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Sample Paper

(2018-19)

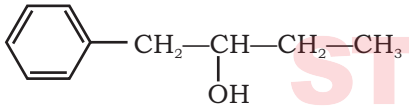
Date : _____ Duration : 3 Hours Max. Marks : 70	**Chemistry**	**Class** **XII**

Instructions:

1. The question paper has 27 questions in all and all questions are compulsory.
2. Question numbers 1 to 5 are very short-answer questions and carry 1 mark each.
3. Question numbers 6 to 12 are short-answer questions arid carry 2 marks each.
4. Question numbers 13 to 24 are also short-answer questions and carry 3 marks each.
5. Question numbers 25 to 27 are long-answer questions and carry 5 marks each.
6. Use Log Tables, if necessary. Use of calculators is not allowed

Section – A

1. Write the IUPAC name of the following:- **[1]**



2. An acid of molecular formula, $C_3H_5O_2Br$ is optically active, what is its structure? **[1]**

3. What happens when an electric field is applied to a colloidal dispersion? **[1]**

4. Write the IUPAC name of complex $[Cr(NH_3)_4Cl_2]^+$. What type of isomerism does it exhibit? **[1]**

5. What happens when a ferromagnetic substance is heated to high temperature? **[1]**

Section – B

6. Complete the following chemical reaction and balance them. **[1+1]**

(a) $MnO_4^- + S_2O_3^{2-} + H_2O \longrightarrow$ (b) $Cr_2O_7^{2-} + Fe^{2+} + H^+ \longrightarrow$

7. How do you convert the following? **[1+1]**

(a) Ethanal to but-2-enal (b) Ethanal to 2-hydroxypropanoic acid

OR

Arrange the following in decreasing order of their acidic strength. Give explanation for the arrangement. **[2]**

C_6H_5COOH, FCH_2COOH, NO_2CH_2COOH

8. For the reaction. **[2]**

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$,

The rate of formation of $NH_3(g)$ is 4×10^{-8} mol L^{-1} s^{-1}. Calculate the rate of disappearance of $H_2(g)$.

9. Why does H_3PO_3 act as a reducing agent but H_3PO_4 does not? **[2]**

10. The freezing point of a solution containing 50 cm^3 of ethylene glycol in 50 g water is found to be –34°C. Assume ideal behaviour, calculate the density of ethylene glycol. **[2]**

(K_f for water = 1.86 K kg mol^{-1}).

11. State the significance of numbers 6 and 6,6 in the polymer names nylon-6 and nylon-6,6. **[2]**

12. Write the names and structures of the monomers of the following polymers:- **[1+1]**

(a) Buna-S (b) Dacron

Section – C

13. By X-ray diffraction method, the unit length of NaCl is observed to be 0.5627 nm. The density of NaCl is found to be 2.164 g cm^{-3}. What type of defect exists in the crystal? Calculate the percentage of Na^+ and Cl^- ions missing. **[3]**

14. Give reason for the following: **[1+1+1]**

(a) Why is liquid ammonia bottle first cooled in ice before opening it?

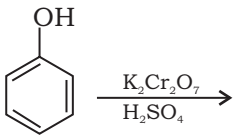
(b) Explain why equimolar aqueous solutions of NaCl and Na_2SO_4 are not isotonic?

(c) Why does a solution of ethanol and cyclohexane show positive deviation from Raoult's law?

15. Write the structures of the main products in the following reactions. **[1+1+1]**

(a) $(CH_3)_3C—OC_2H_5 \xrightarrow{HI}$

(b) $CH_3—\underset{\displaystyle CH_3}{\underset{|}{CH}}—\underset{\displaystyle OH}{\underset{|}{CH}}—CH_3 \xrightarrow{HBr}$

(c)  $\xrightarrow[H_2SO_4]{K_2Cr_2O_7}$

16. A metal ion M^{n+} having d^4 valence electronic configuration combines with three bidentate ligands to form a complex compound. Assuming $\Delta_0 > P$. **[1+1+1]**

(a) Draw the diagram showing d orbital splitting during this complex formation and write the electronic configuration of the valence electrons of the metal M^{n+} ion in terms of t_{2g} and e_g

(b) What type of hybridisation will M^{n+} ion have?

