

No. of printed pages : 11

Roll No.6.....

FAS / CHEMISTRY / XII / HALF YEARLY EXAMINATION, 2024-25

Time : 3 Hrs.]

[M.M. : 70

General Instructions :

Read the following instructions carefully.

- (1) The question paper have five sections: Section A, Section B, Section C, Section D and Section E.
- (2) There are 33 questions in this question paper. All questions are compulsory.
- (3) Section (A) : Q. No. 1 to 16 are multiple choice questions carrying 1 mark each.
- (4) Section (B) : Q. No. 17 to 21 are short answer questions and carrying 2 marks each.
- (5) Section (C) : Q. No. 22 to 28 are short answer questions and carrying 3 marks each.
- (6) Section (D) : Q. No. 29 to 30 are case-based study questions carrying 4 marks each.
- (7) Section (E) : Q. No. 31 to 33 are long answer questions carrying 5 marks each,
- (8) There is no overall choice. However, internal choices have been provided.
- (9) Use of calculators and log tables is not permitted.

SECTION-(A)

On mixing 20 ml of Acetone with 30 ml of Chloroform, the total volume of the solution is :

- | | |
|------------|------------|
| (a) >50 ml | (c) =50 ml |
| (b) <50 ml | (d) =10 ml |

(P.T.O.)

2. The reagent used in Etard's reaction is :

- (a) $\text{SnCl}_2 + \text{HCl}$ (b) H/Ni
 (c) Na/Alcohol (d) CrO_2Cl_2

3. Which of the following does not give Cannizzaro's Reaction :

- (a) HCHO (b) $\text{C}_6\text{H}_5\text{CHO}$
 (c) $\text{CH}_3\text{C}_6\text{H}_4\text{CHO}$ (d) CH_3CHO

4. Which of the following can be prepared by Gabriel synthesis ?

- (a) N-methylbenzylamine (b) Aniline
 (c) 2-Phenylethylamine (d) N-phenylaniline

5. Which of the following should be most volatile ?

- (a) $\text{CH}_3\text{CH}_2\text{NHCH}_3$ (b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$
 (c) $(\text{CH}_3)_3\text{N}$ (d) $\text{C}_6\text{H}_5\text{NH}_2$

6. In the following reaction, identify 'A' and 'B' :

Phenol on reaction with (Compound A + aq. NaOH) gives an intermediate which get hydrolysed in the presence of alkali to give final product 'B'

- (a) $\text{A} = \text{CO}_2$, $\text{B} = 2\text{-Hydroxy benzoic acid}$
 (b) $\text{A} = \text{CHCl}_3$, $\text{B} = \text{Salicylaldehyde}$
 (c) $\text{A} = \text{Zn}$, $\text{B} = 2\text{-Hydroxybenzaldehyde}$
 (d) $\text{A} = \text{CO}_2$, $\text{B} = \text{Salicylaldehyde}$

7. When Phenol reacts with dil. HNO_3 , gives compound 'A' while on reaction with (cone. H_2SO_4 + conc. HNO_3) gives compound 'B'. While on reaction with Br_2 in presence of CS_2 gives compound 'C' and on reaction with $\text{Br}_2/\text{H}_2\text{O}$ gives compound 'D'. Identify compound A, B, C and D.

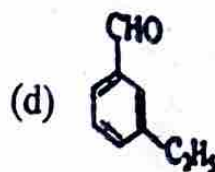
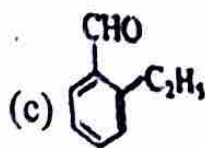
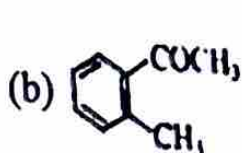
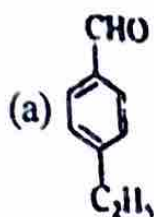
- (a) $\text{A} = \text{p-Nitrophenol}$, $\text{B} = 2,4,6\text{-Trinitrophenol}$, $\text{C} = 2,4,6\text{-Tribromophenol}$, $\text{D} = \text{p-Bromophenol}$

The compound which undergoes dehydration very easily is :

