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IIB CAREER INSTITUTE PVT.LTD.

NEET 2023-24

Mark	Group		Date : 21/03/2024
720	PCB	**PRE FINAL ROUND -03**	Time : 3 :20 Hours

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

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PHYSICS

SECTION - A (35 Questions)

01. **(1)** According to Wien's displacement law

$$\lambda_m \propto \frac{1}{T} \Rightarrow \lambda_{m_2} < \lambda_{m_1} \quad [\because T_1 < T_2]$$

There fore $I-\lambda$ graph for T_2 has lesser wavelength (λ_m) and so curve for T_2 will shift towards left side.

02. **(1)**

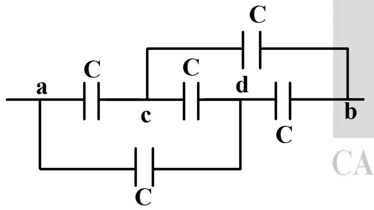
$$F = QE = \frac{QV}{d} \Rightarrow 5000 = \frac{5 \times V}{10^{-2}} \Rightarrow V = 10 volt.$$

03. **(1)** Electric field inside shell is zero

04. **(2)** The two capacitors are in parallel so

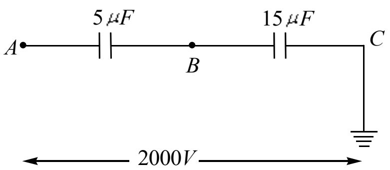
$$C = \frac{\varepsilon_0 A}{t \times 2}.(k_1 + k_2).$$

05. **(1)**



$$C_{eq} = c = \frac{A\varepsilon_0}{d}$$

06. **(3)** The given circuit can be redrawn as follows



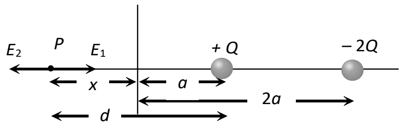
$$(V_A - V_B) = \left(\frac{15}{5+15}\right) \times 2000 \Rightarrow V_A - V_B = 1500V$$

$$\Rightarrow 2000 - V_B = 1500V \Rightarrow V_B = 500V.$$

07. **(2)** Suppose electric field is zero at a point P lies at a distance d from the charge $+Q$

At P $\quad \dfrac{kQ}{d^2} = \dfrac{k(2Q)}{(a+d)^2}$

$$\Rightarrow \frac{1}{d^2} = \frac{2}{(a+d)^2} \Rightarrow d = \frac{a}{\sqrt{2}-1}$$



Since $d > a$ i.e. point P must lies on negative x-axis as shown at a distance from origin hence

$$x = d - a = \frac{a}{\sqrt{2}-1} - a = \sqrt{2}a.$$

Actually P lies on negative x-axis so $x = -\sqrt{2}a.$

08. **(1)** The total energy before connection

$$= \frac{1}{2} \times 4 \times 10^{-6} \times (50)^2 + \frac{1}{2} \times 2 \times 10^{-6} \times (100)^2$$

$$= 1.5 \times 10^{-2} J$$

When connected in parallel

$$4 \times 50 + 2 \times 100 = 6 \times V \Rightarrow V = \frac{200}{3}$$

Total energy after connection

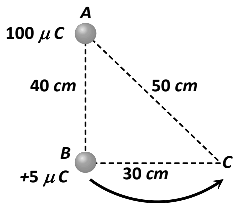
$$= \frac{1}{2} \times 6 \times 10^{-6} \times \left(\frac{200}{3}\right)^2 = 1.33 \times 10^{-2} J.$$

09. **(4)** Momentum $p = \sqrt{2mK}$; where K = kinetic energy = $Q.V$

$$\Rightarrow p = \sqrt{2mQV} \Rightarrow p \propto \sqrt{mQ}$$

$$\Rightarrow \frac{p_e}{p_\alpha} = \sqrt{\frac{m_e Q_e}{m_\alpha Q_\alpha}} = \sqrt{\frac{m_e}{2m_\alpha}}.$$

10. **(4)**



Work done in displacing charge of 5μC from B to C is W = $5 \times 10^{-6}(V_C - V_B)$ where

$$V_B = 9 \times 10^9 \times \frac{100 \times 10^{-6}}{0.4} = \frac{9}{4} \times 10^6 V$$

and $V_C = 9 \times 10^9 \times \dfrac{100 \times 10^{-6}}{0.5} = \dfrac{9}{5} \times 10^6 V$

so $W = 5\times10^{-6}\times\left(\frac{9}{5}\times10^{6}-\frac{9}{4}\times10^{6}\right)=-\frac{9}{4}V.$

