AVIRAL
JEE | NEET | FOUNDATIONS

WEEKLY TEST MEDICAL PLUS - 03 TEST - 21 RAJPUR
SOLUTION Date 29-12-2019

[PHYSICS]

1. $q = ne = 10^{14} \times 1.6 \times 10^{-19}$

$\therefore \quad q = 1.6 \times 10^{-5}\ \text{C} = 16\ \mu\text{C}$

2. As conductor has positive charge. So, there is deficiency of electrons.

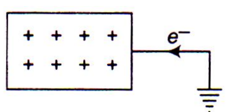
$\therefore$ Number of electrons $= \dfrac{14.4 \times 10^{-19}}{1.6 \times 10^{-19}} = 9$

3. $q = ne$

$\therefore \quad q = +2e = 2 \times 1.6 \times 10^{-19}$

$= +3.2 \times 10^{-19}\ \text{C}$

4.



When positively charged body connected to earth, electrons flow from earth to body and body becomes neutral.

5. $$F_1 = \frac{1}{4\pi\varepsilon_0} \cdot \frac{(1 \times 10^{-6})(5 \times 10^{-6})}{r^2}$$

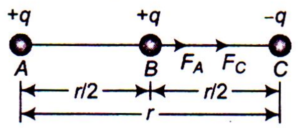
(if distance between them is r)

also, $$F_2 = \frac{1}{4\pi\varepsilon_0} \cdot \frac{(5 \times 10^{-6})(1 \times 10^{-6})}{r^2}$$

$\therefore \quad \dfrac{F_1}{F_2} = \dfrac{1}{1}$

But direction of F_1 and F_2 is different

6. Situation is shown in figure.



Force between A and C

$$F = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q^2}{r^2}$$

When sphere B is kept at the midpoint of line joining A and C, then net force on B is

$$F_{net} = F_A + F_C = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q^2}{(r/2)^2} + \frac{1}{4\pi\varepsilon_0} \cdot \frac{q^2}{(r/2)^2}$$

$$= 8 \cdot \frac{1}{4\pi\varepsilon_0} \cdot \frac{q^2}{r^2} = 8\,F$$

7. According to Coulomb's law

$$F \propto \frac{1}{r^2} \Rightarrow \frac{F_1}{F_2} = \left(\frac{r_2}{r_1}\right)^2$$

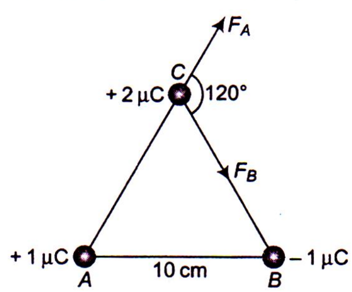
$\therefore$ $$\frac{5}{F_2} = \left(\frac{0.04}{0.06}\right)^2$$

$\therefore$ $$F_2 = 11.25\text{ N}$$

8. Dielectric constant $K = \dfrac{F_{\text{in medium}}}{F_{\text{in air}}}$

So, $$F' = \frac{F}{2}$$

9. F_A = Force on charge at C due to charge at A



$$= 9 \times 10^9 \times \frac{10^{-6} \times 2 \times 10^{-6}}{(10 \times 10^{-2})^2} = 1.8\text{ N}$$

F_B = Force on point C due to charge at B

$$= 9 \times 10^9 \times \frac{10^{-6} \times 2 \times 10^{-6}}{(0.1)^2}$$

$$= 1.8\text{ N}$$

$\therefore$ Net force on C

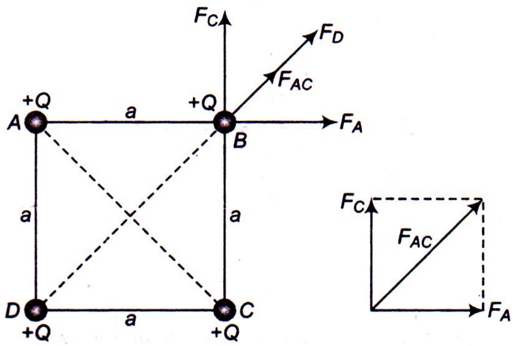
$$F_{net} = \sqrt{(F_A)^2 + (F_B)^2 + 2F_AF_B\cos 120^\circ}$$

$$= \sqrt{(1.8)^2 + (1.8)^2 + 2(1.8)(1.8)(-1/2)} = 1.8\text{ N}$$

10. $q_1' = q_2' = \left(\frac{q_1 + q_2}{2}\right) = \left(\frac{10 - 20}{2}\right) = -5\ \mu C$

$\therefore \quad \frac{F_1}{F_2} = \frac{q_1 q_2}{q_1' q_2'} = \frac{(10)(-20)}{(-5) \times (-5)} = -\frac{8}{1}$

11.



