

ISO 9001: 2015 Certified



NEET FRESH 2023-24

Mark
720

Group
PCB

PCB EXAM - 60

Date : 27/12/2023
Time : 3:20 Hours

Answer Key Version - P (NEET FRESH All Batches)

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PHYSICS

SECTION - A (35 Questions)

01. (1) Initial energy of body =

$$\frac{1}{2}mv^2 = \frac{1}{2} \times 1 \times (20)^2 = 200J$$

A part of this energy consumes in doing work against gravitational force and remaining part consumes in doing work against air friction.

i.e. $W_T = W_{\text{grav.}} + W_{\text{air friction}}$

$$\Rightarrow 200 = 1 \times 10 \times 18 + W_{\text{air}} \Rightarrow W_{\text{air}} = 20J$$

02. (4) $F_c = \frac{mv_1^2}{r} = \frac{2mv_2^2}{(r/2)} = \frac{4mv_2^2}{r}$

So $v_1 = 2v_2$

03. (3)

$$W = Fs \cos \theta \Rightarrow \cos \theta = \frac{W}{Fs} = \frac{25}{50} = \frac{1}{2} \Rightarrow \theta = 60^\circ$$

04. (1) When particle moves in a circle, then the

resultant force must satisfy, $F = \frac{mv^2}{l}$

This resultant force is directed towards the centre and it is called centripetal force. This force originates from the tension T.

Hence, $F = \frac{mv^2}{l} = T$

05. (1)

$$v = \frac{dx}{dt} = 3 - 8t + 3t^2$$

$\therefore v_0 = 3 \text{ m/s}$ and $v_4 = 19 \text{ m/s}$

$W = \frac{1}{2}m(v_4^2 - v_0^2)$ [According to work energy theorem]

$$= \frac{1}{2} \times 0.03 \times (19^2 - 3^2) = 5.28 \text{ J}$$

06. (1) Angular velocity = $\frac{2\pi}{T} = \frac{2\pi}{24} \text{ rad/hr} =$

$$\frac{2\pi}{86400} \text{ rad/s}$$

07. (4) $U \propto x^2 \Rightarrow \frac{U_2}{U_1} = \left(\frac{x_2}{x_1}\right)^2 = \left(\frac{0.1}{0.02}\right)^2 = 25$

$\therefore U_2 = 25U$

08. (4)

09. (1)

10. (1) $P = E \Rightarrow mv = \frac{1}{2}mv^2 \Rightarrow v = 2 \text{ m/s}$

11. (2) For banking $\tan \theta = \frac{V^2}{Rg}$

$$\tan 45 = \frac{V^2}{90 \times 10} = 1$$

$V = 30 \text{ m/s}$

12. (4)

Velocity at B when dropped from A where $AC = 5$

$$v^2 = 0 + 2g(S - x)$$

or $v^2 = 2g(S - x)$... (i)

Potential energy at B = mgx ... (ii)

\therefore Kinetic energy = $3 \times$ potential energy

$$\therefore \frac{1}{2}m \times 2g(S - x) = 3 \times mgx$$

$$\Rightarrow S - x = 3x \text{ or } S = 4x \text{ or } x = S/4$$

From (i),

$$v^2 = 2g(S - x) = 2g\left(S - \frac{S}{4}\right) = \frac{2g \times 3S}{4} = \frac{3gS}{2}$$

13. (2) $v_{\text{max}} = \sqrt{\mu rg} = \sqrt{0.5 \times 40 \times 9.8} = 14 \text{ m/s}$

14. (4) $\vec{F} = 2t\hat{i} + 3t^2\hat{j}$

$$m \frac{d\vec{v}}{dt} = 2t\hat{i} + 3t^2\hat{j} \quad (m = 1 \text{ kg})$$

$$\Rightarrow \int_0^{\vec{v}} d\vec{v} = \int_0^t (2t\hat{i} + 3t^2\hat{j}) dt \Rightarrow \vec{v} = t^2\hat{i} + t^3\hat{j}$$