11 **(3)** Common potential

$$V=\frac{C_1V_1}{C_1+C_2}=\frac{10^{-2}}{16\times10^{-6}}=625V.$$

12. **(4)**

13. **(3)** When the switch is open, 3 μF and 6μF capacitors are in series. Hence charge on each capacitor $q=C_{eq}V=\frac{3\times6}{3+6}\times9=18\mu C$

When the switch is closed, in the steady state no current will flow through the capacitor. Therefore the two resistors 3Ω and 6Ω will be in series.

Current in each resistor will be $I=\frac{9}{3+6}=1\,A$

Now the 3μF capacitor and 6μF capacitor will be in parallel with and resistor respectively

Charge on 3μF capacitor $q_1=CV=3\times3=9\mu C$

Charge on 6μF $q_2=CV=6\times6=36\mu C$

Charge flowing through the switch = increase in charge on the system consisting of right plate of 3μF and left plate of 6μF = (– 9 + 36) = 27 μC.

14. **(2)** $\phi=\frac{1}{\varepsilon_0}\times Q_{enc}=\frac{1}{\varepsilon_0}(2q).$

15. **(2)** Charge on smaller sphere

$$=\text{Total charge}\left(\frac{r_1}{r_1+r_2}\right)=30\left(\frac{5}{5+10}\right)=10\mu C$$

16. **(1)**

17. **(2)** While drawing the dielectric plate outside, the capacitance decreases till the entire plate comes out and then becomes constant. So, V increases and then becomes constant

18. **(4)** $C_{air}=\frac{C_{medium}}{K}=\frac{C}{2}.$

19. **(1)** Magnetic field due to $i_1=\frac{\mu_0 i_1}{2R}\frac{\theta_1}{2\pi}$ (Into the plane)

Magnetic field due to $i_2=\frac{\mu_0 i_2}{2R}\frac{\theta_2}{2\pi}$ (Out of the plane)

For parallel combination

Now, $\frac{i_1}{i_2}=\frac{\rho i_2}{A}\times\frac{A}{\rho i_1}=\frac{l_2}{l_1}$

$$\Rightarrow\frac{i_1}{i_2}=\frac{\frac{1}{4}(2\pi R)}{\frac{3}{4}(2\pi R)}=\frac{1}{3}\Rightarrow i_1=\frac{i_2}{3}\Rightarrow i_2=3i_1.$$

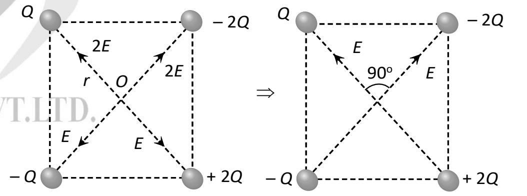
∴ Now magnetic field,

$$=\frac{\mu_0 i_1}{2R}\left(\frac{\theta_1}{2\pi}\right)-\frac{\mu_0 i_2}{2R}\left(\frac{\theta_2}{2\pi}\right)$$

$$=\frac{\mu_0 i_1}{2R}\left(\frac{3\pi}{2\times2\pi}\right)-\frac{\mu_0 i_2}{2R}\left(\frac{\pi}{2\times2\pi}\right)$$

$$=\frac{\mu_0 i_1}{2R}\left(\frac{3i_1}{4}-\frac{i_2}{4}\right)=\frac{\mu_0}{2R}\left(\frac{3i_1}{4}-\frac{3i_1}{4}\right)=0.$$

20. **(1)**



Side $a=5\times10^{-2}$ m

Half of the diagonal of the square $r=\frac{a}{\sqrt{2}}$

Electric field at centre due to charge $QE=\frac{kQ}{(a/\sqrt{2})^2}$

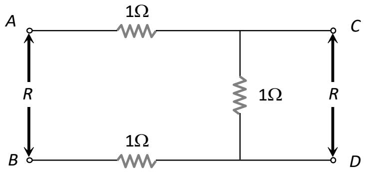
Now field at

$$O=\sqrt{E^2+E^2}=E\sqrt{2}=\frac{kq}{(a/\sqrt{2})^2}.\sqrt{2}$$

$$=\frac{9\times10^9\times10^{-6}\times\sqrt{2}\times2}{(5\times10^{-2})^2}=1.02\times10^7\text{ N/C}$$

