ISO 9001: 2015 Certified

CAREER INSTITUTE PVT.LTD.

NEET FRESH 2023-24

Mark 720	Group PCB	PCB EXAM - 60	Date : 27/12/2023 Time : 3:20 Hours

Answer Key Version - S (NEET FRESH All Batches)

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Biology

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PHYSICS

SECTION - A (35 Questions)

01. **(1)** $p=\frac{mgh}{1}=\frac{200\times10\times200}{10}=40kW$

02. **(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

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

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

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

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

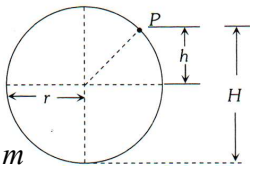
$\Rightarrow 44\%$ increase.

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

$$h=\frac{2}{3}\times21=14\text{ m}$$

But from the bottom

H = h + r = 14 +21 = 35 m

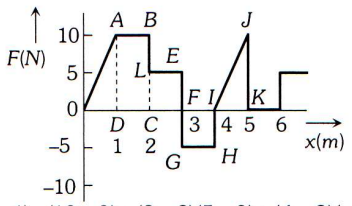


06. **(2)**

Work done = area under F-x graph

= area of rectangle ABCD + area of rectangle LCFE

+ area of rectangle CFIH + area of triangle IJK



$=(2-1)\times(10-0)+(3-2)(5-0)+(4-3)(-5-0)$

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

07. **(3)**

08. **(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.

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

$$a_t=R\alpha=0.5\times2=1\text{ m/s}^2$$

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

$$\omega=0+2\times2=4\text{ rad/sec}$$

$$a_c=\omega^2R=(4)^2\times0.5=16\times0.5=8\text{ m/s}^2$$

$$a_{total}=\sqrt{a_t^2+a_c^2}=\sqrt{1^2+8^2}\approx8\text{ m/s}^2$$

10. **(4)** Kinetic energy for first condition

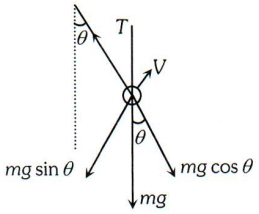
$$=\frac{1}{2}m\left(v_2^2-v_1^2\right)=\frac{1}{2}m\left(20^2-10^2\right)=150\text{ mJ}$$

K.E. for second condition =

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

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

11. **(2)**



From figure T = mg cos θ + mv^2/L

12. **(3)** By definition.

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

$$\left(\frac{\omega_0}{2}\right)^2=\omega_0^2-2\alpha(2\pi n)\Rightarrow\alpha=\frac{3}{4}\frac{\omega_0^2}{4\pi\times36},$$

$(n=36)$ ....(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 α from equation (i)

$$n'=\frac{\omega_0^2}{4\pi}\frac{4\times4\pi\times36}{3\omega_0^2}=48\text{ revolution}$$

Number of rotation = 48 – 36 = 12

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

$$\frac{KE_1}{KE_2}=\frac{(1/2)m_1v_1^2}{(1/2)m_2v_2^2}$$

$v^2=2gs$ (zero initial velocity)

which is same for both

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

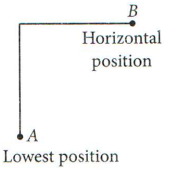
15. **(1)** From $v=r\omega$, when v is constant $r\omega$ = constant

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

16. **(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 = $\sqrt{u^2 + v^2}$

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

17. **(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.

18. **(1)**

19. **(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

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

Choice (1) is correct.

20. **(1)**

21. **(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. $W_T = W_{grav.} + W_{air\ friction}$

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

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

So $v_1 = 2v_2$

23. **(3)**

$W = Fs\cos\theta \Rightarrow \cos\theta = \frac{W}{Fs} = \frac{25}{50} = \frac{1}{2} \Rightarrow \theta = 60^0$

24. **(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, $F = \frac{mv^2}{l} = T$

25. **(1)**

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

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

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

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

26. **(1)** Angular velocity = $\frac{2\pi}{T} = \frac{2\pi}{24}$ rad/hr = $\frac{2\pi}{86400}$ rad/s

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

$\therefore U_2 = 25U$

28. **(4)**

29. **(1)**

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

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

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

V = 30 *m/s*

32. **(4)**

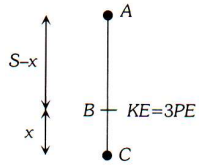
Velocity at B when dropped from A where AC = 5

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

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

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

$\because$ Kinetic energy = 3 × potential energy



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

$\Rightarrow S - x = 3x$ or $S = 4x$ or x= S/4

From (i),

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

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

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

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

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

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

35. **(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,

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

Section - B (Attempt Any 10 Questions)

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

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

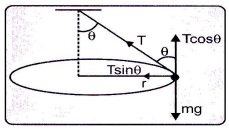
37. **(4)** $v = 4$ m/s, h = ?