Here, $$F_A = \frac{1}{4\pi\varepsilon_0} \cdot \frac{Q^2}{a^2}$$

$$F_C = \frac{1}{4\pi\varepsilon_0} \cdot \frac{Q^2}{a^2}$$

Net force on B

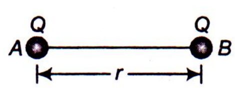
$$F_{net} = F_{AC} + F_D$$

$$= \sqrt{F_A^2 + F_C^2} + F_D$$

$$= \sqrt{\left\{\frac{1}{4\pi\varepsilon_0}\frac{Q^2}{a^2} + \frac{1}{4\pi\varepsilon_0}\frac{Q^2}{a^2}\right\}} + \frac{1}{4\pi\varepsilon_0} \cdot \frac{Q^2}{(a\sqrt{2})^2}$$

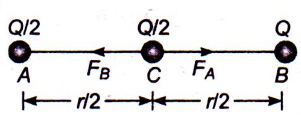
$$= \frac{1}{4\pi\varepsilon_0} \cdot \frac{Q^2}{a^2}\left(\sqrt{2} + \frac{1}{2}\right) = \frac{1}{4\pi\varepsilon_0} \cdot \frac{Q^2}{a^2}\left(\frac{1 + 2\sqrt{2}}{2}\right)$$

12. . Ist case



$$F = \frac{1}{4\pi\varepsilon_0} \cdot \frac{Q^2}{r^2} \qquad \ldots \text{(i)}$$

In IInd case



when sphere C is touched to A then equal charge $Q/2$ distributes on A and C.

$\therefore$ $$F_A = \frac{1}{4\pi\varepsilon_0} \frac{(Q/2)^2}{(r/2)^2} = \frac{1}{4\pi\varepsilon_0} \cdot \frac{Q^2}{r^2}$$

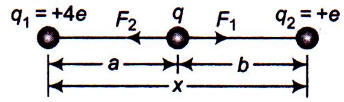
$$F_B = \frac{1}{4\pi\varepsilon_0} \cdot \frac{(Q)(Q/2)}{(r/2)^2} = 2 \cdot \frac{1}{4\pi\varepsilon_0} \cdot \frac{Q^2}{r^2}$$

$\therefore$ Net force on C,

$$F_{net} = F_B - F_A$$

$$= \frac{1}{4\pi\varepsilon_0} \cdot \frac{Q^2}{r^2} = F$$

13. . For equilibrium of charge q, forces on chagre q due to charges q_1 and q_2 should be equal.



$\therefore \quad F_1 = \frac{1}{4\pi\varepsilon_0} \cdot \frac{(4e)(q)}{a^2}$

and $\quad F_2 = \frac{1}{4\pi\varepsilon_0} \cdot \frac{(e)(q)}{b^2}$

Also, $\quad x = a + b$

$\therefore \quad \frac{1}{4\pi\varepsilon_0} \frac{(4e)(q)}{a^2} = \frac{1}{4\pi\varepsilon_0} \cdot \frac{(e)q}{(x-a)^2}$

or $\quad \frac{4}{a^2} = \frac{1}{(x-a)^2}$

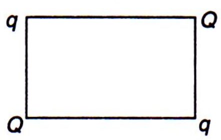
or $\quad \frac{2}{a} = \frac{1}{x-a}$

or $\quad 2x - 2a = a$

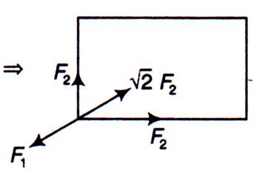
$\therefore \quad a = \frac{2x}{3}$

$\Rightarrow \quad b = x/3$

14. Q and q should be of opposite sign.



$\Rightarrow$



$$\sqrt{2}F_2 = F_1$$

$$\therefore \quad \sqrt{2}\left[\frac{1}{4\pi\varepsilon_0} \cdot \frac{Q(q)}{a^2}\right] = \frac{1}{4\pi\varepsilon_0} \cdot \frac{Q \cdot Q}{(\sqrt{2}a)^2}$$

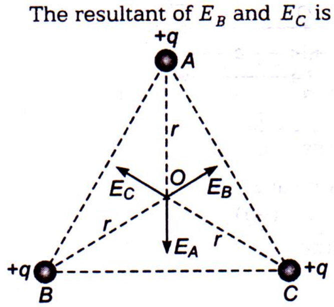
$$Q = -2\sqrt{2}q$$

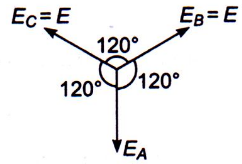
15. Net force on charge Q should be zero. Q and q should be unlike in nature.