[upward]

21. **(3)** Let equivalent resistance between A and B be R, then equivalent resistance between C and D will also be R



$$R' = \frac{R}{R+1} + 2 = R$$

$$\Rightarrow R^2 - 2R - 2 = 0$$

$$\therefore R = \frac{2 \pm \sqrt{4+8}}{2} = \sqrt{3} + 1.$$

22. **(2)** Let l be the length of the wire. Magnetic field at the centre of the loop is

$$B = \frac{\mu_0 I}{2R} \quad \therefore B = \frac{\mu_0 \pi I}{l} (\because l = 2\pi R) \quad \text{........(i)}$$

$$B' = \frac{\mu_0 n I}{2r} = \frac{\mu_0 \pi I}{2(l/2n\pi)} or, B' = \frac{\mu_0 n^2 \pi I}{l}$$

........(ii)

From eqns. (i) and (ii), we get $B' = n^2 B$.

23. **(2)** The formula of drift velocity is $v_d = \frac{eE}{m}\tau$

Current density $J = \frac{I}{A} = \frac{neAv_d}{A} = nev_d$

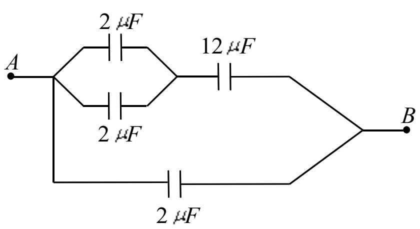
Resistivity is $\rho = \frac{m}{ne^2\tau} \Rightarrow gt = \frac{m}{ne^2\rho}$

Resistance is $R = \frac{V}{I}$

$$\rho\frac{l}{A} = \frac{El}{I} \Rightarrow \rho = \frac{EA}{I} = \frac{E}{J}.$$

where, E = electric field, A = area of cross section e = electronic charge, n = number of density of electrons, τ = relaxation time.

24. **(3)** The circuit can be rearranged as



Net capacitance between

$$AB = \frac{4 \times 12}{4+12} + 2 = 5\mu F.$$

25. **(1)**

26. **(4)** In stretching of wire $R \propto \frac{1}{d^4}$, where d = Diameter of wire.

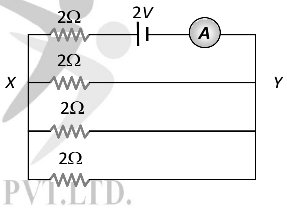
27. **(2)** In parallel combination equivalent conductivity

$$K = \frac{K_1A_1 + K_2A_2}{A_1 + A_2} = \frac{K_1 + K_2}{2} \quad [\text{As } A_1 = A_2]$$

28. **(1)** At point A the slope of the graph will be negative. Hence resistance is negative.

29. **(1)** Internal resistance $\propto \frac{1}{\text{Temperature}}$.

30. **(2)** Resistance across $XY = \frac{2}{3}\Omega$



Total resistance $= 2 + \frac{2}{3} = \frac{8}{3}\Omega$

Current through ammeter $= \frac{2}{8/3} = \frac{6}{8} = \frac{3}{4}A.$

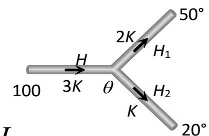
31. **(1)** For maximum energy, we have

External resistance of the circuit = Equivalent internal resistance of the circuit

i.e. $R = r/2$.

32. **(1)** Magnetic moment $M = niA$

33. **(2)** Let the temperature of junction be θ then according to the following figure.

