ISO 9001: 2015 Certified

CAREER INSTITUTE PVT.LTD.

NEET FRESH 2023-24

Mark 720	Group PCB	PCB EXAM - 59	Date : 24/12/2023 Time : 3:20 Hours

Answer Key Version - Q (NEET FRESH All Batches)

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PHYSICS

SECTION - A (35 Questions)

01. **(3)** $w - f = (w/g)a$ or $f = w\left(1 - \frac{a}{g}\right)$

02. **(3)** Area under F -t curve = change in momentum
$20 \times 1 = 2(v - 0) \Rightarrow v = 10$ m/s

03. **(3)** L + B = 4.431 but by rule 4.4 cm.

04. **(1)** Momentum carried by each bullet = $M\upsilon$
$= 0.010 \times 500$ kg - ms^{-1} = 5 kg - ms^{-1}
force due to 10 bullets/s = total change in momentum in 1s
$= 5 \times 10 = 50$ N

$$\text{acceleration} = \frac{50}{200}\text{ms}^{-2} = 25\text{cm}^{-2}$$

05. **(4)** Rocket exerts force on gases and gases exert force on the rocket in opposite direction.

06. **(1)** Here, A = 2.5 ms^{-1} ± 0.5 ms^{-1}, B = 0.10s±0.01s
AB = (2.5 ms^{-1}) (0.10s) = 0.25m

$$\frac{\Delta AB}{AB} = \left(\frac{\Delta A}{A} + \frac{\Delta B}{B}\right) = \left(\frac{0.5}{2.5} + \frac{0.01}{0.10}\right) = 0.3$$

$\Delta AB = 0.3 \times 0.25m = 0.075m = 0.08m$
(Round off to two significant figures)
The value of AB (0.25 ± 0.08) m

07. **(3)** As, $a = \frac{\Delta\upsilon}{\Delta t} = \frac{\upsilon}{m}.\frac{\Delta m}{\Delta t}$

$$= \frac{50}{2} \times 0.1 = 2.5\text{ms}^{-1}$$

08. **(4)**

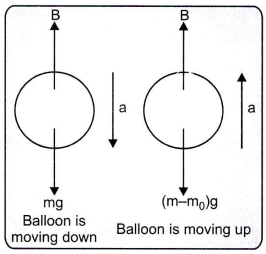
09. **(1)** The water jet striking the block at the rate of 1kg/s at a speed of 5m/s will exert a force on the blank

$$F = \upsilon\frac{dm}{dt} = 5 \times 1 = 5N$$

Under the action of this force of 5N, the block of mass 2kg will move with an acceleration given by

$$a = \frac{F}{m} = \frac{5}{2} = 2.5\text{m/s}^2$$

10. **(1)** Forces acting on balloon are its weight and buoyant force (B). The buoyant force will be constant as there is no charge in volume of the balloon.
When balloon is descending down
$mg - B = ma$ (i)
When balloon is moving up
$B - (m - m_0)g = (m - m_0)a$ (ii)



Equation (i) + equation (ii)

$\Rightarrow mg - mg + m_0g = ma + ma - m_0a$

$$\Rightarrow m_0 = \frac{2ma}{g + a}$$

11. **(1)**

$$R.D. = \frac{\text{wt in air}}{\text{loss in wt}} = \frac{5.00 \pm 0.05}{(5.00 \pm 0.05) - (4.00 \pm 0.05)}$$

$$= \frac{5.00 \pm 0.05}{1.00 \pm 0.1}$$

$$= \frac{5.00}{1.00} \pm \left(\frac{0.05}{5.00} + \frac{0.1}{1.00}\right) \times 100\% = 5.0 \pm 11\%$$

12. **(2)** Person will feel his weight less when the lift goes down with some acceleration.