- (a) n-Propyl alcohol (b) 2-Methylbutan-2-ol
(c) 3-Methylbutan-2-ol (d) Ethyl Alcohol

An aromatic compound 'X' with molecular formula $C_9H_{10}O$ gives the following chemical test :

- (i) forms 2,4-DNP derivative
(ii) Reduces Tollen's Reagent
(iii) Undergoes Cannizzaro's reaction
(iv) On vigorous oxidation, 1-2 benzenedicarboxylic acid is obtained.
- 'X' is :



In the following questions (Q. No. 13-16), a statement of assertion followed by statement of reason is given. Choose the correct answer out of the following choices :

- (a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

13. Assertion : 1 m glucose solution has lesser elevation in boiling point than 1m NaCl.

Reason : NaCl undergoes dissociation in water.

14. Assertion : Nitration of chlorobenzene leads to the formation of m-nitrochlorobenzene.

Reason : $-NO_2$ group is a m-directing group.

15. **Assertion :** Benzyl amine is less basic than ethyl amine.

Reason : Benzene shows + I effect.

16. **Assertion :** Carboxylic Acids contain a carbonyl group but do not show the characteristic reactions of the carbonyl group

Reason : The electrophilicity of the carbon atom is more in carboxylic acids than in aldehydes and ketones.

SECTION-(B)

17. (i) Gas A is more soluble in water than Gas B at room temperature. Which one of the two gases will have a higher value of K_H and why ?

(ii) Components of a binary mixture of two liquids A and B were being separated by distillation. After some time the composition of vapour phase became same as that of liquid phase. Both the components started coming in the distillate. Explain why this happened.

18. Write the products obtained when :

(a) 2-Bromo-2-methylpropane reacts with alc. KOH

(b) Ethylcyclohexene reacts with HI

(c) $\text{CH}_3\text{CH}=\text{C}(\text{CH}_3)_2$ reacts with HBr in presence of peroxide

(d) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$ reacts with AgF in presence of acetone

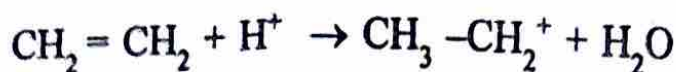
19. Two organic compounds A and B have same molecular formula $\text{C}_4\text{H}_{10}\text{O}$. Compound A reacts with Na metal while B not. B get dissolved in conc. H_2SO_4 and reacts with excess HI to give a compound C. Answer the following :

(i) What relation do A and B possess ?

(ii) Identity A, B and C.

OR

(i) Write the mechanism (using curved arrow notation) of the following reaction :



- (ii) Out of 2-Chloroethanol and ethanol, which one is more acidic and why ?
20. Arrange the following compounds in increasing order of the property indicated against :
- (i) $\text{C}_2\text{H}_5\text{NH}_2$, $\text{C}_6\text{H}_5\text{NHCH}_3$, $(\text{C}_2\text{H}_5)_2\text{NH}$, $\text{C}_6\text{H}_5\text{NH}_2$ (pK_b , value)
- (ii) $\text{C}_6\text{H}_5\text{NH}_2$, $(\text{C}_2\text{H}_5)_2\text{NH}$, $\text{C}_2\text{H}_5\text{NH}_2$ (solubility in water)
21. How will you convert :
- (i) Propanoic Acid to Ethanamine
- (ii) Aniline to p-bromoaniline

SECTION-(C)

22. Answer the following :
- (i) Measurement of Osmotic Pressure Method is preferred for the determination of molar masses of macro molecules such as proteins and polymers, why.
- (ii) How does sprinkling of salt help in clearing the snow covered roads in hilly areas ?
- (iii) Aquatic animals are more comfortable in cold water than warm water. Explain.
23. Answer the following :
- (i) Define Kohlrausch's Law.
- (ii) Write any two substances which can be used as fuel in fuel cells.
- (iii) Why is alternating current used for measuring resistance of an electrolytic solution ?
24. Give plausible explanation for each of the following :
- (a) Cyclohexanone forms cyanohydrin in good yield but 2, 2, 6-trimethylcyclohexanone not.

