

Studymate Solutions to CBSE Board Examination 2018-2019

Series : BVM/1

Code No. 56/1/1

Roll No.

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Candidates must write the Code on the title page of the answer-book.

- ▶ Please check that this question paper contains 12 printed pages.
- ▶ Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- ▶ Please check that this question paper contains 27 questions.
- ▶ Please write down the Serial Number of the question before attempting it.
- ▶ 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

CHEMISTRY

[Time allowed : 3 hours]

[Maximum marks : 70]

General Instructions:

- (i) All questions are compulsory.
- (ii) Question numbers 1 to 5 are very short-answer questions and carry 1 mark each.
- (iii) Question numbers 6 to 12 are short-answer questions and carry 2 marks each.
- (iv) Question numbers 13 to 24 are also short-answer questions and carry 3 marks each.
- (v) Question numbers 25 to 27 are long-answer questions and carry 5 marks each.
- (vi) Use Log Tables, if necessary. Use of calculators is not allowed.

Disclaimer: All model answers in this Solution to Board paper are written by Studymate Subject Matter Experts. This is not intended to be the official model solution to the question paper provided by CBSE. The purpose of this solution is to provide a guidance to students.

Section - A

1. Out of NaCl and AgCl, which one shows Frenkel defect and why?

Ans. AgCl (Size difference)

2. Arrange the following in increasing order of boiling points:



Ans. $(\text{CH}_3)_3\text{N} < \text{C}_2\text{H}_5\text{NH}_2 < \text{C}_2\text{H}_5\text{OH}$

3. Why are medicines more effective in colloidal state?

OR

What is difference between an emulsion and a gel?

Ans. Medicines are more effective in colloidal state because they have large surface area. They get easily assimilated/adsorbed.

OR

A colloidal solution in which both dispersed phase and dispersion medium are liquid is called an emulsion. Gels are that kind of colloid in which dispersed phase is liquid and dispersion medium is solid.

4. Define ambident nucleophile with an example.

Ans. Nucleophile which has more than one nucleophile site is called ambident nucleophile. Example SCN.

5. What is the basic structural difference between glucose and fructose?

OR

Write the products obtained after hydrolysis of lactose.

Ans. Glucose is Aldo hexoses monosaccharide while ketone is Keto hexoses monosaccharide.

OR

β - D Glucose and β - D Galactose

Section - B

6. Write balanced chemical equations for the following process:

(i) XeF_2 undergoes hydrolysis.

(ii) MnO_2 is heated with conc. HCl.

OR

Arrange the following in order of property indicated for each set:

(i) $\text{H}_2\text{O}, \text{H}_2\text{S}, \text{H}_2\text{Se}, \text{H}_2\text{Te}$ – increasing acidic character

(ii) HF, HCl, HBr, HI – decreasing bond enthalpy

Ans. (i) $\text{XeF}_2 + \text{H}_2\text{O} \rightarrow \text{Xe} + \frac{1}{2} \text{O}_2 + \text{HF}$

(ii) $\text{MnO}_2 + 4\text{HCl} \rightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2(\text{g})$

OR

(i) $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$

(ii) $\text{H}-\text{F} > \text{H}-\text{Br} > \text{H}-\text{Cl} > \text{H}-\text{I}$

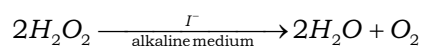
7. State Raoult's law for a solution containing volatile components. Write two characteristics of the solution which obeys Raoult's law at all concentrations.

Ans. The pressure of non volatile solute is equal to the vapour pressure of the pure solvent at that temperature multiplied by its mole fraction.

$$\Delta H_{\text{mix}} = 0$$

$$\Delta V_{\text{mix}} = 0$$

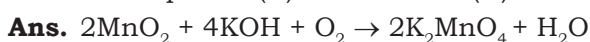
8. For a reaction



- (1) $\text{H}_2\text{O}_2 + \text{I}^- \rightarrow \text{H}_2\text{O} + \text{IO}^-$ (slow)
- (2) $\text{H}_2\text{O}_2 + \text{IO}^- \rightarrow \text{H}_2\text{O} + \text{I}^- + \text{O}_2$ (fast)
 - (i) Write rate law for the reaction.
 - (ii) Write the overall order of reaction.
 - (iii) Out of steps (1) and (2), which one is rate determining step?