$\therefore \quad \frac{K \cdot Qq}{r^2} = \frac{KQ \cdot Q}{(2r)^2}$

or $\quad q = \frac{-Q}{4}$

16. The resultant of E_B and E_C is



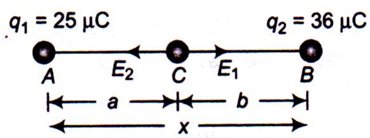


$$= \sqrt{E^2 + E^2 + 2E \cdot E \cos 120°}$$

$$= \sqrt{2E^2 - 2E^2 \cdot \left(-\frac{1}{2}\right)} = E$$

Now situation is shown in figure.
Here, E_A and E_{BC} are equal and opposite so, they cancel out. So, resultant electric field due to E_A, E_B and E_C is zero.

17. Let electric field is zero at point O in the figure.



$\therefore \quad E_1 = E_2$

$\therefore \quad E_1 = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q_1}{a^2}$

$E_2 = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q_2}{b^2}$

Also, $\quad x = a + b$

or $\quad 11 = a + b$

$\therefore \quad b = 11 - a$

Now $\quad \frac{1}{4\pi\varepsilon_0} \frac{q_1}{a^2} = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q_2}{(11-a)^2}$

$\therefore \quad \frac{q_1}{q_2} = \frac{a^2}{(11-a)^2}$

or $\quad \sqrt{\frac{q_1}{q_2}} = \frac{a}{11-a}$

or $\quad \sqrt{\frac{25}{36}} = \frac{a}{11-a}$

or $\quad \frac{5}{6} = \frac{a}{11-a}$

or $\quad 6a = 55 - 5a$

$\therefore \quad a = 5$ cm

So, intensity will be zero at a distance of 5 cm from 25 μC.

18. Unit of E in SI system $E = \frac{F}{q_0}$ = Newton / Coulomb

As, $E = -\frac{dV}{dr}$,

So, unit of E is also volt/metre

Also, $q = CV$

$\therefore$ $q = CEd$ $(\because V = Ed)$

$$E = \frac{q}{Cd} = \frac{qV}{qd} = \frac{K}{qd}$$

$$= \frac{\text{Joule}}{\text{Coulomb - metre}}$$

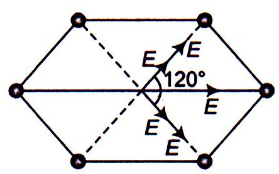
while J/C is unit of electric potential.

19. At point A and C, electric field lines are dense and equally spaced, so $E_A = E_C$

While at B, they are far apart.

$\therefore$ $E_A = E_C > E_B$

20. In Fig. (1), (3) and (4) net electric field is zero, because electric field at a point due to positive charge acts away from the charge and due to negative charge it act's towards the charge for Fig. (2) net electric field is not zero.



Here, net electric field in Fig. (2) is

$$= \sqrt{(2E)^2 + (2E)^2 + (2E)(2E) \cdot 2\cos 120°}$$

$$= 2E$$

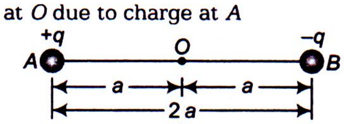
21. $\mathbf{E}_q + \mathbf{E}_{3q}$ is along PA

$\mathbf{E}_{2q} + \mathbf{E}_{4q}$ is along PB

$\therefore$ $\mathbf{E}_{net}$ is along CB.

22.

23. Potential at O due to charge at A



$\therefore$ $V_1 = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q}{a}$

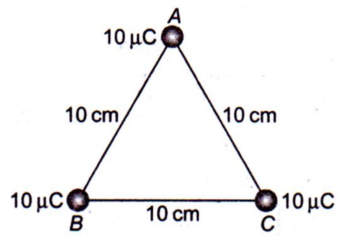
Potential at O due to charge at B

$$V_2 = \frac{1}{4\pi\varepsilon_0} \frac{(-q)}{a}$$

Potential at mid-point O

$$V = \frac{1}{4\pi\varepsilon_0} \frac{q}{a} + \frac{1}{4\pi\varepsilon_0} \cdot \frac{(-q)}{a} = 0$$

24.



$$U_{AB} = \frac{1}{4\pi\varepsilon_0} \cdot \frac{(10)(10)\times10^{-12}}{10\times10^{-2}}$$

$$U_{BC} = \frac{1}{4\pi\varepsilon_0} \cdot \frac{(10)(10)\times10^{-12}}{10\times10^{-2}}$$

$$U_{AC} = \frac{1}{4\pi\varepsilon_0} \frac{(10)(10)\times10^{-12}}{10\times10^{-2}}$$

$$\therefore \quad U_{Total} = U_{AB} + U_{BC} + U_{CA}$$

$$= \frac{3}{4\pi\varepsilon_0}\left[\frac{100\times10^{-12}\times100}{10}\right]$$

$$= 27 \text{ J}$$

25. A, B, C, D, E lies on equipotential surface, as, on sphere, at surface potential is same. So, $W_{AB} = W_{AC} = W_{AD} = W_{AE} = q(V_f - V_i) = \text{zero}$