- (b) There are two NH_2 groups in semicarbazide. However, only one is involved in the formation of semicarbazones.
- (c) Reactions of Aldehydes and Ketones are catalyzed by Dry HCl (g)

OR

- (i) Convert :
- (a) Ethanoic acid to 2-Chloroethanoic acid
- (b) Ethanal to 2-Hydroxypropanenitrile
- (ii) What is Tollens reagent ?
25. (i) How will you convert :
- (a) Ethyl magnesium bromide to Propanol
- (b) Phenol to Salicylic acid
- (ii) Write a chemical test to distinguish between $\text{C}_6\text{H}_5\text{OH}$ and $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$.
26. (i) Convert:
- (a) Propene to Butanoic acid
- (b) Aniline to Iodobenzene
- (ii) Write the structure of optically active isomer of $\text{C}_4\text{H}_9\text{Br}$ and also identify the chiral carbon.
27. Complete the following reactions :
- (a) $\text{C}_6\text{H}_5\text{N}_2\text{Cl} + \text{C}_2\text{H}_5\text{OH} \longrightarrow$
- (b) $\text{CH}_3\text{NH}_2 + \text{CHCl}_3 + \text{alc. KOH} \longrightarrow$
- (c) $\text{C}_6\text{H}_5\text{N}_2\text{Cl} + \text{HBF}_4 \xrightarrow{\text{NaNO}_2/\text{Cu}}$
28. (i) Out of SN_1 and SN_2 which reaction occurs with racemization and why?
- (ii) Arrange the following in decreasing order of reactivity towards SN_2 ;
 $(\text{CH}_3)_3\text{CBr}$, $\text{CH}_3\text{CH}_2\text{CHBrCH}_3$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$
- (iii) Why are aryl halides less reactive towards nucleophilic substitution reaction ?

SECTION-(D)

29.

Read the passage and answer the following questions :

Alcohols undergo dehydration in the presence of protic acids H_2SO_4 , H_3PO_4 . The formation of the reaction product, alkene or ether depends on the reaction conditions alcohol is dehydrated to ethene in the presence of sulphuric acid at 443 K. At 413 K, ethoxyethane is the main product. Diethyl ether has been used widely as an inhalation anaesthetic. But due to its slow effect and longer recovery period, it has been replaced, as an anaesthetic, by other compounds. Acidic dehydration of alcohols, to give an alkene is also associated with substitution reaction to give an ether. The method is suitable for the preparation of ethers having primary alkyl groups only. The alkyl group should be unhindered and the temperature be kept low, since otherwise the reaction favours the formation of alkene. The reaction follows SN_1 pathway when the alcohol is secondary or tertiary. However, the dehydration of secondary and tertiary alcohols to give corresponding ethers is unsuccessful as elimination competes over substitution and as a consequence, alkenes are easily formed.

- (i) Give equation for preparation of methoxy methane.
- (ii) Name the alkyl halide and sodium alkoxide used to synthesise tert-butyl ethyl ether.
- (iii) Explain why sodium metal can be used for drying diethyl ether but not ethyl alcohol ?

OR

$(CH_3)_3C-O-CH_3$ on reaction with HI gives $(CH_3)_3C-I$ and $(CH_3)_3C-OH$ as the main products and not $(CH_3)_3C-OH$ and CH_3-I . Give reason.

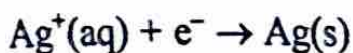
30.

Read the passage and answer the following questions :

A cell in which an external source of voltage is used to bring about a chemical reaction is called electrolytic cell. Such cells are used in industry for the purification of metals. Sodium and magnesium metals are produced by the electrolysis of their fused salts and aluminium is produced by the electrolysis of aluminium oxide in the presence of cryolite. The amount of chemical reaction which occurs at any electrode during electrolysis by a current is proportional to the quantity of electricity passed through the electrolytic solution or melt. The amounts of different substances liberated by the same quantity of electricity passing through the electrolytic solutions are proportional to their chemical equivalent weights (Atomic mass of metal divided by number of electrons required to reduce the cation).

