub>3</sub><sup>-</sup> contains three lone pair of electrons on central iodine atom.

89. Answer (4)

CO<sub>2</sub> is most compressible gas while N<sub>2</sub> is least compressible gas among the given options.

90. Answer (3)

$$d = \frac{PM}{RT}$$

$$d \propto M \quad [P \text{ and } T, \text{ constant}]$$

Higher is the molar mass, higher is the density of the gas.

91. Answer (3)

$$V_c = 3b$$

92. Answer (4)



The molecule contains unpaired electron

93. Answer (2)

$$1 \text{ poise} = 10^{-1} \text{ kg m}^{-1}\text{s}^{-1}$$

94. Answer (3)

Substance	T <sub>c</sub> /K
H <sub>2</sub>	33.2

He	5.3
H <sub>2</sub> O	647.1
NH <sub>3</sub>	405.5

95. Answer (2)

Compound	Shape
[ICl <sub>4</sub> ] <sup>-</sup>	Square planar
ClF <sub>5</sub>	Square pyramidal
XeO <sub>3</sub>	Pyramidal
IF <sub>7</sub>	Pentagonal bipyramidal

96. Answer (4)

Due to strong intermolecular force of attraction in ethylene glycol, viscosity of ethylene glycol is more than ethanol.

97. Answer (2)

$$PV = nRT$$

$$T = \frac{PV}{nR} = \frac{1.245 \times 6}{2 \times 0.083}$$

$$T = 45 \text{ K}$$

98. Answer (1)

Dipole-dipole interaction energy between rotating polar molecules is proportional to  $\frac{1}{r^6}$ .

99. Answer (3)

$$Q = nC\Delta T = \frac{60}{27} \times 24 \times 20 \text{ J} = 1.07 \text{ kJ}$$

100. Answer (3)

$$\Delta T = 0 \text{ then } \Delta H = 0$$

## BOTANY

### SECTION - A

101. Answer (1)

The artificial system of classification was based mainly on vegetative characters or androecium structure. It was given by Linnaeus.

102. Answer (2)

Numerical taxonomy is carried out by using computers and is based on all observable characters.

103. Answer (2)

Algae forms an obligatory association with fungi to form lichen. Mycorrhiza is association of fungi with roots of higher plants.

104. Answer (1)

*Ulothrix* is a filamentous green algae and has motile flagellated gametes.

105. Answer (4)

*Eudorina* shows anisogamous reproduction and forms two gametes, dissimilar in size.

106. Answer (2)

Figure represents brown algae *Dictyota*. It stores food in form of laminarin and mannitol.

Non-motile gametes and presence of polysulphate esters in cell wall are features of red algae.

107. Answer (1)

In green algae, inner layer of cell wall is made of cellulose and outer layer of pectose.

108. Answer (2)

Brown algae vary in colour from olive green to various shades of brown depending upon the amount of xanthophyll pigment fucoxanthin present in them.

109. Answer (1)

Both statements are correct for brown algae.

*Laminaria* is a brown algae.

110. Answer (4)

*Sphagnum* is a moss which can live in soil but is dependent on water for sexual reproduction.

111. Answer (3)

Gemmae are green, multicellular, asexual buds which develop in small receptacles called gemma cups located on the thalli. They become detached from parent body and germinate to form new individuals in liverworts.

112. Answer (2)

*Polytrichum* is a moss and is attached to soil through multicellular and branched rhizoids.

113. Answer (3)

Pteridophytes are the first terrestrial plants possessing xylem and phloem. Dominant phase in

life cycle is sporophytic plant body. Spores are produced by meiosis in spore mother cell. Water is required for fertilization.

114. Answer (1)

- *Cycas* has specialised roots called coralloid roots which are associated with  $N_2$  fixing cyanobacteria.
- *Selaginella* belongs to class Lycopsidea
- *Eucalyptus* is an angiosperm and has diplontic life cycle.
- *Pinus* has branched stem.