(c) Name the type of isomerism exhibited by this complex.

17. An organic compound (A) having molecular formula C_2H_6O on oxidation with $Na_2Cr_2O_7/H_2SO_4$ produces a compound (B) which reduces Tollen's reagent. Both (A) and (B) produce a yellow solid on treatment with I_2/OH^-. Identify A and B and write reactions involved. **[3]**

18. (a) Why iodoform has appreciable antiseptic property? **[1+1+1]**

(b) Which of the compounds will react faster in S_N1 reaction with the OH^- ion?

CH_3CH_2Cl or $C_6H_5CH_2Cl$

(c) Why is the solubility of haloalkanes in water very low?

19. (a) Which is a stronger reducing agent Cr^{2+} and Fe^{2+} and why? **[1+1+1]**

(b) Explain why Cu^+ ion is not stable in aqueous solution?

(c) Explain why Ce^{4+} is a stronger oxidising agent.

20. Explain the following:- **[1+1+1]**

(a) Zinc but not copper is used for the recovery of Ag from $[Ag(CN)_2]^-$.

(b) Partial roasting of sulphide ore in done in the metallurgy of copper.

(c) Why is Cu_2S (Chalcocite) roasted and not calcined during extraction of copper?

21. Deficiency of which vitamin causes **[1+1+1]**

(a) pernicious anaemia (b) convulsion

(c) rickets

OR

(a) What are Zwitter ions? Give one example. **[1+1+1]**

(b) Is a diet consisting mainly of rice an adequate diet?

(c) Name the type of bonding which stabilizes α-helix structure in proteins.

22. The following rate data were obtained for the thermal decomposition of $N_2O_5(g)$. **[3]**

$2N_2O_5 \rightarrow 2\ N_2O_4(g) + O_2(g)$

Time (sec)	0	50
Total pressure (atm)	0.2	0.25

Calculate the rate constant.

23. Explain:- **[1+1+1]**

(a) Why do we require artificial sweetening agents?

(b) Why is use of aspartame limited to cold food & drinks?

(c) Name an alkaloid which is used for treatment of hypertension.

24. Explain what is observed when **[1+1+1]**

(a) an emulsion is subjected to centrifugation.

(b) direct current is passed through a colloidal solution.

(c) a light passed through colloidal solution.

Section – D

25. (a) The EMF of a cell corresponding to the reaction **[3+2]**

$Zn(S) + 2H^+(aq) \rightarrow Zn^{2+}(0.1\ M) + H_2(g, 1atm)$ is 0.28 V at 25°C.

Write the half-cell reaction and calculate the pH of the solution at the hydrogen electrode.

$E^0_{Zn^{2+}/Zn} = -0.76V,\ E^0_{H^+/H_2} = 0$

(b) What type of a cell is the lead storage battery? Write the anode and the cathode reactions and the overall reaction occurring in a lead storage battery while discharging.

OR

(a) Calculate the equilibrium constant for the reaction. **[3+2]**

$$Fe(s) + Cd^{2+}(aq) \rightleftharpoons Fe^{2+}(aq) + Cd(s)$$

$\left(\text{Given}: -E^0_{Cd^{2+}/Cd} = 0.40V, E^0_{Fe^{2+}/Fe} = -0.44V\right)$ (Antilog 28.4263 = 2.67×10^{28})

(b) The λ^0_m values for NaCl and KCl are126.5 and 149.9 S cm^2 mol^{-1} respectively. The ionic conductance of Na^+ at infinite dilution is 50.1 S cm^2 mol^{-1}. Calculate the ionic conductance at infinite dilution for K^+ ion.

26. (a) Write the reaction involved in the following:- **[3+2]**

(i) Carbylamine reaction (ii) Coupling reaction

(iii) Hoffmann bromamide reaction

(b) Account for the following:-

(i) Aniline does not undergo friedel-craft reaction.