Power = $\vec{F} \cdot \vec{v} = (2t^3 + 3t^5)W$

15. (2) Applying Newton's second law to a particle of mass m moving in a circular orbit of radius r with speed v , we get

$$\frac{mv^2}{r} = \frac{k}{r} \Rightarrow v = \sqrt{\frac{k}{m}}$$

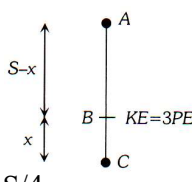
Time period,

$$T = \frac{2\pi r}{v} = \frac{2\pi r}{\sqrt{\frac{k}{m}}} = 2\pi r \sqrt{\frac{m}{k}} \Rightarrow T \propto r.$$

16. (1) $p = \frac{mgh}{1} = \frac{200 \times 10 \times 200}{10} = 40 \text{ kW}$

17. (2) $N - mg = \frac{mg}{2} \Rightarrow N = \frac{3mg}{2}$

$$S = ut + \frac{1}{2}\left(\frac{g}{2}\right)t^2 = \frac{gt^2}{4} [\because u = 0]$$



Now, work done

$$W = \vec{N} \cdot \vec{S} = \left(\frac{3mg}{2} \right) \left(\frac{1}{4} gt^2 \right) = \frac{3mg^2 t^2}{8}$$

18. (4) Angular acceleration = $\frac{d^2\theta}{dt^2} = 2\theta_2$

19. (3) $K = \frac{P^2}{2m}$

$$K' = \frac{(1.2P)^2}{2m} \Rightarrow \frac{K' - K}{K} = (1.2)^2 - 1 = 0.44$$

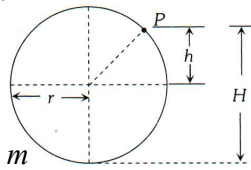
$\Rightarrow 44\%$ increase.

20. (3) As we know for hemisphere the particle will leave the sphere at height $h = 2r/3$

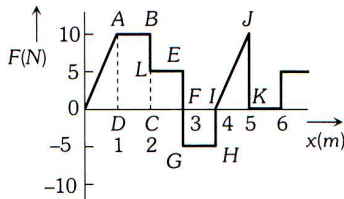
$$h = \frac{2}{3} \times 21 = 14 \text{ m}$$

But from the bottom

$$H = h + r = 14 + 21 = 35 \text{ m}$$



21. (2) Work done = area under F-x graph
= area of rectangle ABCD + area of rectangle LCFE
+ area of rectangle CFIH + area of triangle IJK



$$= (2-1) \times (10-0) + (3-2)(5-0) + (4-3)(-5-0) + \frac{1}{2}(5-4)(10-0) = 15 \text{ J.}$$

22. (3)

23. (3) work done on the ball by the table surface is the work done by the frictional force. Since a ball moves on a frictionless inclined table (or smooth surface), therefore frictional force is zero. Hence the work done on the ball by the table surface is zero.

24. (1) Particle periphery will have both radial and tangential acceleration

$$a_t = R\alpha = 0.5 \times 2 = 1 \text{ m/s}^2$$

$$\omega = \omega_0 + \alpha t$$

$$\omega = 0 + 2 \times 2 = 4 \text{ rad/sec}$$

$$a_c = \omega^2 R = (4)^2 \times 0.5 = 16 \times 0.5 = 8 \text{ m/s}^2$$

$$a_{total} = \sqrt{a_t^2 + a_c^2} = \sqrt{1^2 + 8^2} \approx 8 \text{ m/s}^2$$

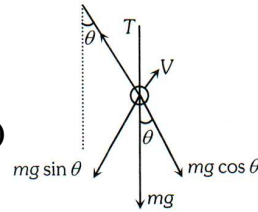
25. (4) Kinetic energy for first condition

$$= \frac{1}{2} m (v_2^2 - v_1^2) = \frac{1}{2} m (20^2 - 10^2) = 150 \text{ mJ}$$

K.E. for second condition =

$$\frac{1}{2} m (10^2 - 0^2) = 50 \text{ mJ}$$

$$\therefore \frac{(K.E.)I}{(K.E.)II} = \frac{150 \text{ mJ}}{50 \text{ mJ}} = 3$$



26. (2) From figure $T = mg \cos \theta + mv^2/L$

27. (3) By definition.