- Ans.** (i) Rate = $k[\text{H}_2\text{O}_2][\text{I}^-]$
 (ii) 2nd order
 (iii) 1st step

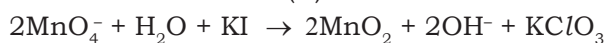
9. When MnO_2 is fused with KOH in the presence of KNO_3 as an oxidizing agent, it gives a dark green compound (A). Compound (A) disproportionates in acidic solution to give purple compound (B). An alkaline solution of compound (B) oxidises KI to compound (C) whereas an acidified solution of compound (B) oxidise KI to (D). Identify (A), (B), (C) and (D).



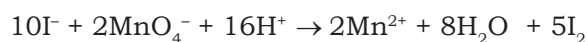
(A)



(B)



(C)



(D)

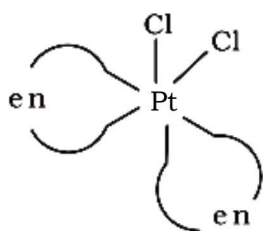
10. Write IUPAC name of the complex $[\text{Pt}(\text{en})_2\text{Cl}_2]$. Draw structures of geometrical isomers for this complex.

OR

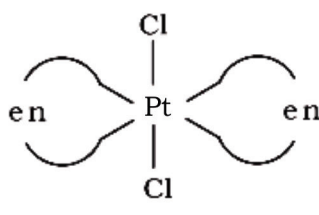
Using IUPAC norms write the formulae for the following:

- (i) Hexaamminecobalt(III) sulphate
- (ii) Potassium trioxalatochromate(III)

Ans. Di-chloridobis(ethane-1,2-diamine) platinum (II)



is



(trans)

OR

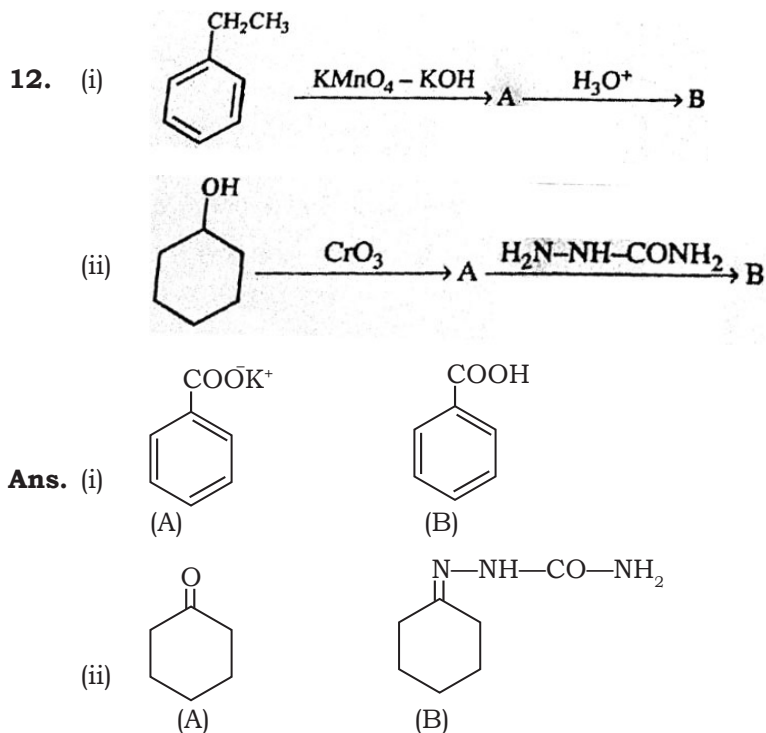
- (i) $[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_4)_3$
- (ii) $\text{K}_3[\text{Cr}(\text{C}_2\text{O}_4)_3]$

11. Out of $[\text{CoF}_6]^{3-}$ and $[\text{Co}(\text{en})_3]^{3+}$, which one complex is

- (i) paramagnetic
- (ii) more stable
- (iii) inner orbital complex and
- (iv) high spin complex

(Atomic no. of Co = 27)

- Ans.** (i) $[\text{CoF}_6]^{3-}$
 (ii) $[\text{Co}(\text{en})_3]$
 (iii) $[\text{Co}(\text{en})_3]$
 (iv) $[\text{CoF}_6]^{3-}$



Section - C

13. The decomposition of NH_3 on platinum surface is zero order reaction. If rate constant (K) is $4 \times 10^{-3} \text{ Ms}^{-1}$, how long will it take to reduce the initial concentration of NH_3 from 0.1 M to 0.064 M.