(ii) Ethylamine is soluble in water whereas aniline is not.

OR

(a) Complete the following:- **[3+2]**

(i) $C_6H_5N_2^+Cl^- + H_3PO_2 + H_2O \longrightarrow$ (ii) $C_6H_5N_2^+Cl^- \xrightarrow[(ii)NaNO_2/Cu,\Delta]{(i)\ HBF_4}$

(iii) $C_6H_5NH_2 \xrightarrow[273-278K]{NaNO_2 + 2HCl}$

(b) Arrange the following compounds in increasing order of basic strengths in their aqueous solution.

(i) NH_3, CH_3NH_2, $(CH_3)_2NH$, $(CH_3)_3N$ (ii) NH_3, $C_2H_5NH_2$, $(C_2H_5)_2NH$, $(C_2H_5)_3N$

27. A translucent white waxy solid (A) on heating in an inert atmosphere is converted into its allotropic form (B). Allotrope (A) on reaction with very dilute aqueous solution of KOH liberates a highly poisonous gas (C) having rotten fish smell. With excess of chlorine (C) forms (D) which hydrolyses to compound (E). Identify (A) to (E). **[5]**

OR

(a) Arrange the following in order of property indicated for each set:- **[3+2]**

(i) F_2, Cl_2, Br_2, I_2 – increasing bond dissociation enthalpy.

(ii) HF, HCl, HBr, HI – increasing acid strength

(iii) NH_3, PH_3, AsH_3, SbH_3, BiH_3 – increasing base strength.

(b) Draw the structure of the following

(i) XeF_2 (ii) BrF_5

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Hints/Solutions to Sample Paper

(2018-19)

Date : _____ Duration : 3 hours Max. Marks : 70	**Chemistry**	**Class** **XII**

1. 1-phenylbutan-2-ol.

2. $CH_3-\underset{*}{\underset{|}{\overset{Br}{C}}}H-COOH$ 2-Bromopropanic acid

3. Colloidal particles move towards the oppositely charged electrode, get neutralised and coagulated (electrophoresis).

4. Tetraamminedichlorochromium (III). It exhibits geometrical isomerism.

5. On heating to high temperature, ferromagnetic substance changes to paramagnetic. This is due to randomisation of domain (spin) on heating.

6. (a) $8MnO_4^- + 3S_2O_3^{2-} + H_2O \longrightarrow 8MnO_2 + 6SO_4^{2-} + 2OH^-$

(b) $Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \longrightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$

7. (a) $2CH_3-CHO \longrightarrow \underset{\text{Ethanal}}{CH_3-\underset{|}{\overset{OH}{C}}H-CH_2-CHO} \xrightarrow[-H_2O]{\Delta} \underset{\text{But-2-enal}}{CH_3-CH=CH-CHO}$

(b) $\underset{H}{\overset{CH_3}{>}}C=O + HCN \xrightarrow{\text{PH-9-10}} \underset{H}{\overset{CH_3}{>}}\underset{CN}{\overset{OH}{C}} + 2H_2O + HCl \xrightarrow{\text{Hydrolysis}} \underset{H}{\overset{CH_3}{>}}\underset{COOH}{\overset{OH}{C}} + NH_4Cl$

α-hydroxy propanoic acid

OR

Due to the presence of +ve charge on the nitrogen atom of NO_2 group, the –I effect of $-NO_2$ group is much stronger than that of F. Therefore NO_2CH_2COOH is a stronger acid than FCH_2COOH.