26.

$$\frac{1}{2}mv^2 = \frac{q_1q_2}{4\pi\varepsilon_0}\left(\frac{1}{r_i} - \frac{1}{r_f}\right)$$

$$\frac{1}{2}\times2\times10^{-3}\times v^2 = (10^{-9})\,(9\times10^9)\,\,(0.9)$$

$$v = \sqrt{8.1\times10^3} \text{ m/s}$$

$$= 90 \text{ m/s}$$

27. From $s = \frac{1}{2}at^2 = \frac{1}{2}\frac{F}{m}\cdot t^2$

$$t \propto \sqrt{m}$$

$$\therefore \quad \frac{t_1}{t_2} = \sqrt{\frac{m_e}{m_p}}$$

28.

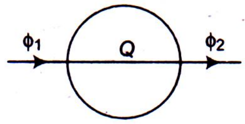
29. If dipole is rotated through an angle of 90° about it's perpendicular axis, then given point comes on equitorial line. So, field becomes half of previous value *i.e.*, $E/2$.

30. $U = -pE\cos\theta$, U is minimum at $\theta = 0°$.

31. $E_{\text{axis}} = \dfrac{2KP}{r^3}$ (along **P**)

$E_{\perp} = \dfrac{KP}{(2r)^3}$ (opposite to **P**)

32. From Gauss's law



$$\text{Net flux} = \frac{\text{Total charge enclosed}}{\varepsilon_0}$$

$$= \frac{1}{\varepsilon_0} \times Q$$

∴ $$Q = \varepsilon_0(\phi_2 - \phi_1)$$

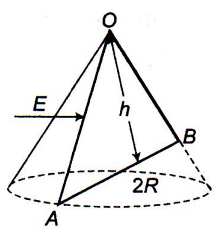
33.

34. Same flux will pass through two concentric spherical shells if charge is kept at centre.

35.

36. $\varphi = \mathbf{E}\cdot\mathbf{S} = 40$ units

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



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

Electric flux entering the cone $= EA = ERh$

38. **(b)** Total enclosed charge $q = 100\ Q$ coulomb

$$\phi_E = \frac{q}{\varepsilon_0} = \frac{100Q}{\varepsilon_0}$$

39. **(a)** Electric flux, $\phi = \dfrac{q}{\varepsilon_0}$

Where q = total charge enclosed by closed surface

$$\phi = \frac{1.25 + 7 + 1 - 0.4}{\varepsilon_0}$$

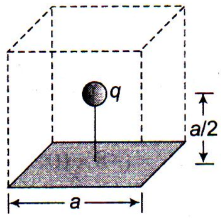
$$= \frac{8.85\text{C}}{8.85 \times 10^{-12}\ \text{C}^2\text{N}^{-1}\text{m}^{-2}}$$

$$= 10^{12}\ \text{N-m}^2/\text{C}$$

40. **(c)** $\tau_{max} = pE = q(2l)E = 2\times10^{-6}\times0.01\times5\times10^{5}$

$= 10\times10^{-3}$ N-m

41. **(d)** An imaginary cube can be made by considering charge q at the centre and given square is one of its face.



So flux from given square (i.e., one face) $\varphi = \dfrac{q}{6\varepsilon_0}$

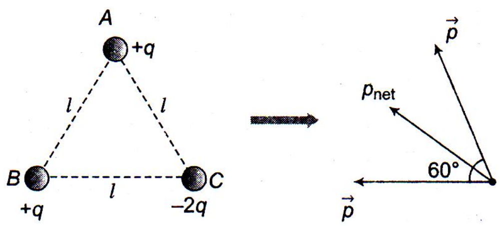
42. **(b)** $\vec{E} = \dfrac{\sigma}{2\varepsilon_o}\hat{k} - \dfrac{2\sigma}{2\varepsilon_o}\hat{k} - \dfrac{\sigma}{2\varepsilon_o}\hat{k} = -\dfrac{2\sigma}{\varepsilon_o}\hat{k}$

43. **(b)** $E_{inside} = \dfrac{\rho}{3\varepsilon_0}r \quad (r < R)$

$E_{outside} = \dfrac{\rho R^3}{3\varepsilon_0 r^2} \quad (r \geq R)$

i.e., inside the uniformly charged sphere field varies linearly ($E \propto r$) with distance and outside varies according to $E \propto \dfrac{1}{r^2}$

44. **(c)**



$p_{net} = \sqrt{p^2 + p^2 + 2pp\cos 60^\circ} = \sqrt{3}p = \sqrt{3}\,ql$

$(\because p = ql)$

45. **(d)** $E_{axial} = E_{equatorial} \Rightarrow k.\dfrac{2p}{x^3} = \dfrac{k.p}{y^3} \Rightarrow \dfrac{x}{y} = \dfrac{2^{1/3}}{1} = \sqrt[3]{2} : 1$

[CHEMISTRY]

46.