115. Answer (2)

The leaves in pteridophyta are small (microphylls) as in *Selaginella* or large (macrophylls) as in ferns.

116. Answer (4)

Female cone is absent in *Cycas* plant. Instead, megasporophylls are borne on the plant.

117. Answer (3)

*Fucus* (alga) is diplontic.

118. Answer (3)

Keel is the characteristic feature of flower of family Fabaceae. *Indigofera* is a plant of family Fabaceae.

119. Answer (2)

In some plants such as *Aloe*, cactus etc. leaves modify into leaf spines which reduce the transpiration and protect the plants from browsing animals.

120. Answer (2)

Alternate phyllotaxy is seen in plants of chilli, china rose, *Datura* and sunflower.

121. Answer (3)

Grape vine – Stem tendril

*Nepenthes* – Petiolar tendril

*Pisum sativum* – Leaflet tendril

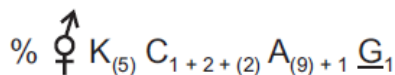
Sweet pea – Leaf tendril

122. Answer (3)

Ashwagandha is a medicinal plant of Solanaceae family while Tulip, *Gloriosa* and *Asparagus* are the plants of Liliaceae family.

123. Answer (1)

Floral formula of members of Fabaceae is



124. Answer (4)

Both mango and coconut are drupe fruits with stony endocarp.

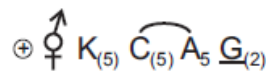
125. Answer (4)

A – represents taproot of *Brassica*

B – represents stem tendril of cucurbits.

126. Answer (2)

Floral formula of Solanaceae family is



127. Answer (2)

a. Gulmohur – Imbricate aestivation

b. *Calotropis* – Valvate aestivation

c. China rose – Twisted aestivation

d. Bean – Vexillary aestivation

128. Answer (1)

In Liliaceae family, there are six tepals (3 + 3) which form perianth.

129. Answer (1)

The swollen leaf base, pulvinus is found in some members of Fabaceae family such as bean.

130. Answer (1)

Pneumatophores are negatively geotropic roots present in plants of swampy area.

131. Answer (1)

Monocots show parallel venation in leaf eg.: bamboo, lily and wheat.

132. Answer (1)

Stamens are attached to perianth in lily flower.

133. Answer (4)

Proteinaceous layer in maize seed is aleurone layer.

134. Answer (3)

The epigynous flowers or inferior ovary is found in guava, cucumber, bittergourd and the ray floret of sunflower.

135. Answer (2)

Axile placentation is found in china rose, tomato and lemon.

#### SECTION - B

136. Answer (2)

Phylogenetic classification systems are based on the evolutionary relationship between various organisms.

137. Answer (2)

*Volvox* is a colonial algae and is oogamous.

138. Answer (1)

*Chlorella* is a unicellular algae rich in proteins and is used as food supplement by space travellers.

139. Answer (3)

*Ectocarpus* is simple, branched filamentous brown algae.

*Chlamydomonas* is unicellular green algae, *Porphyra* is oogamous.

140. Answer (4)

Sexual reproduction is oogamous and accompanied by complex post fertilization development in red algae e.g. *Polysiphonia*.

141. Answer (2)

The main plant body of bryophyte is haploid and produces gametes, hence is called a gametophyte.

142. Answer (4)

Transpiration is not the function of root system.

143. Answer (4)

In banana, pineapple and *Chrysanthemum*, the lateral branches originate from the basal and underground portion of the main stem, grow horizontally beneath the soil and then come out obliquely upward giving rise to leafy shoots.

144. Answer (4)

*Brassica* plants have tetramerous flowers.

145. Answer (1)

Ornamental : Lupin, Sweet pea, *Petunia*, *Gloriosa*.

Medicinal : *Aloe*, Belladonna, Muliathi.

146. Answer (3)

The stem in plant helps on spreading out branches bearing leaves, flowers and fruits.

147. Answer (1)

The stamens may be united into one or more bunches and this is called cohesion of stamens.