28. (2) By using equation $\omega^2 = \omega_0^2 - 2\alpha\theta$

$$\left(\frac{\omega_0}{2} \right)^2 = \omega_0^2 - 2\alpha(2\pi n) \Rightarrow \alpha = \frac{3}{4} \frac{\omega_0^2}{4\pi \times 36}$$

(n = 36) ... (i)

Now let fan completes total n' revolution from the starting to come rest.

$$0 = \omega_0^2 - 2\alpha(2\pi n') \Rightarrow n' = \frac{\omega_0^2}{4\alpha\pi}$$

Substituting the value of alpha from equation (i)

$$n' = \frac{\omega_0^2}{4\pi} \frac{4 \times 4\pi \times 36}{3\omega_0^2} = 48 \text{ revolution}$$

Number of rotation = 48 - 36 = 12

29. (3) Ratio of their kinetic energy is given as

$$\frac{KE_1}{KE_2} = \frac{(1/2)m_1 v_1^2}{(1/2)m_2 v_2^2}$$

$$v^2 = 2gs \quad (\text{zero initial velocity})$$

which is same for both

$$\therefore \frac{KE_1}{KE_2} = \frac{m_1}{m_2} = \frac{2}{4} = \frac{1}{2}$$

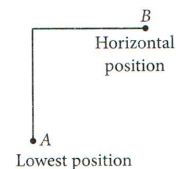
30. (1) From $v = r\omega$, when v is constant $r\omega = \text{constant}$

$$\therefore \omega \propto \frac{1}{r}$$

31. (1) The total energy at A = the total energy at B

$$\Rightarrow \frac{1}{2} mu^2 = \frac{1}{2} mv^2 + mgl$$

$$\Rightarrow v = \sqrt{u^2 - 2gl}$$



The change in magnitude of velocity = $\sqrt{u^2 + v^2}$

$$= \sqrt{2(u^2 - gl)}$$

32. (4) In vertical circular motion, tension in the wire is maximum at the lowermost point, so the wire is most likely to break when the mass is at the lowermost point.

33. (1)

34. (1) $W = \int_{x_1}^{x_2} f dx = \int_{x_1}^{x_2} kx dx = \frac{1}{2} k(x_2^2 - x_1^2)$

$W_A = \frac{1}{2} k[(-2)^2 - (-4)^2] = -6k$: negative

$W_B = \frac{1}{2} k[(-4)^2 - (-2)^2] = 6k$: positive

$W_C = \frac{1}{2} k[2^2 - (-2)^2] = \text{zero}$

Choice (1) is correct.

35. (1)

Section - B (Attempt Any 10 Questions)

36. (1) $P.t = \frac{1}{2} mv^2 \Rightarrow v = \left(\sqrt{\frac{2P}{m}} \right) t^{1/2}$

$s = \int_0^t v dt = \sqrt{\frac{2P}{m}} \int_0^t t^{1/2} dt = \sqrt{\frac{2P}{m}} \cdot \frac{t^{3/2}}{3/2}; s = \sqrt{\frac{8P}{9m}} \cdot t^{3/2}$

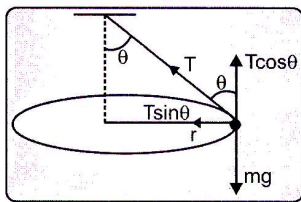
37. (4) $v = 4$ m/s, $h = ?$

$mgh = \frac{1}{2} \times \frac{1}{2} mv^2$

$h = \frac{1}{4} \frac{v^2}{g} = \frac{1}{4} \times \frac{4 \times 4}{10} = 0.4$

38. (2)

$T \cos \theta = mg \dots\dots(1) \quad T \sin \theta = \frac{mv^2}{r} \dots\dots(2)$



divide (2) with (1)

$\tan \theta = \frac{v^2}{rg} \quad \text{or} \quad \frac{v^2}{r} = g \tan \theta.$

Net force is $F = \frac{mv^2}{r} = mg \tan \theta$
 $= 2 \times 10 \times \frac{1}{\sqrt{3}} \approx 11.3$ N.