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

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

38. **(2)**

$$T\cos\theta = mg \text{.....(1)} \quad T\sin\theta = \frac{m\upsilon^2}{r} \text{.....(2)}$$



divide (2) with (1)

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

Net force is $F = \frac{m\upsilon^2}{r} = mg\tan\theta$

$$= 2 \times 10 \times \frac{1}{\sqrt{3}} \simeq 11.3 \text{ N}.$$

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

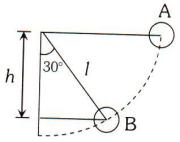
40. **(2)** The minimum possible velocity at B is , $\upsilon_B = \sqrt{gl}$ then the range for this is

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

41. **(3)** Vertical height $= h = l\cos 30°$

Loss of potential energy $= mgh$

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



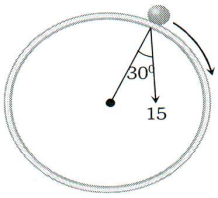
$\therefore$ Kinetic energy gained $= \frac{\sqrt{3}}{2}mgl$

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

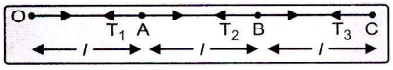
$$15\cos 30^0 = \frac{V^2}{2.5}$$

$$V^2 = 32.44$$

$$V = 5.7\, m/\text{sec}$$



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 $= \frac{p^2}{2m}$

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

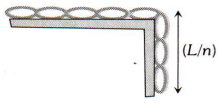
or $E_1 < E_2$ (as $m_1 > m_2$)

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 $W = mgh_{COM} =$

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

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

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

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

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

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

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

$-\frac{V^2}{2}\Big|_{v_1}^{v_2} = \frac{x^2}{200}\Big|_{20}^{30} = \frac{30\times30}{200} - \frac{20\times20}{200} = 4.5 - 2 = 2.5$

$\frac{1}{2}mv_2^2 = \frac{1}{2}mv_1^2 - 25 = \frac{1}{2}\times10\times10\times10 - 25$

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

49. **(4)** To complete a vertical circle, speed of A should be $v_A = \sqrt{5gR}$

using energy conservation

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

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

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

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

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

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

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

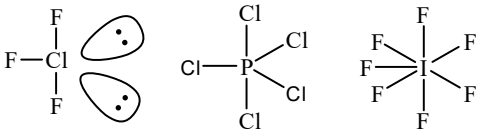
CHEMISTRY

SECTION - A (35 Questions)

51. **(2)**
Anti bonding molecular orbital has high energy than bonding molecular orbital

52. **(3)**
Peroxide ion is $O_2^{2-}[\ ^-O\ -O^-]$
hence the metal will have a valency of '2'

53. **(4)**



Every structure has more than 8 bonded e^-

54. **(3)**
2

55. **(1)**
Due to high electronegativity differene in HF, H is more electropositive so form strong hydrogen bond

56. **(4)**
In HF 1s and 2p overlap.

57. **(3)**
For bond formation potential energy should be minimum and attraction should be maximum.

58. **(1)**
NO and ClO_2

59. **(1)**
$N_2 > N_2^+ > N_2^- > N_2^{-2}$

60. **(3)**
$A \rightarrow 1s^2\ 2s^2\ 2p^6\ 3s^1$ $B \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^4$
$A+ \rightarrow 1s^2 2s^2 2p^6$ $B^{2-} \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6$
$2A^+ + B^{2-} \rightarrow A_2B$

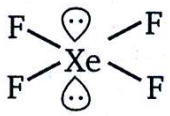
61. **(2)**
No. of covalent bonds are increasing hence covalent character is increasing.

62. **(3)**
CN^- and NO^+ are isoelectronic so same bond order

63. **(3)**
If assertion is true but reason is false

64. **(2)**
Sigma bond shows free rotation along the axis

65. **(1)**



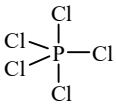
square planar shape.

66. **(1)** o-Salicylic acid
67. **(3)** Increases
68. **(1)** Increase
69. **(3)**
Helium molecule does not exist as bond order of $He_2 = 0$
70. **(3)** 2.5
71. **(4)** $\overset{\oplus}{N}H_4$ has co-ordinate bond because nitrogen donate both of its electron
72. **(3)**

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

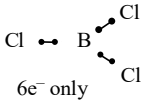
73. **(1)**
(A)-(iv), (B)-(iii), (C)-(i), (D)-(ii)

74. **(3)**



Trigonal bipyramidal

75. **(1)**
The molecule in which central atom has $e^{\ominus}$ less than $8e^{\ominus}$ called hypovalent



76. **(1)**
NaCl is ionic compound and has ionic bond also called as electrovalent bond

77. **(4)**

$\underset{\text{Linear shape}}{H-C\equiv C-H}$ $\underset{\text{Linear shape}}{O=N=O}$

78. **(3)**
$BeCl_2 \rightarrow sp \rightarrow$ linear.
$BCl_3 \rightarrow sp^2 \rightarrow$ triangular planar.

79. **(3)**
Ionic compounds are bad conductor in solid state but good conductor in molten state.

80. **(2)**

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

Lithium is smallest therefore have high hydration energy.

81. **(2)**
Polarity is due to the difference in electronegativities of two atoms or molecules.

82. **(3)**
H_2O has non-zero dipole moment. Remaining all have $\mu = 0$ due to cancellation of vectors.

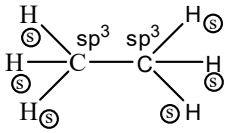
83. **(3)** Lattice energy $\propto \frac{\text{charge}}{\text{size}}$

84. **(1)** Sigma bond is stronger than π bond.

85. **(3)**
In case of SF_6 resultant dipole moment is zero while all other possess dipole moment.

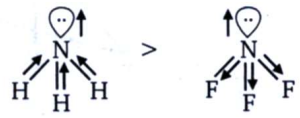
SECTION - B (Attempt Any 10 Questions)

86. **(2)**



6 sp^3 – 5 σ 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.

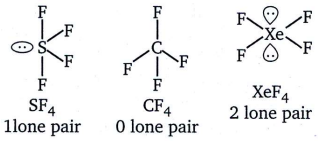
88. **(3)**
XeF_6

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)**



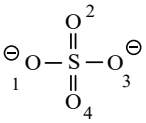
93. **(2)**
I – C, II – A, III – D, IV – E

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.

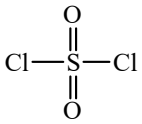
96. **(4)** 'A' is false but 'R' is true

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