148. Answer (2)

Stilt roots – Sugarcane

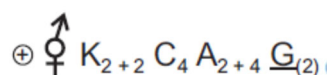
Prop roots – Banyan tree

149. Answer (2)

The marginal placentation is a characteristic feature of Fabaceae family. The given four plants such as pea, mulathi, *Indigofera* and lupin are the members of Fabaceae family.

150. Answer (3)

The floral formula of *Brassica* is



## ZOOLOGY

### SECTION - A

151. Answer (4)

Compound epithelium covers the inner lining of pancreatic ducts and its main function is to provide protection against chemical and mechanical stresses.

152. Answer (1)

Exocrine glands secrete mucus, saliva, earwax, oil, milk, digestive enzymes and other cell products. Endocrine glands secrete hormones (like insulin, melatonin).

153. Answer (2)

Columnar epithelium is found in the lining of stomach and intestine.

154. Answer (4)

Cartilage is present in pinna (outer ear joints) and in the tip of nose, between adjacent bones of the vertebral column, limbs and hands in adults.

155. Answer (2)

Connective tissues are most abundant and widely distributed in the body of complex animals.

156. Answer (3)

The wall of blood vessels contains smooth muscle fibres which are fusiform in shape, unstriated, uninucleated and involuntary.

157. Answer (4)

Areolar tissue serves as a support framework for epithelium. Adipose tissue is specialised to store fats.

158. Answer (2)

Neuroglia make up more than one-half the volume of neural tissue in our body.

Neurons are the excitable cells.

159. Answer (1)

Tendon is a type of dense regular connective tissue.

160. Answer (4)  
In columnar epithelium, only free surface may have microvilli.
161. Answer (1)  
Testis                      4<sup>th</sup>-6<sup>th</sup> abdominal segments  
Ovary                      2<sup>th</sup>-6<sup>th</sup> abdominal segments  
Spermatheca              6<sup>th</sup> abdominal segment  
Mushroom gland              6<sup>th</sup>-7<sup>th</sup> abdominal segments
162. Answer (2)  
Hepatic or gastic caeca present at the junction of foregut and midgut, secretes digestive juices.
163. Answer (3)  
The next to last nymphal stage of cockroach has wing pads but only adult cockroaches have wings.
164. Answer (1)  
Genital pouch in female cockroach is formed by 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> sterna.
165. Answer (3)  
Ligaments attach one bone to another bone.  
Tendons attach skeletal muscles to bones.
166. Answer (2)  
Cilia on ciliated epithelium in fallopian tubes helps to move ovum from ovary to uterus. It is also present in the inner surface of hollow organs like bronchioles.
167. Answer (1)  
Each organised skeletal muscle is made of a number of muscle bundles or fascicles held together by a common collagenous tissue layer called fascia. Skeletal muscle fibres are voluntary in nature. They contract (shorten) in response to stimulation and then relax (lengthen) to their uncontracted state.
168. Answer (2)  
In each segment, exoskeleton has hardened plates called sclerites (tergites dorsally and sternites ventrally) that are joined to each other by a thin and flexible articular membrane (arthrodial membrane).
169. Answer (3)  
Anterior part of brood or genital pouch contains female gonopore, spermathecal pores and opening of collateral glands.
170. Answer (1)  
With the help of ommatidia, a cockroach can receive several images of an object. The image received by them is compound and made up of large number of separate images which is contributed by single ommatidium. Thus, the image seen by the whole eye is made up of many dark and light spots each contributed by one ommatidium. This kind of vision is known as mosaic vision with more sensitivity but less resolution.
171. Answer (4)  
Tight junctions help to stop substances from leaking across a tissue.  
Adhering junctions perform cementing to keep neighbouring cells together.  
Gap junctions facilitate the cells to communicate with each other by connecting the cytoplasm of adjoining cells for rapid transfer of ions, small molecules and sometimes big molecules.
172. Answer (1)  
Bone marrow in some bones is the site of production of blood cells.
173. Answer (4)  
The respiratory system consists of a network of trachea, that open through 10 pairs of spiracles present on the lateral sides of the body. Tracheal tubes (subdivided into tracheoles) carry oxygen from the air to all the parts.
174. Answer (1)  
The sperms are stored in the seminal vesicles and are glued together in the form of bundles called spermatophores which are discharged during copulation.
175. Answer (4)  
Skeletal muscles are voluntary in nature.
176. Answer (4)  
Chondrocytes in cartilage are enclosed in small cavities within them.
177. Answer (2)  
Neural tissue exerts the greatest control over the body's responsiveness to changing conditions.
178. Answer (3)  
*Periplaneta americana* are about 34-53 mm long.
179. Answer (2)  
A-Crop  
B-Gizzard  
C-Hepatic caecae  
D-Malpighian tubules
180. Answer (2)  
Neuroglial cells protect and support neurons which is responsible for generation of action potential.
181. Answer (2)  
Compound epithelium covers the dry surface of skin, moist surface of buccal cavity, pharynx, inner lining of ducts of salivary glands and pancreatic ducts. Squamous epithelium lines the wall of blood vessels.