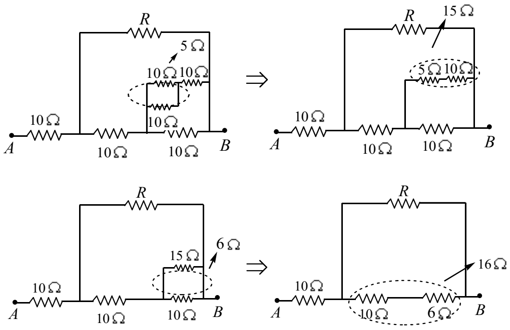


$$H = H_1 + H_2$$

$$\Rightarrow \frac{3K \times A \times (100 - \theta)}{l} = \frac{2KA(\theta - 50)}{l} + \frac{KA(\theta - 20)}{l}$$

$\Rightarrow 300-3\theta = 3\theta-120 \Rightarrow \theta = 70°C.$

34. **(3)**



$\therefore \frac{R\times 16}{R+16}+10=18,$ on solving we get, $R=16\Omega.$

35. **(2)**

SECTION - B (Attempt Any 10 Questions)

36. **(2)** The current flowing in the ring is $I=qf$ ....(i)

The magnetic induction at the centre of the ring is

$B=\frac{\mu_0 I}{2R}=\frac{\mu_0 q f}{2R}$ (Using (i)).

37. **(4)** Magnetic field due to the solid cylindrical conductor of radius R,

(i) For $d<R$, $I'=\frac{Id^2}{R^2}$

$\int \vec{B}.\vec{dl}=\mu_0 I' \Rightarrow B(2\pi d)=\frac{\mu_0 Id^2}{R^2} \Rightarrow B=\frac{\mu_0 Id}{2\pi R^2}$

$\therefore B \propto d$

(ii) For $d=R$, $B=\frac{\mu_0 I}{2\pi R}$ (maximum)

(iii) For $d=R$, $B=\frac{\mu_0 I}{2\pi d} \Rightarrow B \propto \frac{1}{d}$.

38. **(3)** Force on arm AB due to current in conductor XY is

$F_1=\frac{\mu_0}{4\pi}\frac{2IiL}{L/2}=\frac{\mu_0 Ii}{\pi}$

acting towards XY in the plane of loop.

Force on arm CD due to current in conductor XY is

$F_2=\frac{\mu_0}{4\pi}\frac{2IiL}{3(L/2)}=\frac{\mu_0 Ii}{3\pi}$

acting away from XY in the plane of loop.

$\therefore$ Net force on the loop $=F_1-F_2$

$=\frac{\mu_0 Ii}{\pi}\left(1-\frac{1}{3}\right)=\frac{2}{3}\frac{\mu_0 Ii}{\pi}.$

39. **(3)** $B=\frac{\mu_0}{4\pi}\frac{2i_2}{(r/2)}-\frac{\mu_0}{4\pi}\frac{2i_1}{(r/2)}=\frac{\mu_0}{4\pi}\frac{4}{r}(i_2-i_1)$

$B=\frac{\mu_0}{4\pi}\frac{4}{5}(2.5-5.0)=-\frac{\mu_0}{2\pi}.$

Negative sing shows that B is acting inwards i.e., into the plane.

40. **(4)** $m=l\times area\times density$

$Area \propto \frac{m}{l}$

$R \propto \frac{l}{Area} \propto \frac{l^2}{m}$

$R_1:R_2:R_3=\frac{l_1^2}{m_1}:\frac{l_2^2}{m_2}:\frac{l_3^2}{m_3}$

$R_1:R_2:R_3=\frac{25}{1}:\frac{9}{3}:\frac{1}{5}=125:25:1.$

41. **(4)** $(Q)_{Balck\ body}=A\sigma T^4 t \Rightarrow Q \propto T^4$

$\Rightarrow Q_2=Q_1\left(\frac{T_2}{T_1}\right)^4=10\left(\frac{273+327}{273+27}\right)^4=10\left(\frac{600}{300}\right)^4=160J.$

42. **(3)** Total energy radiated from a body $Q=A\varepsilon\sigma T^4 t$

$\Rightarrow Q \propto AT^4 \propto r^2T^4 \quad (\because A=4\pi r^2)$

$\Rightarrow \frac{Q_P}{Q_Q}=\left(\frac{r_P}{r_Q}\right)^2\left(\frac{T_P}{T_Q}\right)^4$

$\Rightarrow \frac{Q_P}{Q_Q}=\left(\frac{8}{2}\right)^2\left(\frac{273+127}{273+527}\right)^4=1.$

43. **(4)** As resistance of a bulb $R=\frac{v^2}{P}$,

Hence $R_1:R_2:R_3=\frac{1}{100}:\frac{1}{60}:\frac{1}{60}$

Now the combined potential difference across B_1 and B_2 is same as the potential difference across B_3. Hence, W_3 is more than W_1 and W_2, being in series, carry same current and $R_1 < R_2$, therefore $W_1 < W_2$,

$\therefore W_1 < W_2 < W_3$.