C_6H_5 group, on the other hand, has a weak –I effect and hence C_2H_5COOH is a weaker acid than both. Thus, the overall acidic strength decreases in the order :

$NO_2CH_2COOH > FCH_2COOH > C_6H_5COOH$

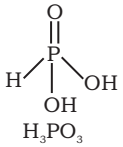
8. $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$

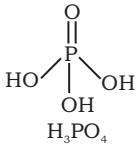
Rate of Reaction $= -\frac{d[N_2]}{dt} = \frac{-1}{3}\frac{d[H_2]}{dt} = +\frac{1}{2}\frac{d[NH_3]}{dt}$

i.e., $-\frac{d[K_2]}{dt} = \frac{3}{2}\frac{d[NH_3]}{dt} = \frac{3}{2} \times 4 \times 10^{-8}$

$-\frac{d[K_2]}{dt} = 6 \times 10^{-8} \text{ mol } L^{-1} S^{-1}$

9. H_3PO_3 contains one P–H bond and hence acts as a reducing agent but H_3PO_4 does not contain a P–H does not contain a P–H bond and hence does not act as a reducing agent.


H_3PO_3


H_3PO_4

10. $\Delta T_f = T_f^\circ - T_f = 0 - (-34) = 34°C$ 1 → solvent, 2 → solute

$\Delta T_f = \frac{1000 \times k_f \times w_2}{m_2 \times w_1}$

$w_2 = \frac{\Delta T_f \times m_2 \times w_1}{1000 \times K_f} = \frac{34 \times 62 \times 50}{1000 \times 1.86} = 56.67 \text{ g.}$

Density = $\frac{w_2}{V} = \frac{56.67}{50} = 1.13\,g\,cm^{-3}$

11. Nylon-6 means that it is a condensation polymer of only one type of monomer molecular containing six carbon atoms, i.e., caprolactam. Nylon-6,6, on the other hand, implies that it is a condensation polymer of two types of monomer molecular each containing six carbon atoms. i.e., adipic acid and hexamethylenediamine

12. (a) Buna-S:- $CH_2{=}CH{-}CH{=}CH_2$ (Buta-1, 3-diene) & $C_6H_5{-}CH{=}CH_2$ (styrene)

(b) Dacron :- $HO{-}CH_2{-}CH_2{-}OH$ (Ethylene glycol) & HOOC–C$_6$H$_4$–COOH (Terepthalic acid)

Section-C

13. Calculating density, $d = \frac{Z \times M}{a^3 \times N_A} = \frac{4 \times 58.5}{(0.5627 \times 10^{-7})^3 \times 6.022 \times 10^{23}} = 2.1809\,g\,cm^3$

Observed density = 2.164 g cm^{-3}

Observed density is less than theoretically calculated value, this means that same Na^+ and Cl^- ions are missing from their lattice site i.e. there is Schottky defect.

Actual formula units of NaCl per unit cell can be calculate as follows:-

$$Z = \frac{a^3 \times d \times N_A}{M} = \frac{(0.5627 \times 10^{-7}\,cm)^3 \times (2.164 cm^{-3}) \times (6.022 \times 10^{23}\,mol^{-1})}{58.5\,g\,mol^{-1}} = 3.9868$$

$\therefore$ Formula units missing per unit cell = 4–3.968 = 0.032

$\therefore$ % Missing = $\frac{0.032}{4} \times 100 = 8\%$

14. (a) At room temperature the vapour pressure of liquid ammonia is very high On cooling, vapour pressure decreases. Hence, the liquid ammonia will not splash out.

(b) NaCl dissociates to give 2 ions (Na^+ & Cl^-). Na_2SO_4 dissociates to give 3 ions (2 Na^+ & SO_4^{2-}). Thus, equimolar solutions of NaCl and Na_2SO_4 have different concentration of ions in the solution. As osmotic pressure depends upon the concentration of particles in the solution, they have different osmotic pressures.

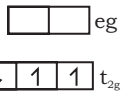
(c) On adding cyclohexane, its molecules get in between the molecules of ethanol thus presenting the hydrogen bonds present between ethanol molecules and reducing Ethanol-ethanol interaction.

