Since 1999 IIB CAREER INSTITUTE PVT.LTD.

NEET 2023-24

Mark 720	Group PCB	PRE FINAL ROUND - 07	Date : 30/03/2024 Time : 3 :20 Hours

Answer Key Version - P (PCB NEET 2023-24)

Physics

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Chemistry

Biology

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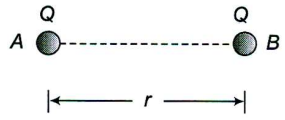
PHYSICS

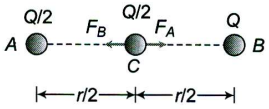
SECTION - A (35 Questions)

01. **(3)** $P=\frac{nhc}{\lambda t}\Rightarrow\frac{n}{t}=\frac{P\lambda}{hc}=\frac{100\times5000\times10^{-10}}{6.6\times10^{-34}\times3\times10^{8}}$
$=2.50\times10^{20}$

02. **(1)** Initially,



$F=k\frac{Q^2}{r^2}$ Finally,



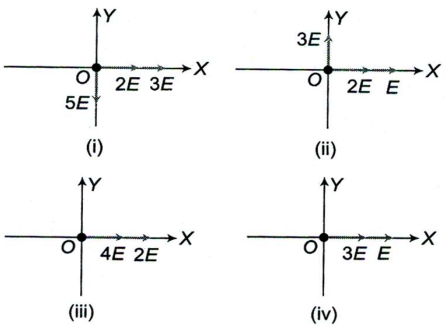
Force on C due to A, $F_A=\frac{k(Q/2)^2}{(r/2)^2}=\frac{kQ^2}{r^2}$

Force on C due to B, $F_B=\frac{KQ(Q/2)}{(r/2)^2}=\frac{2KQ^2}{r^2}$

$\therefore$ Net force on C, $F_{net}=F_B-F_A=\frac{kQ^2}{r^2}=F$

03. **(2)** Negative charges are attracted to surface of M near S by electrostatic induction and positive charges are repelled to surface of M away from S such that entire M still remains neutral (uncharged). Charge on S is also redistributed to have more charge on surface near to M due to the field set up by negative charges on M.

04. **(3)** If electric field due to charge $|q|$ at origin is E, then electric field due to charges $|2q|$, $|3q|$, $|4q|$ and $|5q|$ are respectively $2E$, $3E$, $4E$ and $5E$.



$E_{(i)}=\sqrt{(5E)^2+(5E)^2}=5\sqrt{2}E$

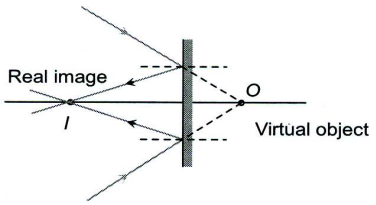
$E_{(ii)}=\sqrt{(5E)^2+(3E)^2}=3\sqrt{2}E$

$E_{(iii)}=4E+2E=6E$ and

$E_{(iv)}=3E+E=4E$

$\Rightarrow\ E_{(i)}>E_{(iii)}>E_{(ii)}>E_{(iv)}$

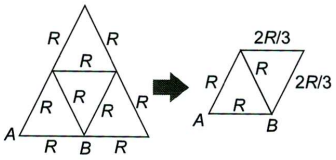
05. **(2)** A Plane mirror can form a real image only for a virtual object.

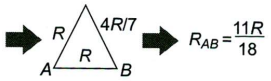


06. **(1)** $n_i^2=n_hn_e\Rightarrow(10^{19})^2=10^{21}\times n_e=10^{17}/m^3$.

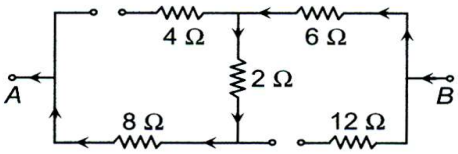
07. **(2)** Zener breakdown can occur in heavily doped diodes. In lightly doped diodes the necessary voltage is higher, and avalanche multiplication is then the chief process involved.