44. **(2)** $\rho-$ same, $l-$same, $A_2 = \frac{1}{4}A_1 \left(as\ r_2 = \frac{r_1}{2}\right)$

By using

$$R = \rho\frac{l}{A} \Rightarrow \frac{R_1}{R_2} = \frac{A_2}{A_1} \Rightarrow \frac{R_1}{8} = \frac{1}{4} \Rightarrow R_1 = 2\Omega.$$

Hence, $R_{eq} = \frac{R_1R_2}{R_1+R_2} = \frac{2+8}{2+8} = \frac{8}{5}\Omega.$

45. **(1)** In parallel, $\frac{H_1}{H_2} = \frac{p_1t}{p_2t} = \frac{P_1}{P_2} = \frac{500}{200} = \frac{5}{2}$

In series, $\frac{H_1}{H_2} = \frac{I^2R_1t}{I^2R_2t} = \frac{R_1}{R_2} = \frac{V^2/P_1}{V^2/P_2}$

$= \frac{P_1}{P_2} = \frac{200}{500} = \frac{2}{5}.$

46. **(1)** The potential difference across $300\Omega = 60-30 = 30V$

Therefore the effective resistance of voltmeter resistance R and 400Ω in parallel will be equal to 300Ω, as 60 V is equally divided between two parts.

So $300 = \frac{R\times 400}{R+400}$

or $300R + 120000 = 400R$ or $R = 1200\ \Omega$

47. **(1)** Work done

$$W = Q(V_B - V_A) \Rightarrow (V_B - V_A) = \frac{W}{Q}$$

$$= \frac{10\times10^{-3}}{5\times10^{-6}}\text{J/C} = 2kV.$$

48. **(2)** According to the figure, there is no other charge. A single charge when moved in a space of no field, does not experience any force. No work is done

$W_A = W_B = W_C = 0$.

49. **(1)** $\tan\theta = \frac{\frac{kq^2}{x^2}}{mg} \Rightarrow \sin\theta = \frac{kq^2}{x^2\,mg}$

$$\frac{x}{2L} = \frac{kq^2}{x^2\,mg} \Rightarrow x^3 = \frac{kq^2 2L}{mg}$$

$$x = \left[\frac{q^2L}{2\pi\varepsilon_0 mg}\right]^{1/3}$$

50. **(4)** 12 μF and 6 μF are in series and again are in parallel with 4 μF. Therefore, resultant of these three will be $= \frac{12\times6}{12+6} + 4 = 4+4 = 8\mu F$

This equivalent system is in series with 1 μF

Its equivalent capacitance $= \frac{8\times1}{8+1} = \frac{8}{9}\mu F$ ......(i)

Equivalent of $8\mu F$, $2\mu F$ and $2\mu F$

$= \frac{4\times8}{4+8} = \frac{32}{12} = \frac{8}{3}\mu F$ ......(ii)

(i) and (ii) are in parallel and are in series with C

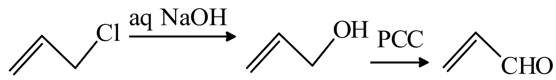
$\therefore \frac{8}{9} + \frac{8}{3} = \frac{32}{12}$ and

$$C_{eq} = 1 = \frac{\frac{32}{9}\times C}{\frac{32}{9}+C} \Rightarrow C = \frac{32}{23}\mu F.$$

CHEMISTRY

SECTION - A (35 Questions)

51. **(2)**



52. **(3)**

$$\text{SN}^2\text{Reactivity} \propto \frac{1}{\text{steric hindrance}}$$

53. **(4)**

The vapour pressure of 0.45 molar urea solution is equal to that of 0.45 molar solution of sugar.

54. **(4)**

The freezing point of 0.1 M urea is greater than that of 0.1 M KCl solution.

55. **(3)**

(a), (b) and (c)

56. **(1)**

Due to C–Cl partial double bond character.

57. **(3)**

(1)-(iii), (2)-(i), (3)-(iv), (4)-(ii)

58. **(2)**

As concentration α B.P. $\alpha \frac{1}{\text{V.P}}$

So the correct order of Conc^n. as 3 > 2 > 1.