Glycol is used as an antifreeze in automobiles.

47.

Four primary alcohols of $C_5H_{11}OH$ are possible. These are:

(i) $CH_3CH_2CH_2CH_2CH_2OH$

(ii) $CH_3CH_2-\underset{\underset{CH_3}{|}}{CH}-CH_2OH$

(iii) $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2CH_2OH$

(iv) $CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_2OH$

48.

$ZnCl_2$ is a lewis acid and interact with alcohol.

$$CH_3-CH_2OH + ZnCl_2 \rightarrow R-\underset{\underset{H}{|}}{\overset{\oplus}{O}}-ZnCl_2$$

$(R = CH_3-CH_2-)$ (I)

$$R-\underset{\underset{H}{|}}{\overset{\oplus}{O}}-ZnCl_2 \rightarrow R^{\oplus} + [HOZnCl_2]^{\ominus}$$

(I)

1 mole of carbon = 12gm of carbon
$= 6.023 \times 10^{23}$ C – atoms.

Carbocation is formed as intermediate in the S_N^1 mechanism which these reaction undergoes.

In the absence of $ZnCl_2$ formation of primary carbocation is difficult which is the case with (ii) while (i) undergoes reaction.

(iii) Tertiary carbocation casily formed due to the stability.

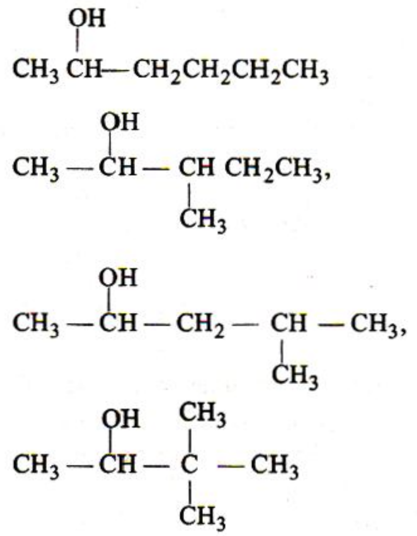
$$CH_3-\overset{\overset{OH}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_3 \longrightarrow CH_3-\underset{\underset{CH_3}{|}}{\overset{\oplus}{C}}-CH_3 + H_2O$$

(iv) In the presence of $ZnCl_2$, 2° carbocation is formed from $(CH_3)_2-\underset{\underset{H}{|}}{C}-OH$

i.e., $CH_3-\overset{\oplus}{C}H-CH_3$

49.

Compound containing $CH_3CH(OH)$ or CH_3CO–group give positive iodoform test.



50.

$$CH_3-Br \xrightarrow{KCN} \underset{(A)}{CH_3-CN} \xrightarrow{H_3O^+}$$

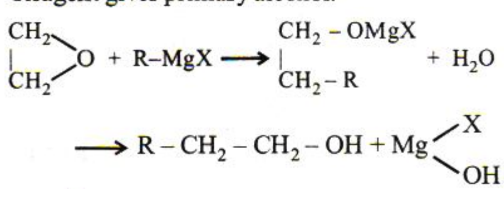
$$\underset{(B)}{CH_3-COOH} \xrightarrow{LiAlH_4} \underset{\substack{(C)\\ \text{Ethyl alcohol}}}{CH_3-CH_2-OH}$$

51.

$$CH_3CH_2OH \xrightarrow{PBr_3} CH_3CH_2Br \xrightarrow{alc.KOH} CH_2=CH_2 \xrightarrow{H_2SO_4} CH_3-CH_2-HSO_4 \xrightarrow[heat]{H_2O} CH_3CH_2OH$$

52.

Ethylene oxide when treated with Grignard Reagent gives primary alcohol.



53.

CH_3OH does not have $-CH(OH)CH_3$ group hence it will not form yellow precipitate with an alkaline solution of iodine (haloform reaction).

54.