The quantity of electricity Q passed is given by $Q = It$,

Q is in coulombs when I is in amperes and t in seconds. In the reaction :

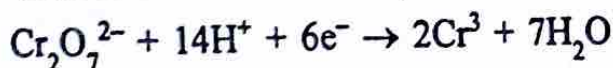


One mole of electrons having charge equal to 1 Faraday is required for the reduction of one mole Ag^+ ions.

(i) Predict the product of electrolysis of Silver Nitrate Solution with Silver Electrodes.

(ii) What will be the product formed at anode when NaCl solution is electrolyzed and why.

(iii) Write the value of Faraday's constant. Consider the reaction :



What is the quantity of electricity in coulombs needed to reduce 1 mole of $\text{Cr}_2\text{O}_7^{2-}$?

OR

If a current of 0.5A flows through a metallic wire for two hours, then how many electrons would flow through the wire.

SECTION-(E)

31. An organic compound 'A' C_7H_6O , which has a characteristic odour on treatment with conc. NaOH gives compound 'B' and 'C'. Compound 'B' has a molecular formula C_7H_8O , which on oxidation gives back 'A'. Compound C is a sodium salt of an acid and on reaction with soda lime gives an aromatic hydrocarbon 'D'. Identify A, B, C and D. Write the chemical reactions involved. Identify the positive test shown by compound A from the following: Iodoform Test, Silver mirror Test and Fehling's Test, also write the corresponding reactions.

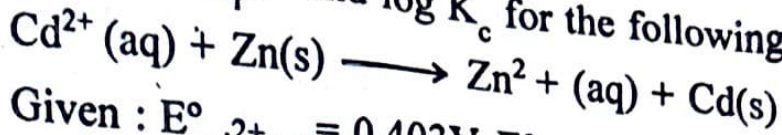
OR

- (i) Write a chemical test to distinguish between Formic acid and Acetic acid.
- (ii) How will you carry out the following conversions :
- (a) Ethanal to But-2-enal
 - (b) Acetyl chloride to ethane
- (iii) Which of the two will not react with $NaHSO_3$ and why: Acetophenone or Benzophenone.
- (iv) Write the structural formula of the product obtained when Cyclohexanone reacts with hydroxylamine.
32. (i) Out of the following pairs, predict with reason which will allow greater conduction of electricity :
- (a) Silver wire at $30^\circ C$ or silver wire at $60^\circ C$.
 - (b) 0.1 M CH_3COOH solution or 1 M CH_3COOH solution.
 - (c) KCl solution at $20^\circ C$ or KCl solution at $50^\circ C$.

- (ii) The molar conductivity of a 1.5 M solution of an electrolyte is found to be $138.9 \text{ Scm}^2\text{mol}^{-1}$. Calculate the conductivity of this solution.

OR

- (i) Calculate $\Delta_r G^\circ$ and $\log K_c$ for the following reaction :



Given : $E^\circ_{\text{cd}^{2+}/\text{cd}} = 0.403\text{V}$, $E^\circ_{\text{zn}^{2+}/\text{zn}} = 0.763\text{V}$

Write the reaction taking place in lead storage battery when it is in use.

What will be the effect of increase in temperature on :

- (a) Conductivity of metals.
(b) Conductivity of electrolytes.

Q. 33:

Attempt any five of the following:

- (i) Calculate the amount of solute (molar mass 60 g/mol) that must be added to 180g of water so that the vapour pressure of water is lowered by 10%.
- (ii) Which of the following is an Ideal solution and why :
a) Ethanol and water
b) Benzene and Toluene
- (iii) What happens when the external pressure applied becomes more than the osmotic pressure of the solution?
- (iv) What is the van't Hoff factor for a compound that undergoes tetramerisation in an organic solvent?
- (v) 2 g each of the solutes A and B (mol mass of $A > B$) are dissolved separately in 20g each of the same solvent C. Which will show greater lowering of vapour pressure and why?
- (vi) A peeled egg swells when dipped in water while shrinking in saturated brine solution, why?
- (vii) 0.6 mL of Acetic acid is dissolved in 1L of water. The value of the van't Hoff factor is 1.04 . What will be the degree of dissociation of the acetic acid?