15. (a) $(CH_3)_3C{-}OC_2H_5 \xrightarrow{HI} CH_3{-}\underset{CH_3}{\overset{CH_3}{C}}{-}I + C_2H_5OH$

(b) $CH_3{-}\underset{CH_3}{CH}{-}\underset{OH}{CH}{-}CH_3 \xrightarrow[(1,\,2\ hydride\ shift)]{HBr} CH_3{-}\underset{CH_3}{\overset{Br}{C}}{-}CH_2{-}CH_3$

(c) Phenol $\xrightarrow[H_2SO_4]{K_2Cr_2O_7}$ p-benzoquinone

16. (a) If g Δ_0 > P, pairing will occur in the t_{2g} orbitals and eg orbitals will remain vacant.



Electronic configuration $t_{2g^4}eg^0$

(b) d^2sp^3 (as there as three bidentate ligands to combine.

(c) $[M(AA)_3]$ type complexes show geometrical isomerism.

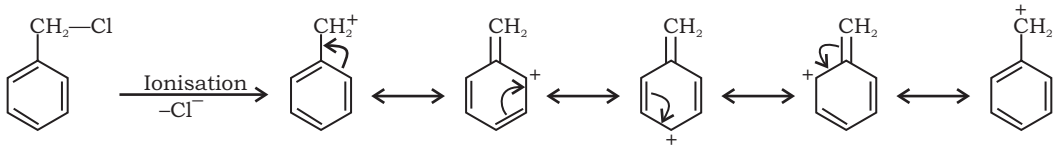
17. $CH_3CH_2OH \xrightarrow[(oxidation)]{Na_2Cr_2O_7/H_2SO_4} CH_3CHO$ (Ethanol (A) → Ethanal (B))

CH_3CH_2OH or $CH_3CHO \xrightarrow[(Iodoform\ reaction)]{I_2/OH^-} CHI_3$ Iodoform (yellow)

18. (a) The antiseptic property of iodoform is due to liberation of I_2 when it contact with skinand not due iodoform itself.

CHI_3 (Iodoform) $\xrightarrow{Contact\ with\ skim}$ I_2 (Iodine) (has antiseptic property)

(b) S_{N^1} reactions occur through carbocation intermediates. $C_6H_5CH_2$—Cl readily undergoes ionisation to give $C_6H_5CH_2^+$ which is stabilised by resonance.



(c) Although haloalkanes are polar molecules, neither they form H-bonds with water nor can they break the H-bonds already existing between water molecules. As a result, the solubility of haloalkanes in water is very low.

19. (a) Cr^{2+} is a stronger reducing agent the Fe^{2+} because $E^0_{cr^{3+}/Cr^{2+}}$ is –ive (–0.41V) where as $E^0_{Fe^{3+}/Fe^{2+}}$ is +ve (+0.77V). Thus Cr^{2+} is easily oxidised to Cr^{3+} but Fe^{2+} cannot be easily oxidized to Fe^{3+}. Hence, Cr^{2+} is a strong reducing agent than Fe^{2+}.

(b) This is because Cu^+ ion is aqueous solution undergoes disproportionation to give more stable Cu^{2+} and Cu.s

(c) The is because Ce^{4+} tends to change to Ce^{3+} as +3 oxidation state is more stable.

20. (a) The E° of zinc(Zn^{2+}/Zn = –0.76 V) is lower than that of copper (Cu^{2+}/Cu = 0.34 V), therefore, Zn is a more powerful reducing agent Cu. Further, Zn is also cheaper than Cu.

(b) Partial roasting of sulphide are forms same oxide which then reacts with the remaining sulphide are to form copper metal by self-reduction of the oxide and sulphide.

$$2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$$
$$2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$$

Thus, to bring about self reduction process, sulphide are of copper is partially roasted.

(c) Calcination is used for conversion of carbonate and hydroxide ores to their respective oxides while roasting is used for conversion of sulphide ores to their respective oxides. Since chalcocite (Cu_2S) is a sulphide ore, therefore, it is roasted and not calcined.