Primary alcohol on oxidation give aldehyde which on further oxidation give carboxylic acid whereas secondary alcohols give ketone.

$$\underset{\text{n-propyl alcohal}}{CH_3CH_2CH_2OH} \xrightarrow{[O]}$$

$$CH_3CH_2CHO \xrightarrow{[O]} CH_3CH_2COOH$$

$$\underset{\text{isopropyl alcohal}}{(H_3C)_2CH-OH} \xrightarrow{[O]} \underset{\text{Ketone}}{(H_3C)_2C=O}$$

55.

$$C_2H_5OH + 4I_2 + 6NaOH \longrightarrow \underset{\text{Iodoform}}{CHI_3}\downarrow + HCOONa + 5NaI + 5H_2O$$

56.

$$CH_3-CH=CH_2 \xrightarrow[NaOH/H_2O_2]{B_2H_6} \underset{\text{Propanol}}{CH_3-CH_2-CH_2-OH}$$

57.

We know that

$$\underset{\text{(epoxide, O bridging)}}{H_2C-CH_2} + RMgX \longrightarrow \underset{OMgX\quad R}{CH_2-CH_2} \xrightarrow[-Mg(OH)X]{H_2O} \underset{OH\quad\ R}{CH_2-CH_2}$$

58.

Due to –I-effect of the three C–Cl-bonding between Cl and C-atom of the OH group, $CCl_3CH(OH)_2$ is most stable.

59.

Secondary alcohols on oxidation give ketones.

Note : – Primary alcohols from aldehydes.

$$\underset{\text{Isopropyl alcohol}}{R_2CHOH} \xrightarrow{[O]} \underset{\text{Ketone}}{R_2C=O}$$

60.

1° Alcohols on catalytic dehydrogenation give aldehydes.

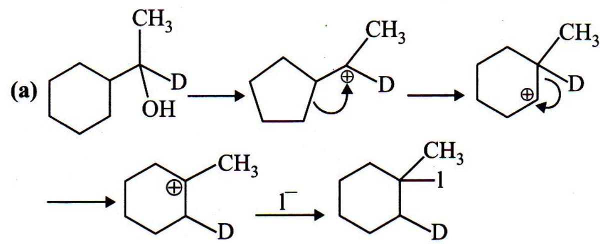
$$\underset{1°\text{ alcohol}}{RCH_2OH} \xrightarrow[300°C]{Cu} \underset{\text{Aldehyde}}{RCHO} + H_2$$

61.

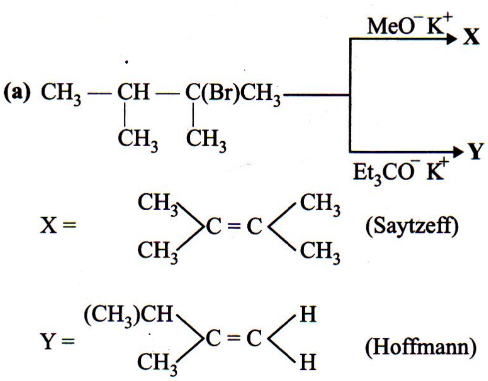
Water gas is mixed with half of its volume of hydrogen. The mixture is compressed to approximately 200 – 300 atmospheres. It is then passed over a catalyst ($ZnO + Cr_2O_3$) at 300°C. Methyl alcohol vapours are formed which are condensed

$$\underset{\text{Compressed gas}}{CO + 2H_2} \xrightarrow[300°C]{ZnO+Cr_2O_3} \underset{\text{Methyl alcohol}}{CH_3OH}$$

62. (a)



63. (a)



64.

$KMnO_4$ (alkaline) and OsO_4 / CH_2Cl_2 are used for hydroxylation of double bond while O_3 /Zn is used for ozonolysis. Therefore, the right option is (c), i.e.,

$$3CH_3CH = CH_2 \xrightarrow{BH_3 \text{ in THF}} (CH_3CH_2CH_2)_3B$$

$$\xrightarrow[NaOH]{3H_2O_2} \underset{\text{1-propanol}}{3CH_3CH_2CH_2OH} + H_3BO_3$$

65.

Lucas reagent is conc. HCl + anhyd. $ZnCl_2$.

66.

Electron withdrawing $-NO_2$ group has very strong –I and –R effects so, compound 3 will be most acidic.

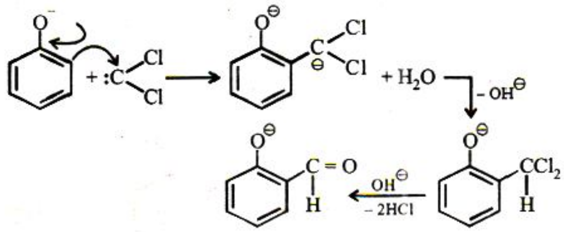
67.

This is an example of Williamson ether synthesis reaction in which sodium alkoxide reacts with alkyl halide and gives ether.