Ans. $K = 4 \times 10^{-3}$

Order of Reaction = 0

$$\text{Rate of reaction} = K[\text{NH}_3]^0$$

$$[R_0] = 0.1 \text{ M}, [R] = 0.064 \text{ M}$$

$$K = \frac{[R]_0 - [R]}{t}$$

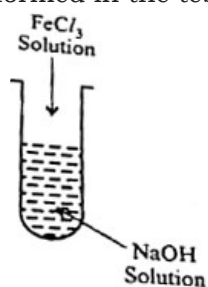
$$t = \frac{[R]_0 - [R]}{K}$$

$$t = \frac{0.1 - 0.064}{4 \times 10^{-3}}$$

$$t = \frac{0.036}{4 \times 10^{-3}}$$

$$t = 9 \text{ sec.}$$

14. (i) What is the role of activated charcoal in gas mask?
 (ii) A colloidal sol is prepared by the given method in figure. What is the charge on hydrated ferric oxide colloidal particles formed in the test tube? How is the sol represented?



- (iii) How does chemisorption vary with temperature?

- Ans.** (i) Activated charcoal is used to absorb poisonous gases in gas mask and not oxygen.
 (ii) The charge on hydrated ferric oxide colloidal particle in test tube is negative charge due to adsorption of OH^- ions.
 It is represented as
 $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}/\text{OH}^-$
 (iii) Chemisorption first increase with increase of temperature then decrease with increase of temperature.

15. An element crystallizes in fcc lattice with a cell edge of 300 pm. The density of the element is 10.8 g cm^{-3} . Calculate the number of atoms in 108 g of the element.

Ans. $a = 300 \text{ pm} = 300 \times 10^{-10} \text{ cm}$

$$d = 10.8 \text{ g cm}^{-3}$$

$$d = \frac{ZM}{a^3 N_A} \Rightarrow M = \frac{da^3 N_A}{Z} = \frac{10.8 \times (3 \times 10^{-8})^3 (6.022 \times 10^{23})}{4}$$

$$= 43.9 \text{ g mol}^{-1}$$

$$\text{No. of atoms} = \frac{108}{43.9} \times 6.022 \times 10^{23}$$

$$= 14.8 \times 10^{23}$$

16. A 4% solution (w/w) of sucrose ($M = 342 \text{ g mol}^{-1}$) in water has freezing point of 271.15K. Calculate the freezing point of 5% **glucose** ($M = 180 \text{ g mol}^{-1}$) in water.

(Given : Freezing point of pure water = 273.15K)

Ans. 4% (w/w) solution of glucose

Mass of solution = 100 g

Mass of sucrose = 4g

Mass of $\text{H}_2\text{O} = 96 \text{ g}$

$$\Delta T_f = K_f \frac{W_{\text{sucrose}}}{M_{\text{sucrose}} \times W_{\text{H}_2\text{O}}}$$

$$\Rightarrow 2 = K_f \frac{4}{342 \times \frac{96}{1000}}$$

$$\Rightarrow K_f = 16.416.$$

5% solution of sucrose

$$\Delta T_f = K_f \frac{W_s}{M_s \times W_{\text{H}_2\text{O}}} = 16.416 \times \frac{5}{180 \times \frac{95}{1000}}$$

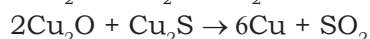
$$= \frac{16.416 \times 5}{17.1} = \frac{82.08}{17.1} = 4.8$$

$$T_f = 273.15 - 4.8 = 268.35 \text{ K.}$$

- 17.** (a) Name the method of refining which is
 (i) used to obtain semiconductor of high purity.
 (ii) used to obtain low boiling metal.
 (b) Write chemical reactions taking place in the extraction of copper from Cu_2S .