08. **(4)**





09. **(3)** According to the given figure, A is at lower potential w.r.t. B. Hence, both diodes are in reverse biasing, so equivalent circuit can be redrawn as follows:



Equivalent resistance between A and B,
R = 8 + 2 + 6 = 16 Ω

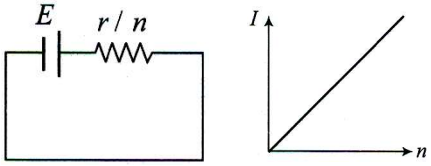
10. **(3)** $v_d=\frac{i}{Ane}$;

As $A\uparrow$ so $v_d\downarrow\Rightarrow v_P>v_Q$

11. **(4)** Infrared radiation is found in Paschen, Brackett and Pfund series and it is obtain when electron transition occur from high energy level to minimum third level.

12. **(1)** (A) → (4) ; (B) → (3) ; (C) → (1) ; (D) → (2)

13. **(1)** If n batteries are in parallel than the circuit can be made as $I=\frac{nE}{r}$



i is directly proportional to n.

14. **(4)** At time t = 0 i.e., when capacitor is charging,

current $i = \frac{2}{1000} = 2\,\text{mA}$

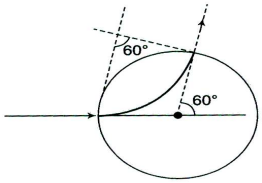
When capacitor is fully charged, no current will pass through it. Hence, current through the circuit is

$i = \frac{2}{2000} = 1\,\text{mA}$

15. **(1)** Balancing length is independent of the cross-sectional area of the wire.

16. **(1)** According to given conditions TIR must take place at both the surfaces *AB* and *AC*. Hence only option (1) is correct.

17. **(3)** Angle rotated in magnetic field = 60°



So time taken should be $\frac{1^{\text{th}}}{6}$ of time period.

$t = \frac{T}{6} = \frac{1}{6}\left(\frac{2\pi m}{qB}\right) = \frac{\pi m}{3qB}$

18. **(3)** Torque acting on the loop is

$\tau = M \times B = MB\sin\theta$

where θ = angle between *M* and *B*

In the figure shown, $\theta = 90^\circ$ because *B* is in plane of loop.

Or $\tau = MB$ = maximum torque

Hence, (3) is correct and choice (4) is wrong.

Since, torque is acting on the loop so loop is not in equilibrium.

19. **(3)** If nothing is said then it is considered that final images is formed at infinite and

$m_\infty \frac{(L_\infty - f_o - f_e).D}{f_o f_e} \simeq \frac{LD}{f_0 f_e}$

$\Rightarrow 400 = \frac{20 \times 25}{0.5 \times f_e}$

$\Rightarrow f_e = 2.5\,\text{cm}.$

20. **(2)** $B = \mu_0\mu_r H \Rightarrow \mu_r \propto \frac{B}{H}$ = slope of *B*-*H* curve

According to the given graph, slope of the graph is highest at point *Q*.

21. **(3)** When key *K* is pressed, currant through the electromagnet starts increasing, i.e. , flux linked with ring increases which produces repulsion effect.

22. **(4)** By Fleming's right hand rule, field due to wire inwards and perpendicular to the plane. This field keeps on decreasing as distance from wire increases. So, potential at *A* will be higher than that at *B*.

23. **(3)** For frequency $0 - f_r$, *Z* decreases, hence I(= *V*/*Z*), increases.

For frequency $f_r - \infty$, Z increases *I* decreases.

24. **(2)** For series LCR circuit,

Voltage, $V = \sqrt{V_R^2 + (V_L - V_C)^2}$

Since, $V_L = V_C$, hence $V = V_R = 220$ V

Also, current $i = \frac{V}{R} = \frac{220}{100} = 2.2\,\text{A}$

25. **(1)** The direction of EM wave is given by the direction of $\vec{E} \times \vec{B}$.

26. **(4)** $P = P_1 + P_2$
$= +12 - 2 = 10$ D

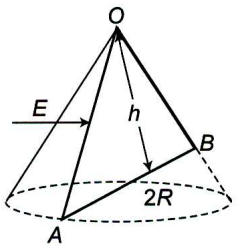
Now $F = \frac{1}{P} = \frac{1}{10}$ m = 10 cm.