21. (a) Vitamin B_{12} (b) Vitamin B_6

(c) Vitamin D

OR

(a) A zwitter ion is a dipolar ion formed by neutralisation of acidic and basic centres present with in the molecule. For examples, amino acetic acid i.e., glycine exist as

$$H_3\overset{+}{N}—CH_2—COO^-$$

(b) A diet consisting required mainly of rice is not an adequate diet because it is deficient lysine and threonine which are essential amino acids required for growth and maintenance of health and hence their deficiency has to supplemented by other protein rich diet like pulses etc.

(c) On boiling, the globular proteins in egg undergo coagulation to form fibrous proteins. As a result, protein lose their biological activity and thus get denatured.

22.

	$2N_2O_5(g)$	$\rightarrow$	$2\ N_2O_4(g)$	+	$O_2(g)$	
Initial	0.2 atm		0		0	
After 50s,	(0.2 –p) atm		p		p/2	Total pressure = 0.2 + p/2

At t = 50 sec, $0.2+\frac{P}{2}=0.25$ or p = 0.10 atm

Thus, a α 0.2, a $-x\alpha$ 0.2 – p i.e., (0.2 – 0.1) i.e., 0.10 atm

$$k=\frac{2.303}{50}\log\frac{P_0}{P_t}$$

$$=\frac{2.303}{50}\log\frac{0.2}{0.1}$$

$$=\frac{2.303}{50}\times 0.3010=0.01386 s^{-1}$$

K = 0.01386 s^{-1}

23. (a) To reduce calorie intake and to protect teeth from decaying, we need artificial sweeteners.

(b) It decomposes at baking or cooking temperatures and hence can be used only in cold foods and drinks.

(c) Reserpine

24. (a) Demulsification occurs i.e, the emulsion separates into its constituent liquids.

(b) The charges colloidal particles move towards the oppositively charged electrode where they aggregate together and hence get coagulated.

(c) Tyndall effect

25. (a) The half–cell reaction are:-

$Zn \rightarrow Zn^{2+} + 2e^-$ (Oxidation half reaction)

$2H^+ + 2e^- \rightarrow H_2$ (Reduction half reaction)

The cell may be represented as:-

$Zn \mid Zn^{2+} \parallel H^+ \mid H_2$

For the given cell $E^0_{cell} = E^0_{H^+/\frac{1}{2}H_2} - E^0_{Zn^{2+}/Zn} = 0 - (-0.76) = 0.76\,V$

Applying Nernst equation to the given cell reaction.

$$E_{cell} = E^0_{cell} - \frac{0.0591}{2}\log\frac{[Zn^{2+}]}{[H^+]^2}$$

$$0.28 = 0.76 - \frac{0.0591}{2}\log\frac{0.1}{[H^+]}$$

$$0.28 = 0.76 - \frac{0.0591}{2}\left[\log 0.1 - 2\log[H^+]\right]$$

0.28 = 0.76 – 0.02955 [–1 + 2 pH]

$$pH = \frac{0.5095}{0.0591}$$

pH = 8.62

(b) Lead storage battery is a type of secondary cell.

The electrode reaction that occur during discharge are as follows:

At anode :- $Pd(s) + SO_4^{2-}(aq) \longrightarrow PbSO_4(s) + 2e^-$

At cathode : - $PbO_2(s) + SO_4^{2-}(aq) + 4H^+(aq) + 2e^- \longrightarrow PbSO_4(s) + 2H_2O$

Overall reaction :- $Pb(s) + PbO_2(s) + 4H^+(aq) + 2SO_4^{2-}(aq) \longrightarrow 2PbSO_4(s) + 2H_2O$

OR

(a) Cell representation

$Fe\left|Fe^{2+}(aq)\right|\left|Cd^{2+}(aq)\right|Cd$

$E^0_{cell} = E^0_{Cd^{2+}/Cd} - E^0_{Fe^{2+}/Fe}$

= 0.40 – (–0.44)