68.

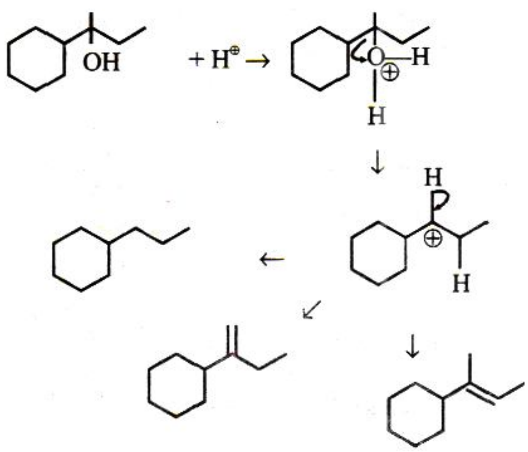
$$CHCl_3 + NaOH \rightleftharpoons :\overset{\ominus}{C}Cl_3 + H_2O$$

$$:\overset{\ominus}{C}Cl_3 \longrightarrow :CCl_2 + Cl^{\ominus}$$

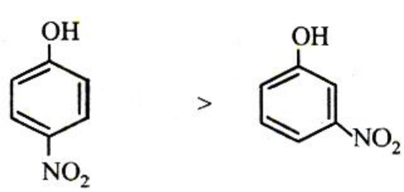


Therefore functional group – CHO is introduced.

69.

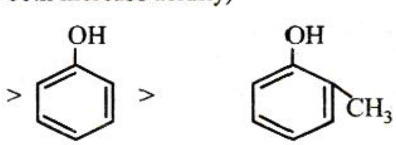


70.



(iv) (– I and – M effects, both increase acidity)

(iii) (only – I effect)



(i)

(ii) (+ I effect of CH_3 group decreases acidity)

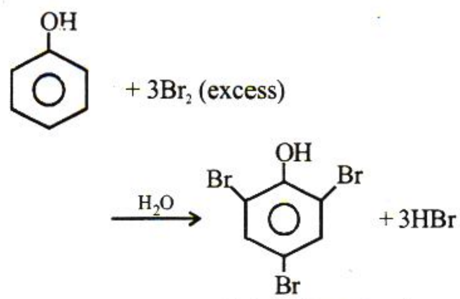
∴ Correct choice : (b)

71.

Phenol is most acidic because its conjugate base is stabilised due to resonance, while the rest three compounds are alcohols, hence, their corrosponding conjugate bases do not exhibit resonance

72.

With Br_2 water, phenol gives 2, 4, 6- tribromophenol.

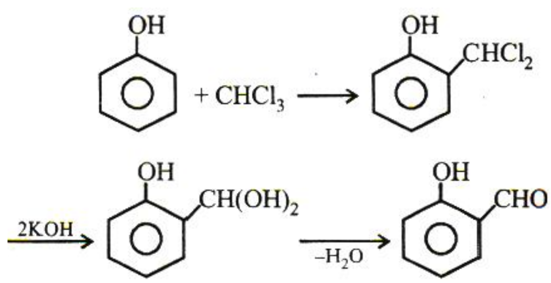


2, 4, 6 Tribromphenol

73.

Due to strong electron-donating effect of the OH group, the electron density in phenol is much higher than that in toluene, benzene and chlorobenzene and hence phenol is readily attacked by the electrophile.

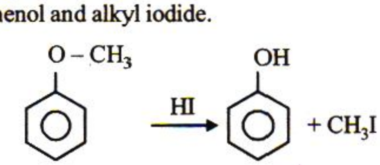
74.



Reimer-Tiemann reaction.

75.

When Ar – O – R ethers are reacted with HI, they are cleaved at weaker O – R bond to give phenol and alkyl iodide.

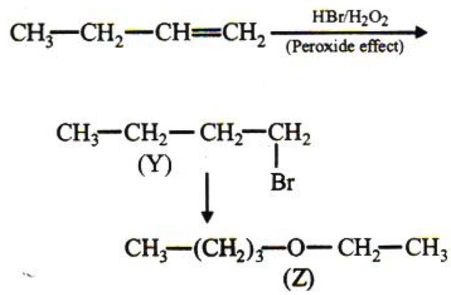


76. **(d)** As this is alkaline hydrolysis.

77.

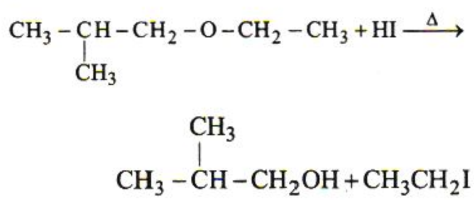
Williamson synthesis is one of the best methods for the preparation of symmetrical and unsymmetrical ethers. In this method, an alkyl halide is allowed to react with sodium alkoxide.