27. **(3)** Slit width ratio = 1 : 9
Since slit width ratio is the ratio of intensity and intensity $\propto$ (amplitude)^2
$\therefore I_1 : I_2 = 1:9$
$\Rightarrow a_1^2 : a_2^2 = 1:9$
$\Rightarrow a_1 : a_2 = 1:3$

$\text{Im}in / \text{Im}ax = \left(\frac{a_1 - a_2}{a_1 + a_2}\right)^2 = \left(\frac{2}{4}\right)^2 = \frac{1}{4}$

28. **(4)** In a non-uniform magnetic field both torque and net force acts on the dipole. If magnetic field were uniform, net force on dipole would be zero.

29. **(2)** Plane normal to electric field is a triangle with base length 2*R* and height *h*.



Area of triangle $A = \frac{1}{2} \times 2Rh = Rh$

Electric flux entering the cone = $E_A = ERh$

30. **(4)** Energy required to remove electron in the $n = 2$ state

$= +\frac{13.6}{(2)^2} = +3.4\,\text{eV}$

31. **(2)** $v \propto Z^2$

$\Rightarrow \frac{v_{\text{H}}}{v_{\text{He}}} = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$

$\Rightarrow v_{He} = 4v_H = 4v_0$

32. **(3)** ${}_{85}X^{297} \rightarrow {}_{77}Y^{281} + 4({}_2He^4)$

33. **(1)** Number of fissions per second

$$= \frac{\text{Power output}}{\text{Energy released per fission}}$$

$$= \frac{3.2\times10^6}{200\times10^6\times1.6\times10^{-19}} = 1\times10^{17}$$

$\Rightarrow$ Number of fission per minute

$= 60 \times 1 \times 10^{17} = 6 \times 10^{18}$

34. **(4)** Nuclear radius $r \propto A^{1/3}$, where A is mass number

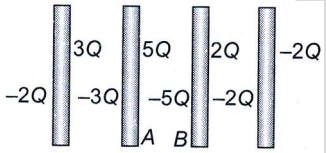
$$r = r_0(27)^{1/3} = 3r_0$$

$$\Rightarrow r_0 = \frac{3.6}{3} = 1.2\text{fm}$$

For 64Cu,

$r = r_0A^{1/3} = 1.2$ fm $(64)^{1/3} = 4.8$ fm

35. **(1)** Distribution of charge before the wire is connected is shown in figure.

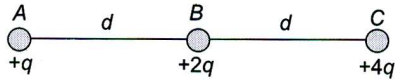


On connecting with wire $5Q$ and $-5Q$ will get neutralized. Hence, $5Q$ charge will flow from A to B.

SECTION - B (Attempt Any 10 Questions)

36. **(1)** The work function has no effect on current so long as $hv > W_0$. The photoelectric current is proportional to the intensity of light. Since there is no change in the intensity of light, therefore $I_1 = I_2$.

37. **(2)** From equilibrium of charge q,



$$k\left[\frac{2q^2}{d^2} + \frac{4q^2}{4d^2}\right] = T_{AB} \Rightarrow T_{AB} = \frac{3kq^2}{d^2}$$

From equilibrium of charge $4q$,

$$k\left[\frac{8q^2}{d^2} + \frac{4q^2}{4d^2}\right] = T_{BC} \Rightarrow T_{BC} = \frac{9kq^2}{d^2}$$

Thus, $\frac{T_{AB}}{T_{BC}} = \frac{1}{3}$

38. **(3)** $R_{t_1} = R_1(1+\alpha_1 t)$ and $R_{t_2} = R_2(1+\alpha_2 t)$

Also $R_{eq.} = R_{t_1} + R_{t_2}$

$$\Rightarrow R_{eq} = R_1 + R_2 + (R_1\alpha_1 + R_2\alpha_2)t$$

$$\Rightarrow R_{eq} = (R_1 + R_2)\left\{1 + \left(\frac{R_1\alpha_1 + R_2\alpha_2}{R_1 + R_2}\right)t\right\}$$