182. Answer (4)

Cockroach has determinate cleavage during embryonic development.

183. Answer (3)

Areolar – Loose connective tissue

Ligament – Dense regular connective tissue

Lymph – Specialised connective tissue

184. Answer (4)

Many species of cockroaches are wild and are of no known economic important yet.

185. Answer (1)

There are 12 pairs of alary muscles in cockroach.

### SECTION - B

186. Answer (1)

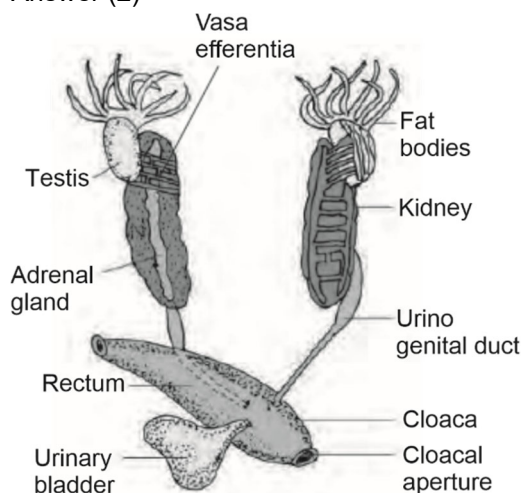


In all connective tissues except blood, the cells secrete fibres of structural proteins called collagen or elastin.

187. Answer (3)

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

188. Answer (2)



189. Answer (4)

Humans have closed circulatory system and they are ureotelic whereas cockroaches have open circulatory system and they are uricotelic.

190. Answer (1)

Anterior end consists of the mouth and the prostomium, a lobe which serves as a covering of the mouth and as a wedge to force open cracks in the soil into which the earthworm may crawl.

191. Answer (3)

Both neurons and muscle fibres show excitability and conductivity.

192. Answer (2)

The development of *P. americana* is paurometabolous.

193. Answer (1)

Peristomium is first true segment in earthworm.

194. Answer (3)

The nervous system of cockroach is spread throughout the body. The head holds a bit of nervous system while the rest is situated along the ventral (belly-side) part of its body.

195. Answer (4)

All voluntary muscle fibres are striated but all striated muscle fibres are not voluntary.

196. Answer (2)

From each testis arises a thin vas deferens, which opens into ejaculatory duct through seminal vesicle. The ejaculatory duct opens into male gonopore situated ventral to anus.

197. Answer (4)

Cells, tissues, organs and organs system split up the work in a way that ensures the survival of the body as a whole and exhibit division of labour.

198. Answer (4)

Coelenterates (ex-*Hydra*, *Adamsia*) have tissue level of body organisation.

199. Answer (3)

Limbs bones serve weight-bearing function. They also interact with skeletal muscles attached to them to bring about movements.

200. Answer (3)

Fibroblasts secrete fibres and modified polysaccharides.