13. **(3)** The acceleration of both the blocks = $\frac{15}{3x} = \frac{5}{x}$

$$\therefore \quad \text{Force on } B = \frac{5}{x} \times 2x = 10N$$

14. **(2)** Average value

$$= \frac{2.63 + 2.56 + 2.42 + 2.71 + 2.80}{5} = 2.62\,s$$

Now $|\Delta T_1| = 2.63 - 2.62 = 0.01$

$|\Delta T_2| = 2.62 - 2.56 = 0.06$

$|\Delta T_3| = 2.62 - 2.42 = 0.20$

$|\Delta T_4| = 2.71 - 2.62 = 0.09$

$|\Delta T_5| = 2.80 - 2.62 = 0.18$

Mean absolute error

$$\Delta T = \frac{|\Delta T_1| + |\Delta T_2| + |\Delta T_3| + |\Delta T_4| + |\Delta T_5|}{5}$$

$$= \frac{0.54}{5} = 0.108 = 0.11s$$

15. **(3)** $N = (10 + 5)(g + a) = 15\,(10 + 3) = 195$N

16. **(4)** The tension in massless spring at every point is same and in this case it is

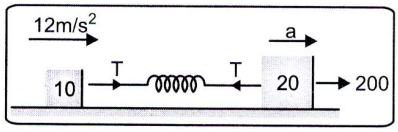
$$T = \frac{2m_1m_2}{m_1+m_2}g$$

and reading is $\frac{T}{g}$.

17. **(1)**

18. **(4)**

19. **(2)**



$T = 10 \times 12 = 120$

$200 - T = 20a \Rightarrow a = 4\text{m/s}^2$

20. **(2)** Since downward force along the inclined plane $= mg\sin\theta = 5 \times 10 \times \sin 30^\circ = 25\text{N}$

21. **(1)** $\text{L.C.} = \frac{\text{pitch}}{\text{no. of division}} = \frac{2}{4\times 50} = 0.01$ mm

22. **(1)** Acceleration at $t = 1\text{s}$, $a_1 = \frac{3.6}{2} = 1.8\,\text{m/s}$

$T = m(g + a) = 1500\ (9.8 + 1.8) = 17400$ N

23. **(1)** 29 MSD = 30 VSD

$1\text{ VSD} = \frac{29}{30}\text{MSD}$

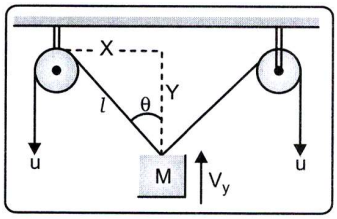
L.C. = 1 MSD – 1 VSD

$= \left(1-\frac{29}{30}\right)MSD = \frac{1}{30}MSD$

$= \frac{1}{30}MSD$

$= \frac{1}{30}\times 0.5 = 1\text{ min}$

24. **(2)**



(i) $x^2 + y^2 = l^2$

(ii) $2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 2l\frac{dl}{dt}$

$\frac{dx}{dt} = 0$, since x is constant

$V_y = \frac{u}{y/l} = \frac{u}{\cos\theta}$

25. **(2)** $\mathbf{V} = \frac{distace}{time} = \frac{13.8}{4.0} = 3.45$

$\frac{\Delta V}{V} = \frac{\Delta d}{d} + \frac{\Delta t}{t} = \frac{0.2}{13.8} + \frac{0.3}{4.0} = 0.089$

$\Delta V = 0.089 \times 3.45 = 0.30$

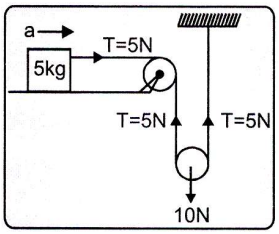
$\therefore$ Velocity $= (3.45 \pm 0.3)$ m/s