Ans. (a) (i) Zone refining

(ii) Distillation



Pure Cu is then obtained by electrolytic refining.

18. Give reasons for the following:

- Transition elements and their compounds act as catalysts.
- E° value for $(Mn^{2+} | Mn)$ is negative whereas for $(Cu^{2+} | Cu)$ is positive.
- Actinoids show irregularities in their electronic configuration.

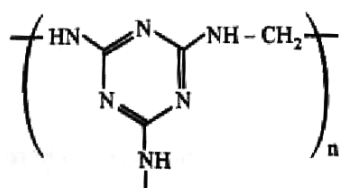
Ans. (i) Variable oxidation state and large surface area.
 (ii) Hydration enthalpy of Cu^{2+} does not compensate for its sublimation and ionisation.
 (iii) 7s, 6d and 5f having comparable energies.

19. Write the structures of monomers used for getting the following polymers:

- Nylon-6,6
- Glyptal
- Buna-S

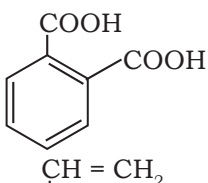
OR

- Is $\left[CH_2 - \overset{\overset{CH_3}{|}}{CH} \right]_n$ a homopolymer or copolymer? Give reason.
- Write the monomers of the following polymer:



- What is the role of Sulphur in vulcanization of rubber ?

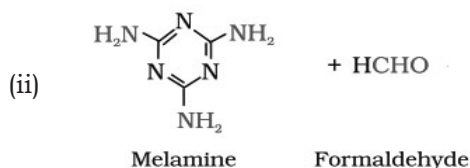
Ans. (i) $H_2N-(CH_2)_6-NH_2$ and $HOOC-(CH_2)_4-COOH$

- $HO-CH_2-CH_2-OH$ and 

- $CH_2 = CH-CH = CH_2$ and 

OR

- Homopolymer because only one type of monomer



- Cross linking

20. (i) What type of drug is used in sleeping pills ?
 (ii) What type of detergents are used in toothpastes ?
 (iii) Why the use of alitame as artificial sweetener is not recommended ?

OR

Define the following terms with a suitable example in each:

- Broad-spectrum antibiotics
- Disinfectants
- Cationic detergents

Ans. (i) Tranquillizer
 (ii) Anionic detergents
 (iii) Because it is high potency artificial sweetener due to which difficult to control the sweetness of food.

OR

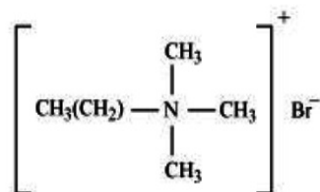
- (i) Antibiotics which kill or inhibit a wide range of harmful or disease causing bacteria are called broad spectrum antibiotics. These are equally effective against Gram-positive and Gram-negative bacteria (both).
e.g. Ampicillin and amoxycillin
- (ii) These are the chemical substances which kill microorganisms not safe to be applied to the living tissues. They are generally kill the microorganisms present on inanimate objects such as drainage systems, instruments, etc.

Example of disinfectants

10% phenol solution is disinfectant while in lower concentration 0.2% solution of phenol is antiseptic.

- (iii) Cationic detergents are quaternary ammonium salts of acetates, chlorides, or bromides. These are called cationic detergents because the cationic part of these detergents contains a long hydrocarbon chain and a positive charge on the N atom.

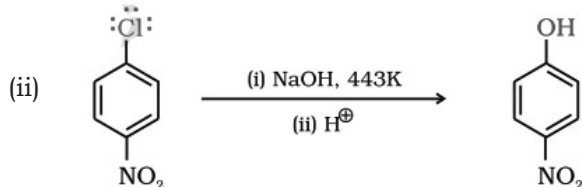
For example: cetyltrimethylammonium bromide