So $\alpha_{eff} = \frac{R_1\alpha_1 + R_2\alpha_2}{R_1 + R_2}$

39. **(3)** Output of upper OR gate $= W + X$

Output of lower OR gate $= W + Y$

Net output, $F = (W + X)(W + Y)$

$= WW + WY + XW + XY$

(Since WW = W)

$= W(1 + Y) + XW + XY$ (Since $1 + Y = 1$)

$= W + XW + XY = W(1 + X) + XY = W + XY$

40. **(3)** For first minima $\sin\theta = \frac{\lambda}{a}$

$$\Rightarrow \frac{1}{2} = \frac{6200\times10^{-10}}{a}$$

$a = 12400 \times 10^{-10}$ m

$a = 1.24$ microns

41. **(3)** As there is no power loses, so input power will be equal to output power.

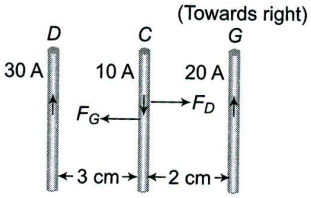
42. **(2)** By using $E(eV) = \frac{12375}{\lambda(\text{Å})}$

$$\Rightarrow \lambda = \frac{12375}{2.48} = 4989.9 \text{ Å} \approx 5000 \text{ Å}$$

43. **(3)** Force on wire C due to wire D.

$$F_D = \frac{\mu_0 i_1 i_2 \ell}{2\pi r}$$

$$F_D = 10^{-7} \times \frac{2\times30\times10}{3\times10^{-2}} \times 25\times10^{-2} = 5\times10^{-4}\text{N}$$



Force on wire C due to wire G. $= 5 \times 10^{-4}$ N.

44. **(2)** Since $m = \frac{f_o}{f_e}$

Also $m = \frac{\text{Angle subtended by the image}}{\text{Angle subtended by the object}}$

$$\therefore \frac{f_o}{f_e} = \frac{\alpha}{\beta} \Rightarrow a = \frac{f_o \times \beta}{f_e} = \frac{60\times2}{5} = 24^\circ$$

45. **(2)** $n_1\lambda_1 = n_2\lambda_2 \Rightarrow n_2 = n_1 \times \frac{\lambda_2}{\lambda_2} = 12 \times \frac{600}{400} = 18$

46. **(2)** $Q = 4(x_2 - x_1)$

47. **(4)** For 1k Ω :

$i_1 = \frac{15}{1} = 15$ mA

For 250 Ω :

$i_{250\Omega} = \frac{20-15}{250} = \frac{5}{250} = \frac{20}{1000} = 20$ mA

$\therefore \quad i_{Zener} = 20 - 15 = 5$ mA

48. **(1)** The emission of an α-particle from the atom of an element reduces its atomic number by 2 and mass number by 4.

Hence, the radioactive emission is as follows:

$${}_Z X^A \xrightarrow{\alpha\text{-particle}} {}_{Z-2} Y^{A-4} + {}_Z He^4 \quad (\alpha\text{-particle})$$

Also from law of conservation of momentum,

$$m \times 0 = m_y v_y + m_\alpha v_\alpha$$

$$= (A-4)v_y + 4v \qquad \Rightarrow \quad v_y = \frac{4v}{A-4}$$

49. **(1)** A diverging lens if ruled out because both x and y are positive values. Both x and y equal 20 cm at their smallest sum, which occurs when

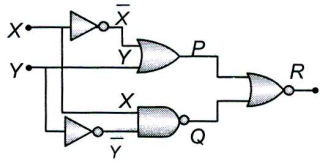
$x + y = 40$ cm $= 4f$

$\therefore \quad f = 10$ cm

The indicates a converging lens of focal length.