39. (3)

Natural length, $l_1 = AB = \frac{2\pi r}{4}$

Extended length $l_2 = AC = 3 \times \frac{2\pi r}{4}$

Increase in length, $x = l_2 - l_1 = \pi r$

Energy stored = $\frac{1}{2} kx^2 = \frac{1}{2} k\pi^2 r^2$

40. (2)

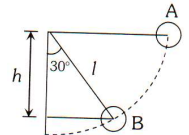
The minimum possible velocity at B is, $v_B = \sqrt{gl}$ then the range for this is

$R = v_B \sqrt{\frac{2h}{g}} = \sqrt{gl} \times \sqrt{\frac{2(2l)}{g}} = 2l$

41. (3) Vertical height = $h = l \cos 30^\circ$

Loss of potential energy = mgh

$= mgl \cos 30^\circ = \frac{\sqrt{3}}{2} mgl$



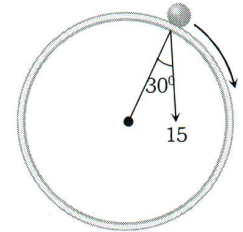
\therefore Kinetic energy gained = $\frac{\sqrt{3}}{2} mgl$

42. (4) $a_c = \frac{V^2}{r}$

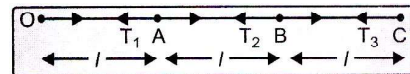
$15 \cos 30^\circ = \frac{V^2}{2.5}$

$V^2 = 32.44$

$V = 5.7$ m/sec



43. (4) Let ω is the angular speed of revolution



$T_2 = m\omega^2 3l$

$T_2 - T_3 = m\omega^2 2l \Rightarrow T_2 = m\omega^2 5l$

$T_1 - T_2 = m\omega^2 l \Rightarrow T_1 = m\omega^2 6l$

$T_3 : T_2 : T_1 = 3 : 5 : 6$

44. (1) Kinetic energy = $\frac{p^2}{2m}$

$\therefore \frac{E_1}{E_2} = \frac{p_1^2 / 2m_1}{p_2^2 / 2m_2} \Rightarrow \frac{E_1}{E_2} = \frac{m_2}{m_1}$

or $E_1 < E_2$ (as $m_1 > m_2$)

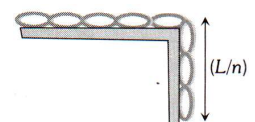
45. (3) $\int F dt = \Delta p$

$\Rightarrow \frac{1}{2} \times 4 \times 3 - \frac{1}{2} \times 1.5 \times 2 = p_f - 0 \Rightarrow p_f = 6 - 1.5 = \frac{9}{2}$

K.E. = $\frac{p^2}{2m} = \frac{81}{4 \times 2 \times 2}$; K.E. = 5.06 J

46. (2) Mass of the hanging part = M/n

$h_{COM} = \frac{L}{2n}$



Work done $W = mgh_{\text{COM}} =$

$$\left(\frac{M}{n}\right)g\left(\frac{L}{2n}\right) = \frac{MgL}{2n^2}$$

47. (4) $\frac{d\omega}{dt} = P$

$$\omega = Pt = \frac{1}{2}mV^2 \text{ So } \sqrt{\frac{2Pt}{m}} = V$$

$$\text{Hence } a = \frac{dV}{dt} = \sqrt{\frac{2P}{m}} \cdot \frac{1}{2\sqrt{t}}$$

$$\text{So from } = ma = \sqrt{\frac{2Pm^2}{m}} \cdot \frac{1}{2\sqrt{t}} = \sqrt{\frac{Pm}{2t}}$$