Cetyltrimethylammonium bromide

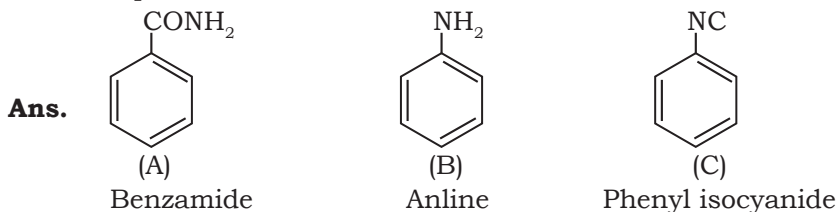
21. (i) Out of $(\text{CH}_3)_3\text{C}-\text{Br}$ and $(\text{CH}_3)_3\text{C}-\text{I}$. which one is more reactive towards $\text{S}_{\text{N}}1$ and why ?
(ii) Write the product formed when p-nitrochlorobenzene is heated with aqueous NaOH at 443 K followed by acidification.
(iii) Why *dextro* and *laevo* - rotatory isomers of Butan-2-ol are difficult to separate by fractional distillation ?

Ans. (i) $(\text{CH}_3)_3\text{C}-\text{I}$ is more reactive because I is better leaving group.

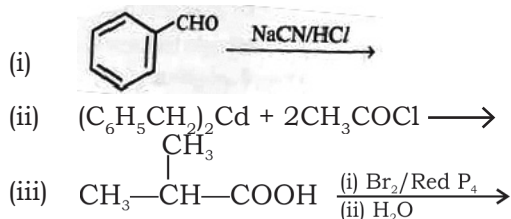


- (iii) Because they have same boiling point.

22. An aromatic compound "A" on heating with Br_2 and KOH forms a compound 'B' of molecular formula $\text{C}_6\text{H}_7\text{N}$ which on reacting with CHCl_3 and alcoholic KOH produces a foul smelling compound 'C' Write the structures and IUPAC names of compounds A, B and C.



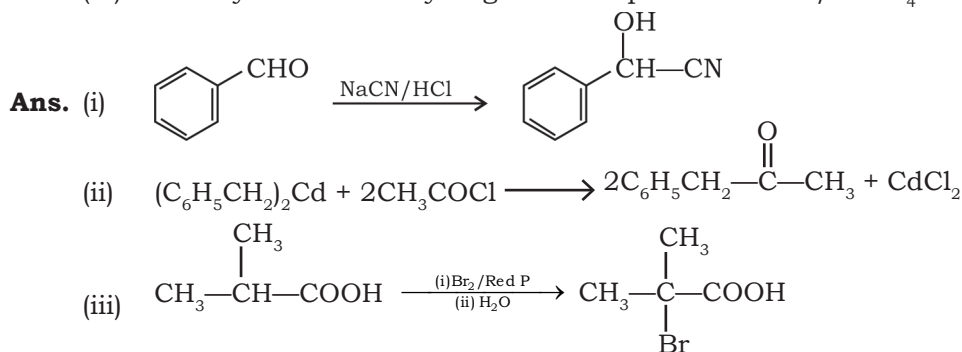
23. Complete the following reaction:



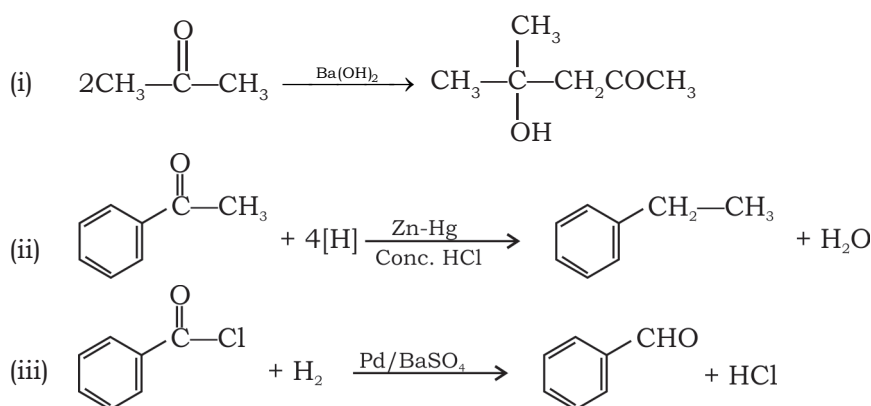
OR

Write chemical equations for the following reactions :

- (i) Propanone is treated with dilute $\text{Ba}(\text{OH})_2$.
 (ii) Acetophenone is treated with $\text{Zn}(\text{Hg})/\text{Conc. HCl}$
 (iii) Benzoyl chloride is hydrogenated in presence of Pd/BaSO_4 .