= 10 cm

50. **(3)**



The truth table can be written as

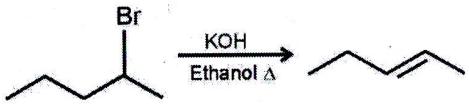
X	Y	$\bar{X}$	$\bar{Y}$	$P = \bar{X} + Y$	$Q = \overline{X.\bar{Y}}$	$R = \overline{P+Q}$
0	1	1	0	1	1	0
1	1	0	0	1	1	0
1	0	0	1	0	0	1
0	0	1	1	1	1	0

Hence $X = 1$, $Y = 0$ gives output $R = 1$

CHEMISTRY

SECTION - A (35 Questions)

51. **(2)**



52. **(2)**

$$PhCH_2Br + Mg \xrightarrow{\text{Dry ether}} PhCH_2MgBr$$

$$\xrightarrow{CH_3OH} PhCH_3$$

53. **(4)** (1)-(iii); (2)-(iv); (3)-(ii); (4)-(i)

54. **(2)** 1 < 2 < 4 < 3

55. **(2)** PH_3 is less basic than NH_3 due to lesser availability of lone pair of electrons.

56. **(2)** In oxyacids of chlorine $HClO$, $HClO_2$, $HClO_3$, $HClO_4$, the Cl central atom is sp^3-hybridised. The half filled unhybridised d-orbitals of Cl and p-orbitals of oxygen overlap to form π-bonds.

57. **(1)** 1-Bromobutane

58. **(4)** (a), (b) and (c)

59. **(4)**

$$\frac{p^0 - p_s}{p_s} = \frac{n}{N} = \frac{18 \times 18}{180 \times 178.2} = 0.01$$

($p^0 = 760$ torr) On solving

$$\frac{760 - p_s}{p_s} = 0.01.$$

$p_s = 752.4$ torr

60. **(2)** Number of ions formed

Urea : NaCl : Na_2SO_4

0.01 mole : 0.01 × 2 mole : 0.01 × 3 mol

1 : 2 : 3

Thus, ΔT_f is also in the same ratio.

($\Delta T_f \alpha$ i, when molality is constant)

61. **(1)** Only primary valencies are ionisable. Presence of two ionisable chloride ions shows that two chlorine atoms satisfy primary valency and remaining one chlorine atom satisfies secondary valency.

62. **(2)** two, tetrahedral

63. **(2)**

64. **(1)** $(CH_3)_3C–I$ and C_2H_5OH

65. **(1)** For spontaneous process,

ΔG = –ve, K > 1 and E^o_{cell} = +ve

66. **(3)** From the given expression

At anode: $A \rightarrow A^+ + e$ At cathode: $B^+ + e \rightarrow B$

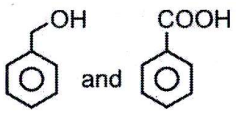
Overall raction is: $A + B^+ \rightarrow A^+ + B$

67. **(2)** Mn^{2+} ($3d^5$) is more stable than Mn^{3+} ($3d^4$).

68. **(2)** Mn^{2+} has most stable configuration, i.e., $3d^5$ (all the five d-orbitals are singly occupied). Hence, to remove electron from Mn^{2+} ion requires more energy, i.e., the third ionisation enthalpy of manganese is highest.

69. **(2)** Stephen reaction

70. **(3)**



71. **(3)** 1 mole Mn_3O_4 lose $\left(6 - \frac{8}{3}\right) \times 3 = 10$ mole e^-.

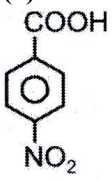
So total charge required = 2 × 10 = 20F.

72. **(2)** H_2 and O_2

73. **(1)** For the first four actinide elements, Th, Pa, U and Np, the difference in energy between 5f and 6d-orbitals is small. Thus, in these elements (and their ions) electrons may occupy the 5f or the 6d levels or sometimes both. Later in the actinide series the 5f-orbitals d become appreciably lower in energy. Thus, from Pu onwards the 5f-shell fills in a regular way and the elements become very similar.

74. **(1)** Both Assertion and Reason are correct statements, and Reason is the correct explanation of the Assertion.