48. (4) $a = \frac{0.1x}{10} = 0.01x = V \frac{dV}{dx}$

$$\text{So, } \int_{v_1}^{v_2} v dV = \int_{20}^{30} \frac{x}{100} dx$$

$$-\frac{V^2}{2} \Big|_{v_1}^{v_2} = \frac{x^2}{200} \Big|_{20}^{30} = \frac{30 \times 30}{200} - \frac{20 \times 20}{200} = 4.5 - 2 = 2.5$$

$$\frac{1}{2}mv_2^2 = \frac{1}{2}mv_1^2 - 25 = \frac{1}{2} \times 10 \times 10 \times 10 - 25$$

$$= 500 - 25 \text{ J} = 475 \text{ J}$$

49. (4) To complete a vertical circle, speed of A should

$$\text{be } v_A = \sqrt{5gR}$$

using energy conservation

$$mgh = \frac{1}{2}mv_A^2 \quad h = \frac{1}{2} \frac{v_A^2}{g} = \frac{1}{2} \frac{5g}{g} \frac{D}{2} \quad \left(R = \frac{D}{2}\right)$$

$$h = \frac{5D}{4}$$

50. (4) $U = \frac{a}{x^{12}} - \frac{b}{x^6}$

$$F = -\frac{dU}{dx} = +12 \frac{a}{x^{13}} - \frac{6b}{x^7} = 0 \Rightarrow x = \left(\frac{2a}{b}\right)^{1/6}$$

$$U = (x = \infty) = 0$$

$$U_{\text{equilibrium}} = \frac{a}{\left(\frac{2a}{b}\right)^2} - \frac{b}{\left(\frac{2a}{b}\right)} = \frac{b^2}{4a}$$

$$\therefore U(x = \infty) - U_{\text{equilibrium}} = 0 - \left(-\frac{b^2}{4a}\right) = \frac{b^2}{4a}$$

CHEMISTRY

SECTION - A (35 Questions)

51. (4)

$\oplus \text{NH}_4$ has co-ordinate bond because nitrogen donate both of its electron

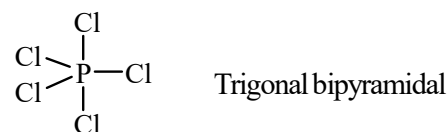
52. (3)

The bond formed by electropositive elements only have no difference in electronegativity and both are metals form metallic bond.

53. (1)

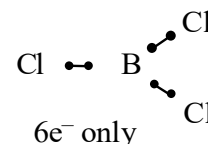
(A)-(iv), (B)-(iii), (C)-(i), (D)-(ii)

54. (3)



55. (1)

The molecule in which central atom has e^- less than $8e^-$ called hypovalent



56. (1)

NaCl is ionic compound and has ionic bond also called as electrovalent bond

57. (4)



58. (3)

$\text{BeCl}_2 \rightarrow sp \rightarrow \text{linear}$.

$\text{BCl}_3 \rightarrow sp^2 \rightarrow \text{triangular planar}$.

59. (3)

Ionic compounds are bad conductor in solid state but good conductor in molten state.

60. (2)

Hydration energy $\propto \frac{\text{charge}}{\text{size}}$

Lithium is smallest therefore have high hydration energy.

61. (2)

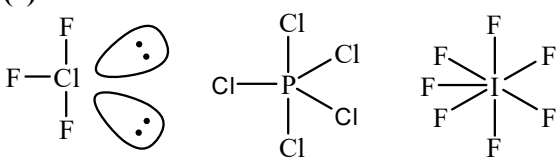
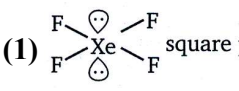
Polarity is due to the difference in electronegativities of two atoms or molecules.