OR



24. Differentiate between the following:

- (i) Amylose and Amylopectin
 (ii) peptide linkage and Glycosidic linkage
 (iii) Fibrous proteins and Globular proteins

OR

Write chemical show that open structure of D-glucose contain Write chemical reactions to following

- (i) Straight chain
 (ii) Five alcohol groups
 (iii) Aldehyde as carbonyl group

Ans. (i)

Amylose	Amylopectin
1. Amylose is a straight chain polymer of D-glucose units.	1. Amylopectin is a branched chain polymer of D-glucose unit.
2. Amylose content in starch is about 20%.	2. Amylopectin content in starch is about 80%.

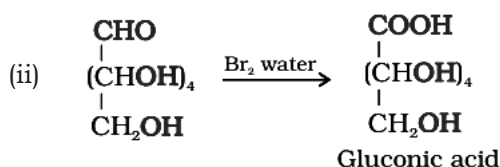
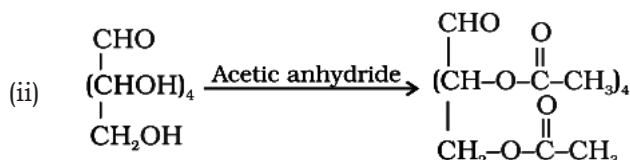
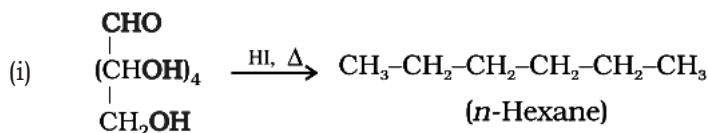
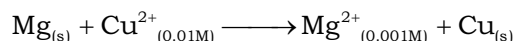
(ii)

Peptide linkage	Glycosidic Linkage
1. Peptide bond is a type of covalent bond formed between two amino acids.	1. Glycosidic bond is a type of covalent bond formed between two monosaccharides.
2. Present in proteins	2. Present in carbohydrates

(iii)

Fibrous proteins	Globular proteins
1. A class of insoluble proteins which constitute the main structural element of the body	1. A protein soluble in water and tend to be involved in metabolic functions.
2. Parallel uncoiled polypeptide chains	2. Coiled polypeptide chains

OR

25. E°_{cell} for the given redox reaction is 2.71 V

Calculate E_{cell} for the reaction. Write the direction of flow of current when an external opposite potential applied is

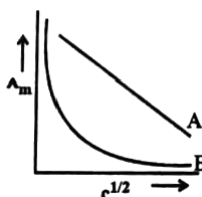
- less than 2.71 V and
- greater than 2.71 V

OR

(a) A steady current of 2 amperes was passed through two electrolytic cells X Y connected in series containing electrolytes FeSO_4 and ZnSO_4 until 2.8 g of Fe deposited at the cathode of cell X. How long did the current flow ? Calculate the mass of Zn deposited at the cathode of cell Y.

(Molar mass : Fe = 56 g mol⁻¹ Zn = 65.3 g mol⁻¹, 1F = 96500 C mol⁻¹)

(b) In the plot of molar conductivity (\wedge_m) vs square root of concentration ($c^{1/2}$), following curves are obtained for two electrolytes A and B :



Answer the following :

- Predict the nature of electrolytes A and B.
- What happens on extrapolation of \wedge_m to concentration approaching zero for electrolytes A and B?