75. **(3)**



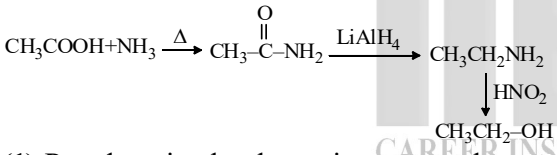
76. **(1)** Only i-amines will given isocyanide test.

77. **(1)** Temperature

78. **(3)** L. mol^{-1} s^{-1}

79. **(3)** Only aliphatic amines prepared.

80. **(2)**



81. **(1)** Pseudo-unimolcualr reactions occur when one or more reactants is in excess. Usually such reactions occur in solvents, which itself is one of the reactants.
e.g.,

$CH_3COOC_2H_5 + H_2O \rightleftharpoons CH_3COCH + C_2H_5OH$

82. **(1)** If both Assertion & Reason are true and the Reason is the correct explanation of the Assertion, then mark (1)

83. **(4)** (1)-(iv); (2)-(iii); (3)-(ii); (4)-(i)

84. **(1)** Sucrose

85. **(4)** (a), (b) & (c)

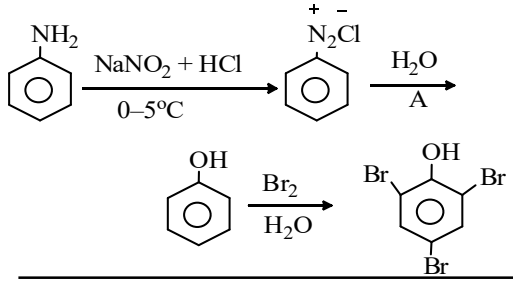
SECTION - B (Attempt Any 10 Questions)

86. **(3)** A unit formed by the attachment of a base to 1' position of sugar is known as nucleotide

87. **(2)** Gluconic acid and saccharic acid

88. **(3)** (Anti Markovnikov's addition).

89. **(3)**



90. **(3)** P (Na_2SO_4) = i CRT = i (0.004) RT
p (glucose) = CRT = 0.010 RT
As solutions are isotonic, i (0.004) RT
= 0.01 RT
This gives i = 2.5

Na_2SO_4	$\rightleftharpoons$	$2Na^+$	+	SO_4^{2-}
1 mole		0		0
$1-\alpha$		2α		α,

Total = $1 + 2\alpha$, that is, i = $1 2\alpha$

$$\alpha = \frac{i-1}{2} = \frac{2.5-1}{2} = \frac{1.5}{2} = 0.75 = 75\%$$

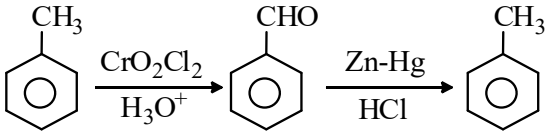
91. **(3)** E_{cell} becomes zero at equilibrium point but E^o_{cell} remains constant under all conditions.

92. **(4)** Sulphatopentaamminecobalt(III) bromide: $[Co(SO_4)(NH_3)_5]Br$
Sulphatopentaamminecobalt(III) chloride: $[Co(SO_4)(NH_3)_5]Cl$
Two compounds have different molecular formula hence, there is no isomerism between these two.

93. **(1)** The correct reaction is

$$4FeCr_2O_4 + 8Na_2CO_3 + 7O_2 \rightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$$

94. **(3)**



95. **(4)** a, b, c and d

96. **(2)** $t_{1/2}$ of first order reaction is independent of initial concentration of reactant.

97. **(1)** From expt (1) and (2), it is clear that when $[B_2]$ is kept constant and [A] is made 6 times, the rate also becomes 6 times, thus $r \propto [A]^1$. Furthr from expt (1) and (3) when [A] is kept constant and $[B_2]$ is tripled, rate also becomes three times,
Thus, $t \propto [B_2]^1$
Hence $r = k[A]^1 [B_2]^1$

98. **(2)** (A)-(3); (B)-(1); (C)-(4); (D)-(2)

99. **(2)** If both Assertion & Reason are true but the Reason is not the correct explanation of the Assertion, then mark (2)

100. **(3)** Lactose (C1 of β-glucose and C4 of β-galactose)