26. **(3)** 10m rope has mass = 10kg

So, 3m rope will have mass $= \frac{10}{10} \times 3 = 3\text{kg}$

Tension at point P is $T = (10 + 3)g = 130\text{N}$

27. **(2)** $T = 5a$



$5 = 5a$

or $a = 1\text{m/s}^2$

28. **(2)** Impulse =

$m\upsilon - mu = m\times 0 - 0.1\times\frac{4}{2} = -0.2\text{kms}^{-1}$

29. **(3)** L.C. 1 MSD – 1 VSD

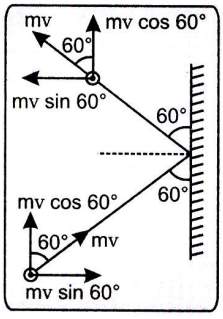
= 0.02 = 0.1 – 1 VSD

1 VSD = 0.08

but $1\text{ VSD} = \frac{\text{vernier scale length}}{\text{No. of division}}$

$\frac{m}{n} = 0.08$ So option (3) is correct.

30. **(3)**



Change in momentum along the wall

$= m\upsilon\cos 60^\circ - m\upsilon\cos 60^\circ = 0$

Change in momentum perpendicular to the wall

$= m\upsilon\sin 60^\circ - (-m\upsilon\sin 60^\circ)$

$= 2mv\sin 60^\circ$

$\therefore$ Applied force

$= \dfrac{\text{Change in momentum}}{\text{Time}}$

$= \dfrac{2mv\sin 60^\circ}{0.20}$

$= \dfrac{2\times 3\times 10\times\sqrt{3}}{2\times 0.20} = 50\times 3\sqrt{3}$

31. **(2)**

32. **(2)** Velocity $v = \sqrt{2gh}$

and momentum $p = mv$

we have $p \propto \sqrt{h}$

Here $\dfrac{p_2}{p_1} = \sqrt{\dfrac{h_2}{h_1}}$

$\dfrac{p_2}{p_1} = \sqrt{\dfrac{2h}{h}} = \sqrt{2}$

$\therefore\ p_2 = 1.414\,p_1$

$\%\text{ change} = \dfrac{p_2 - p_1}{p_1}\times 100 = 41\%$

33. **(4)** Given, $p = a + bt + ct^2$

Differentiating with respect to t (time), we get

$\dfrac{dp}{dt} = 0 + b + 2ct$

From Newton's second law of motion,

$F \propto \dfrac{dp}{dt}$

$\Rightarrow F \propto t$, force is dependent linearly on time.

34. **(3)** $u_y = 40\text{m/s}$, $F_v = 5\text{N}$, $m = 5\text{ kg}$

So, $a_y = \dfrac{F_y}{m} = -1\text{m/s}^2$ $\quad (\text{As } v = u + at)$

$\therefore v_y = 40 - 1\times t = 0 \Rightarrow t = 40\text{sec}.$

35. **(3)**

$\rho = \dfrac{m}{v} = \dfrac{4.237}{25} = 1.695$

but by rule $\rho = 1.7\text{ g/cm}^3$

Section - B (Attempt Any 10 Questions)

36. **(1)** $\Delta P = I = (\text{Total Area}) = 0.$

37. **(3)** $T_2 = (2 + 3)g = 5g.$

38. **(2)** $T_2 = (m_2 + m_3)\,a$

$a = \dfrac{40}{10+6+4} = \dfrac{40}{20} = 2\text{m/s}^2.$

$= (6 + 4)\times 2 = 20\text{ N}.$

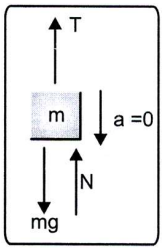
39. **(3)** By FBD $F = mg\sin\theta - \mu\, mg\cos\theta$

40. **(3)**

41. **(3)**

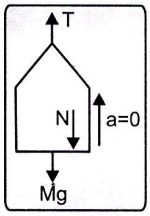
42. **(2)**

43. **(1)** Man:



$T + N = mg$ (i)

Frame:

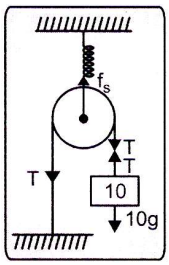


$T - N = Mg$ (ii)

$T = \dfrac{(M+m)g}{2}$

44. **(4)**

45. **(1)** $T = mg = 10\times 10 = 100\text{N}$



$f_s = 2T = 2\times 100 = 200N$

$kx = 200$

$1000x = 200$ or $x = 0.2m = 20$ cm

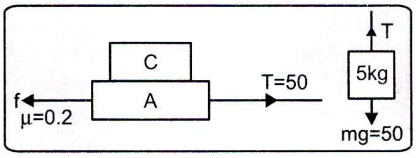
46. **(2)** $f_s(\max) = mg$

$\mu_s F = mg$ or $0.1\times F = 1\times 10$ or $F = 100\text{N}$

$= 150\sqrt{3}$ newton

47. **(1)** System is at rest contract

So,



At rest $f = T = \mu N$

$N = 50/0.2 = 250$ newton

so $m_c = 15$kg

48. **(4)** Friction can cause motion and it is possible even when body is at rest.

49. **(2)**

50. **(3)** For F_{min}

Force should be applied at angle of friction

$\mu = \tan\theta$

$\sqrt{3} = \tan\theta$

$\theta = 60^o$

CHEMISTRY

SECTION - A (35 Questions)

51. **(4)**

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

52. **(3)**

The electronic configuration of La (Z = 57) is [Xe] $5d^1\ 6s^2$. Thereafter, further addition of electrons occurs in the lower energy 4f-orbital till it is exactly half-filled at Eq (Z = 63.). Thus, the electronic configuration of Eu is [Xe] $4f^7\ 6s^2$: Thereafter, addition of next electron does not come in the more stable exactly half-filled $4f^7$ shell but comes in the little higher energy d-orbital. Thus, the electronic configuration of Gd (Z = 64) is [Xe] $4f^7\ 5d^1\ 6s^2$, i.e., option (3) is correct.

53. **(4)**

$I^- > I > I^+$

54. **(3)**

$$E = 13.6Z^2\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$$

$$= 13.6(1)^2\left[\frac{1}{2^2} - \frac{1}{4^2}\right]$$

$$= 13.6 \times \left(\frac{3}{16}\right) = 2.55 \text{ eV}$$

55. **(2)**

No. of magnetic quantum number $= n^2$

$\Rightarrow 4^2 = 16$

56. **(3)**

Assertion and reason both are correct statements and reason is correct explanation for assertion.

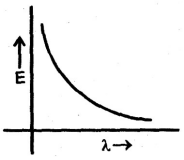
57. **(2)**

$e^- \Rightarrow 8s^2\ 8p^6\ 8d^{10}\ 8f^{14}\ 8g^{18} \rightarrow 50\ e^-$

58. **(4)**

$$E = \frac{hc}{\lambda}$$

$$\boxed{E \propto \frac{1}{\lambda}}$$



59. **(4)**

$$E = \frac{hc}{\lambda} = \frac{(6.6\times10^{-34})(3\times10^8)}{\lambda} = 3.03\times10^{-19}$$

$\lambda = 656$ nm

60. **(4)**

Electronic configuration

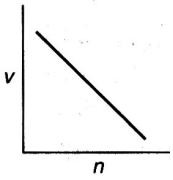
61. **(1)**

$Ti^{4+} \rightarrow 4s^0\ 3d^0$

62. **(2)**

$$v \propto \frac{Z}{n}$$

63. **(4)**



64. **(1)**

P = 9, So $e^- \equiv 9$

i.e. 2, 7

so valency = 1

65. **(4)**

All belong to same group except option (4).