Ans. $\text{Mg}_{(s)} + \text{Cu}^{2+}(0.01 \text{ M}) \longrightarrow \text{Mg}^{2+}(0.001\text{M}) + \text{Cu}_{(s)}$

$$E^\circ_{\text{cell}} = 2.71 \text{ V}$$

$$n = 2$$

$$E_{\text{cell}} = E^\circ_{\text{cell}} - \frac{0.0591}{n} \log \frac{[\text{Mg}^{2+}]}{[\text{Cu}^{2+}]}$$

$$= 2.71 - \frac{0.0591}{2} \log \frac{(0.001)}{(0.01)}$$

$$= 2.71 - 0.02955 \log 10^{-1}$$

$$= 2.71 + 0.02955$$

$$E_{\text{cell}} = 2.73955\text{V}$$

When

(i) $E^{\circ}_{\text{ext}} < 2.71\text{V}$

Electron flow from Mg rod to Cu rod hence current flows from Cu to Mg.

(ii) $E^{\circ}_{\text{ext}} > 2.71\text{V}$

Electron flow from Cu to Mg and current flows from Mg to Cu.

OR

(a) Given $I = 2.8\text{ A}$

Weight of Fe deposited at cathode of cell X = 2.8g.

find : How long the current flow?

Calculate the mass of Zn deposited at the cathode of cell Y.



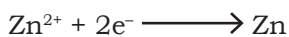
$$\text{Weight of Fe deposited } W = \frac{\text{At. mass} \times I \times t}{96500 \times n}$$

$$2.8 = \frac{56 \times 2.8 \times t}{96500 \times 2}$$

$$\frac{2.8 \times 96500 \times 2}{56 \times 2.8} = t$$

$$t = 3446.43 \text{ sec}$$

$$\text{time} = 57.44 \text{ min}$$



$$\text{Weight of Zn deposited} = W = \frac{65.3 \times 2.8 \times 3446.43}{96500 \times 2} = 3.26 \text{ g}$$

(b) (i) A is a strong electrolyte and B is a weak electrolyte.

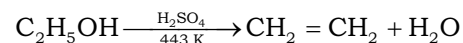
(ii) The graph of A is a straight line from which the value of (\wedge_m) can be calculated where as graph B is not straight line so (\wedge_m) can not be obtained by extrapolation.

26. (a) How do you convert the following :

(i) Phenol to Anisole

(ii) Ethanol to Propan-2-ol

(b) Write mechanism of the following reaction :



(c) Why phenol undergoes electrophilic substitution more easily than benzene?

OR

(a) Account for the following :

(i) o-nitrophenol is more steam volatile than p-nitrophenol.

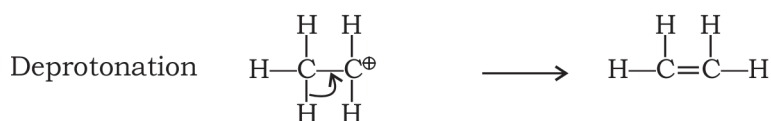
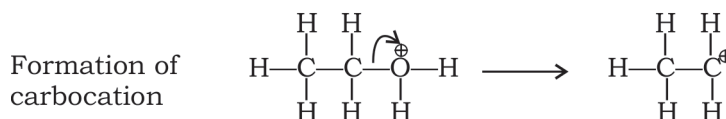
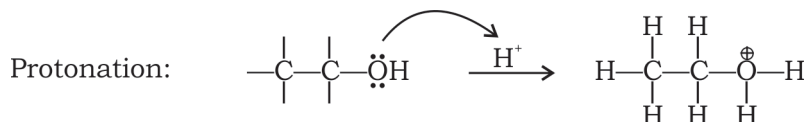
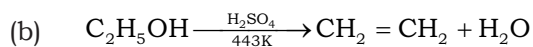
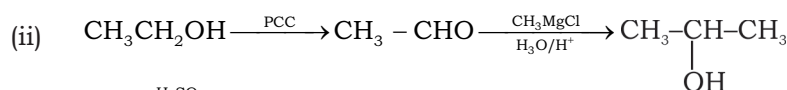
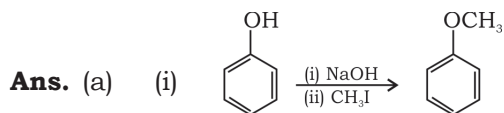
(ii) t-butyl chloride on heating with sodium methoxi gives 2-methylpropene instead of t-butylmethylether.