62. (3)

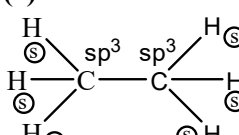
H_2O has non-zero dipole moment. Remaining all have $\mu = 0$ due to cancellation of vectors.

63. (3)

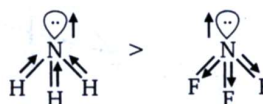
Lattice energy $\propto \frac{\text{charge}}{\text{size}}$

64. (1) Sigma bond is stronger than π bond.
 65. (3) In case of SF_6 resultant dipole moment is zero while all other possess dipole moment.
 66. (2) Anti bonding molecular orbital has high energy than bonding molecular orbital
 67. (3) Peroxide ion is $\text{O}_2^{2-} [\text{O}^- - \text{O}^-]$ hence the metal will have a valency of '2'
 68. (4)

 Every structure has more than 8 bonded e^-
 69. (3) 2
 70. (1)
 Due to high electronegativity difference in HF, H is more electropositive so form strong hydrogen bond
 71. (4) In HF 1s and 2p overlap.
 72. (3)
 For bond formation potential energy should be minimum and attraction should be maximum.
 73. (1) NO and ClO_2
 74. (1) $\text{N}_2 > \text{N}_2^+ > \text{N}_2^- > \text{N}_2^{2-}$
 75. (3)
 $\text{A} \rightarrow 1s^2 2s^2 2p^6 3s^1$ $\text{B} \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^4$
 $\text{A}^+ \rightarrow 1s^2 2s^2 2p^6$ $\text{B}^{2-} \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6$
 $2\text{A}^+ + \text{B}^{2-} \rightarrow \text{A}_2\text{B}$
 76. (2)
 No. of covalent bonds are increasing hence covalent character is increasing.
 77. (3) CN^- and NO^+ are isoelectronic so same bond order
 78. (3) If assertion is true but reason is false
 79. (2) Sigma bond shows free rotation along the axis
 80. (1)
 square planar shape.
 81. (1) o-Salicylic acid
 82. (3) Increases
 83. (1) Increase
 84. (3) Helium molecule does not exist as bond order of $\text{He}_2 = 0$
 85. (3)
 2.5

SECTION - B (Attempt Any 10 Questions)

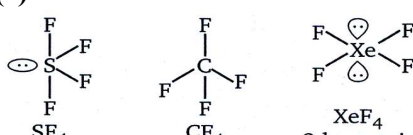
86. (2)
 6 $sp^3 - 5 \sigma$ bonds

87. (1)
 Dipole moment of CO_2 , BF_3 and CCl_4 is 0.

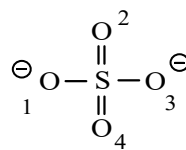


Dipole moment of NH_3 is greater than NF_3 .

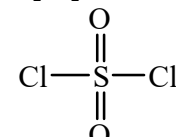
88. (3) XeF_6
 89. (2) Electron gain enthalpy of electronegative element is High
 90. (2)
 Both 'A' and 'R' are true but 'R' is not the correct explanation to 'A'.
 91. (1)
 Smaller the shell no. greater will be the extent of overlapping.
 For same shell no. the order of extent of overlapping is
 $p-p > s-p > s-s$
 hence $1s-1s > 2p-2p > 2s-2p > 2s-2s$

92. (4)

 1 lone pair 0 lone pair 2 lone pair

93. (2)
 I - C, II - A, III - D, IV - E
 94. (2)
 If statement-1 is false but statement-2 is true.
 95. (1)
 If statement-1 is true but the statement-2 is false.
 96. (4)
 'A' is false but 'R' is true
 97. (1)



The structure of SO_4^{2-} is shown above

98. (2)
 SO_2Cl_2

 Sulphur can make maximum 6 bonds.
 99. (4)
 $N_b < N_a$ or $N_a = N_b$
 i.e., a negative or zero bond order corresponds to an unstable molecule.
 100. (1)
 More electronegative atoms always keep on axial position