66. **(4)**

According to Bohr

angular momentum of $e^- = n \times \frac{h}{2\pi}$

where n = 1, 2, 3, ...

$$\Rightarrow mvr = \frac{nh}{2\pi} = \frac{5h}{2\pi} = 2.5\frac{h}{\pi}$$

67. **(1)**

For the transition n = 1 to n = 2, the energy change, ΔE is positive, i.e., energy is absorbed. For the

transition n = 5 to n = 1, ΔE is negative, i.e., energy is released.

68. **(2)**
Uut – 113. (13th group)

69. **(3)**
Mn $\rightarrow 4s^2\ 3d^5$
Mn^{x+} have n = 3
So $4s^0\ 3d^3$ i.e., remove $4e^-$
$Mn^{4+} \Rightarrow x = 4$.

70. **(1)**
Number of wave in one complete revolution = shell number.

71. **(1)**

$$\lambda = \frac{h}{mu} = \frac{h}{momentum}$$

72. **(2)**
O < C < S < Se

73. **(4)**
Due to high attraction of +ve charges.

74. **(1)**

$$\lambda = \frac{h}{mv} = \frac{6.6\times10^{-34}}{9.1\times10^{-31}\times10^{7}} = 7.27\times10^{-11}\,m$$

75. **(4)**

Orbital angular momentum $= \sqrt{l(l+1)}\,\frac{h}{2\pi}; l = 1$

for p-orbital.

76. **(3)**
Down the group I.P decreases.

77. **(2)**
Stability increases so energy released.

78. **(4)**
$|\ m\ | \not> l$

79. **(1)**

Angular momentum of orbital $= \frac{nh}{2\pi} = \frac{3h}{2\pi}$

80. **(4)**
Metal oxides are basic
Down the group, basicity increases

81. **(3)**
No. of angular nodes in 4d-orbital $= l = 2$.

82. **(3)**
No. of orbitals in 3rd shell (n = 3) $= n^2 = 3^2 = 9$

83. **(2)**
Amongst isoelectronic species, ionic radii increase as the + ve charge decrease or the negative charge increases. Ionic radii increases in the order:
$Mg^{2+} < Na^+ < F^- < O^{2-}$

84. **(1)**
Within the same shell, screening effect decreases in the order: s > p > d > f, i.e., option (1) is correct.

85. **(2)**
$Cr^{3+} = [Ar]^{18}\ 3d^3$, $Fe^{3+} = [Ar]^{18}\ 3d^5$,
$Mn^{2+} = [Ar]^{18}\ 3d^5$.

SECTION - B (Attempt Any 10 Questions)

86. **(4)**

$$E = \frac{1240}{\lambda_{nm}} = \frac{1240}{91} = 13.6\ eV$$

87. **(2)**
8×10^6 m/s

88. **(2)**
S-subshell should be filled first as it possesses lower energy level than p-subshell.

89. **(1)**
Same orbital can have two different values of spin of e^- of $+\frac{1}{2}$ ad $-\frac{1}{2}$ (spin quantum number).

90. **(1)**
Number of radial nodes = $n - l - 1$
For 3s, $= 3 - 0 - 1 = 2$
2p, $= 2 - 1 - 1 = 0$

91. **(2)**

$$\lambda = \frac{h}{m_e x} = \frac{\eta}{m_p V} = \frac{h}{1840\,m_e V}[m_p = 1840\,m_e]$$

Hence, $V = \frac{x}{1840}$

92. **(3)**
Statement I is false but statement II is true

93. **(2)**
Assertion and reason both are correct statements and reason is correct explanation of assertion

94. **(2)**
Fe^{2+} is $1s^2, 2s^2\ 2p^6, 3s^2\ 3p^6\ 3d^6$

95. **(3)** $\sqrt{r}$

96. **(3)** Electronic configuration

97. **(4)** Both statement I and statement II are true

98. **(1)** Both A and R are correct and R is the correct explanation of A

99. **(1)**
Cr > Mn > V > Ti

100. **(2)**
A-(4), B-(1), C-(2), D-(3)