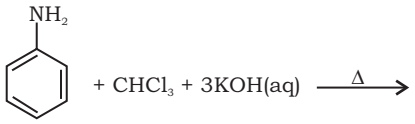
= 0.84 V

$$E^0_{cell} = \frac{0.591}{n}\log K_c$$

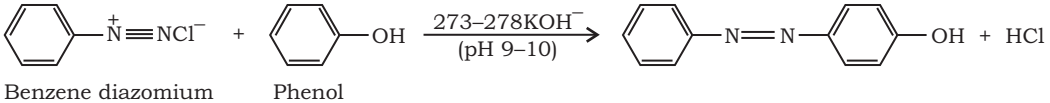
$$0.84 = \frac{0.0591}{2}\log K_C$$

$$K_C = \text{antilog}\left(\frac{0.84\times 2}{0.0591}\right)$$

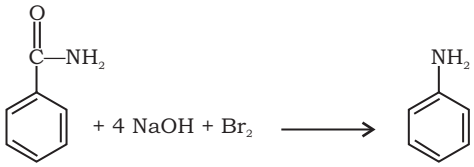
$K = 2.67 \times 10^{28}$

26. (a) (i) 

Aniline + $CHCl_3$ + 3KOH(aq) $\xrightarrow{\Delta}$ Phenyl isocyanide + 3KCl + $3H_2O$

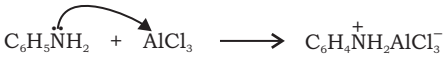
(ii) 

Benzene diazomium chloride + Phenol $\xrightarrow[(pH\ 9–10)]{273–278KOH^-}$ + HCl

(iii) 

Aniline + 4 NaOH + Br_2 $\longrightarrow$ + Na_2CO_3 + 2NaBr + $2H_2O$

(b) (i) Aniline being a Lewis base reacts with Lewis acid $AlCl_3$ to form a salt.



Due to the presence of a positive charge on N atom in the salt, the group $-\overset{+}{N}H_3AlCl_3^-$ as a strongly deactivating group. As a result aniline does not under go friedel craft reaction.

(ii) Ethylamine dissolves in water due to intermolecular H-bonding. However aniline, due to large hydrophobic part i.e. hydrocarbon part. The extent of H-bonding decreases & hence is insoluble in water.

OR

(a) (i) $C_6H_5N_2Cl + H_3PO_2 + H_2O \xrightarrow{Cu^+} C_6H_6 + N_2 + H_3PO_3 + HCl$

(ii) $C_6H_5N_2Cl \xrightarrow[-HCl]{HBF_4} C_6H_5\overset{+}{N}_2BF_4^- \xrightarrow[\Delta]{NaNO_2/Cu} C_6H_5NO_2 + BF_3 + NaF$

(iii) $C_6H_5NH_4 \xrightarrow[273-278K]{HNO_2+HCl} C_6H_5\overset{+}{N}_2Cl^- + 2H_2O$

(b) (i) $NH_3 < (CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$

(ii) $NH_3 < C_2H_5NH_2 < (C_2H_5)_3N < (C_2H_5)_2NH$

$P_4(s) \xrightarrow{\text{Heat, inert gas}} P_4(s)$

27. White phosphorous (A) Red phosphorous (B)

$P_4(s) + 3KOH(aq) + 3H_2O(l) \xrightarrow{heat} 3KH_2PO_2(aq) + PH_3(g)$

(A) Phosphine (C)

$PH_3(g) + 4Cl_2(g) \xrightarrow{\text{excess}} PCl_5(s) + 3HCl(g)$

(C) Phosphorous pentachloride (D)

$PCl_5(s) + 4H_2O(l) \longrightarrow H_3PO_4(aq) + 5HCl(g)$

(D) Phosphorous acid (E)

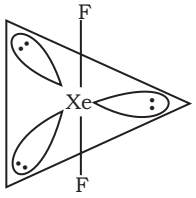
OR

(a) (i) $I_2 < F_2 < Br_2 < Cl_2$

(ii) $HF < HCl < HBr < HI$

(iii) $BiH_3 < SbH_3 < AsH_3 < PH_3 < NH_3$

(b) (i)



(ii)