78.



79.

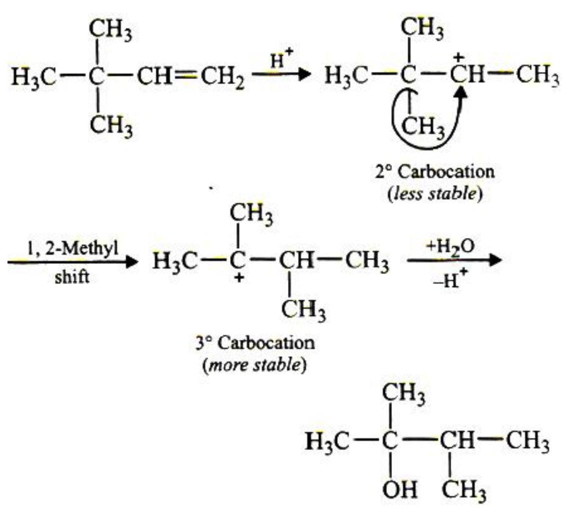
In the cleavage of mixed ethers with two different alkyl groups, the alcohol and alkyl iodide that form depend on the nature of alkyl group. When primary or secondary alkyl groups are present, it is the lower alkyl group that forms alkyl iodide therefore



80.

$$C_6H_5ONa + C_2H_5I \xrightarrow{\Delta} \underset{\text{Phenetole}}{C_6H_5OC_2H_5} + NaI$$

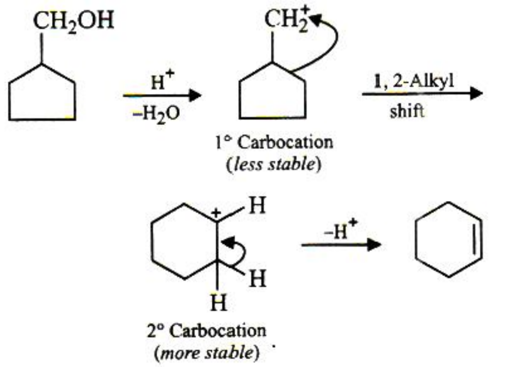
81.



82.

83.

84.



85.

C_2–OH is 3° while C_5–OH is 2°. Since 3° alcohols are weaker acids than 2° alcohols, therefore, 3° alcohols are stronger bases than 2° alcohols, *i.e.*, option (*a*) is correct.

86.

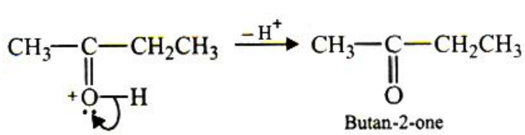
The order of reactivity depends upon the stability of the carbocations formed, *i.e.*, $FCH_2\overset{+}{C}HCH_3$, $FCH_2CH_2\overset{+}{C}HCH_3$, $CH_3\overset{+}{C}HCH_3$ and $Ph\overset{+}{C}H_2$. Since the relative stabilities of these carbocations follow the order :

$Ph\overset{+}{C}H_2 > CH_3\overset{+}{C}HCH_3 > FCH_2CH_2\overset{+}{C}HCH_3 > FCH_2\overset{+}{C}HCH_3$, therefore, the order of reactivity of the alcohols (I, II, III and IV) follows the sequence : IV > III > II > I.

87.

The order of reactivity depends upon the stability of the carbocations formed, *i.e.*, $FCH_2\overset{+}{C}HCH_3$, $FCH_2CH_2\overset{+}{C}HCH_3$, $CH_3\overset{+}{C}HCH_3$ and $Ph\overset{+}{C}H_2$. Since the relative stabilities of these carbocations follow the order :

$Ph\overset{+}{C}H_2 > CH_3\overset{+}{C}HCH_3 > FCH_2CH_2\overset{+}{C}HCH_3 > FCH_2\overset{+}{C}HCH_3$, therefore, the order of reactivity of the alcohols (I, II, III and IV) follows the sequence : IV > III > II > I.



88.
89.

Due to almost identical sizes of 2*p*-orbitals of C and F, + R-effect and –I-effect of F almost balance each other and hence *p*-fluorophenol is almost as acidic as phenol. However, *p-chlorophenol and p-nitrophenol are more acidic than phenol.* Further, due to stronger –R and –I-effect of NO_2

group, *p*-nitrophenol is a much stronger acid than *p*-chlorophenol in which Cl has only weak + R and –I-effect. Thus, option (*c*) is correct.

90.

3° Alcohols react fastest with Lucas reagent by S_N1 mechanism (*i.e.*, carbocation intermediate) to give turbidity.