(b) Write the reaction involved in the following :

(i) Reimer-Tiemann reaction

(ii) Friedal-Crafts Alkylation of Phenol

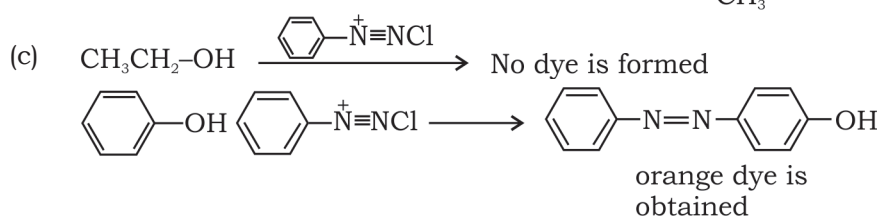
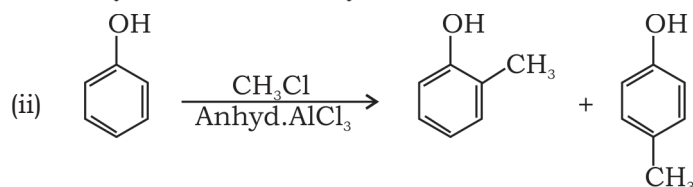
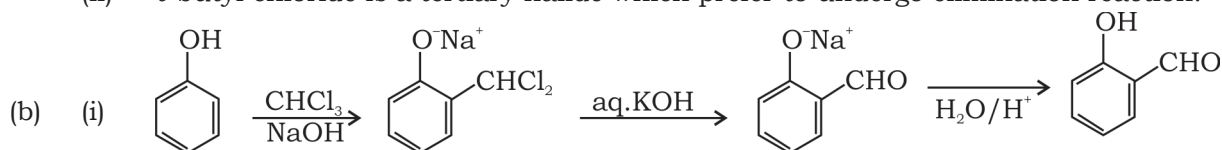
(c) Give simple chemical test to distinguish between Ethanol and Phenol.



- (c) In phenol, -OH group shows +R effect which makes the benzene ring e⁻ rich and activate it towards electrophilic substitution reaction

OR

- (a) (i) o-nitrophenol has intramolecular H-bonding whereas p-nitrophenol has intermolecular H-bonding because which it has higher boiling point and hence o-nitrophenol is steam volatile.
 (ii) t-butyl chloride is a tertiary halide which prefer to undergo elimination reaction.



27. (a) Give reasons for the following :

- (i) Sulphur in vapour state shows paramagnetic behaviour.
 (ii) N-N bond is weaker than P-P bond.
 (iii) Ozone is thermodynamically less stable than oxygen.

- (b) Write the name of gas released when Cu is added to

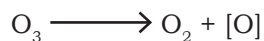
- (i) dilute HNO_3 and
 (ii) cone. HNO_3

OR

- (a) (i) Write the disproportionation reaction of H_3PO_3 .
 (ii) Draw the structure of XeF_4 .

- (b) Account for the following :
- (i) Although Fluorine has less negative electron gain enthalpy yet F_2 is strong oxidizing agent.
- (ii) Acidic character decreases from N_2O_3 to Bi_2O_3 , in group 15.
- (c) Write a chemical reaction to test sulphur dioxide gas. Write chemical equation involved.

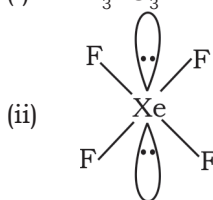
- Ans.** (a) (i) Sulphur in vapour state exist as diatomic molecule (S_2) which has two unpaired electrons in its antibonding p-orbital which makes it paramagnetic.
- (ii) N—N bond is weaker due to inter-electronic repulsion because of small size of N.
- (iii) Ozone dissociates to give oxygen and liberate nascent oxygen, and in this process entropy increases.



- (b) (i) NO (nitric oxide)
- (ii) NO_2 (nitrogen dioxide)

OR

- (a) (i) $H_3PO_3 \xrightarrow{\Delta} H_3PO_4 + PH_3$



- (b) (i) F_2 has high electro-negativity and due to its small size it has high hydration enthalpy which makes it a strong oxidising agent.
- (ii) From N to Bi, size of atom increase due to which acidic character decreases.
- (c) SO_2 can be detected using $KMnO_4$.

Reaction involved is :-