59. **(4)**

Wurtz-Fittig reaction

60. **(4)**

Enantiomers have different melting point

61. **(3)**

There will be no movement of KCl or $BaCl_2$

62. **(2)**

$$\frac{i-1}{n-1}$$

63. **(2)**

(c) only

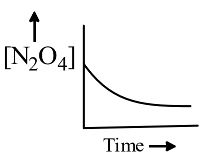
64. **(2)**

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

65. **(4)**

The azeotropic mixture cannot be separated into individual components as both the components boil at the same temperature.

66. **(2)**



67. **(1)**

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

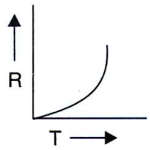
68. **(1)**

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

69. **(1)**

$t_{1/2}$

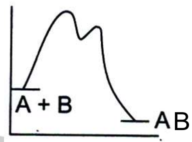
70. **(3)**



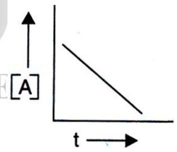
71. **(3)**

(a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

72. **(2)**



73. **(1)**



74. **(4)**

The stoichiometric coefficients of reaction has no relation to the order of reaction.

75. **(3)**

(1)-(i), (2)-(iv), (3)-(iii), (4)-(ii)

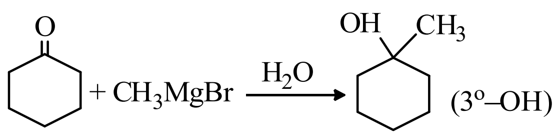
76. **(4)**

Since N is more electronegative, it will pull the electron of hydrogen towards itself H being having +1 oxidations state so N will have (-1/3) O.S.

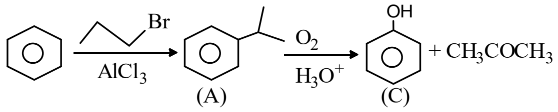
77. **(3)**

Statement-I is correct and Statement-II is incorrect

78. **(3)**



79. **(1)**



80. **(1)**

(1)-(iii), (2)-(v), (3)-(i), (4)-(ii)

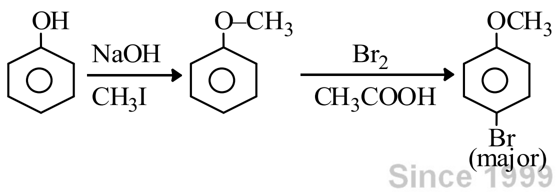
81. **(4)**

$\frac{M}{11}$ [because Fe is going from +2 to +3 and sulphur from –1 to +4].

82. **(4)**

Rate of reactivity of alcohol 3° > 2° > 1°.

83. **(3)**



84. **(4)**

Bromine is both reduced and oxidized

85. **(4)**

+6

SECTION - B (Attempt Any 10 Questions)

86. **(4)**

As there is no movement of ions.

87. **(3)**

y

88. **(2)**

+R and +I group ↑ es e– density on benzne ring

stability of benzylic carbon ↑ es

SN^1 reactivity $\propto$ stability of carbocation.

89. **(1)**

Zero-order w.r.t. A

90. **(2)**

ΔE for the forward reaction is B – A

91. **(3)**

Molecularity of slowest step is order of overall complex reaction.

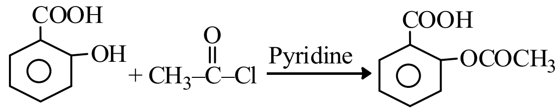
92. **(4)**

x = 6, y = 10, z = 22

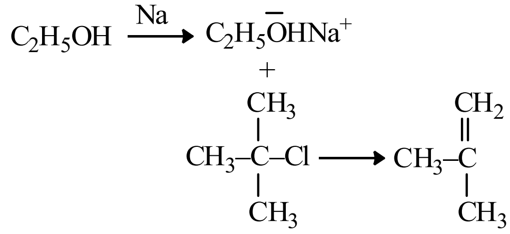
93. **(4)**

(i), (ii), (iv)

94. **(2)**



95. **(2)**



96. **(4)**

–1 and +1

97. **(4)**

Statement-I is incorrect and Statement-II is correct

98. **(2)**

p-nitro phenol is less acidic than o-nitro phenol

99. **(2)**

$$Ph-CH_2-Br + Mg \xrightarrow[\text{ether}]{\text{dry}} PhCH_2MgBr \xrightarrow{CH_3OH} PhCH_3$$

100. **(4)**