

No. of Printed Pages : 8

HALF YEARLY EXAMINATION 2024-25

CHEMISTRY

Class XII

Time : 3 hrs.]

[M.M. : 70

General Instructions—

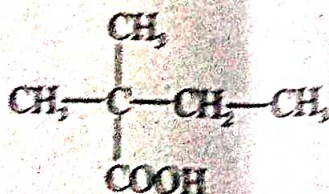
- (i) This question paper contains 33 questions. All questions are compulsory.
- (ii) Section A - Q.No. 1 to 16 are MCQ. Each question carries 1 mark.
- (iii) Section B - Q.No. 17 to 21 are very short answer type questions. Each question carries 2 marks.
- (iv) Section C - Q.No. 22 to 28 are short answer type questions. Each question carries 3 marks each.
- (v) Section D - Q.No. 29 and 30 are case based questions. Each question carries 4 marks.
- (vi) Section E - Q.No. 31 to 33 are long answer type questions. Each question carries 5 marks.

SECTION-A

Q.No. 1 to 16 are MCQ, carrying 1 mark each—

1×16=16

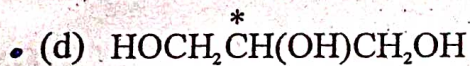
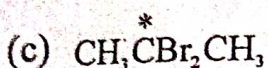
1. Alkenes decolourise bromine water in presence of CCl_4 due to formation of :
(a) Allyl bromide (b) Vinyl bromide
(c) Bromoform (d) Vicinal dihalide
2. Which of the following alcohols will not undergo oxidation ?
(a) Butanol (b) Butan-2-ol
(c) 2-Methyl butan-2-ol (d) 3-Methyl butan-2-ol
3. What is the correct IUPAC name of the given compound ?



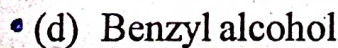
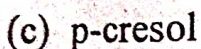
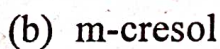
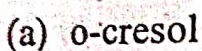
P.T.O.

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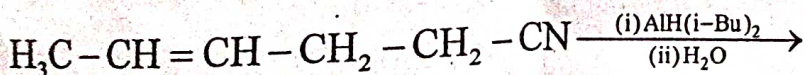
- (a) 2, 2-Dimethyl butanoic acid (b) 2-carboxyl-2-methyl butane
(c) 2-ethyl-2-methyl propanoic acid (d) 3-methyl butane carboxylic acid
4. The reaction $\text{ArN}_2^+\text{Cl}^- \xrightarrow{\text{Cu/HCl}} \text{ArCl} + \text{N}_2 + \text{CuCl}$ is named as :
- (a) Sandmeyer reaction (b) Gatterman reaction
(c) Claisen reaction (d) Carbylamine reaction
5. Tertiary structure of protein is stabilised by :
- (a) Disulphide bonds (b) Vander Waal's forces
(c) Hydrogen bonds (d) All of the above
6. Hardness of water is estimated by simple titration with $\text{Na}_2\text{-EDTA}$ because :
- (a) Ca^{2+} ions form stable complexes with EDTA.
(b) Mg^{2+} ions form stable complexes with EDTA.
(c) Ca^{2+} ions form unstable complexes with EDTA.
(d) Both (a) and (b)
7. Which of the following molecules has a chiral centre correctly labelled with an asterisk (*) ?



8. Monochlorination of toluene in sunlight followed by hydrolysis with aq. NaOH yields :



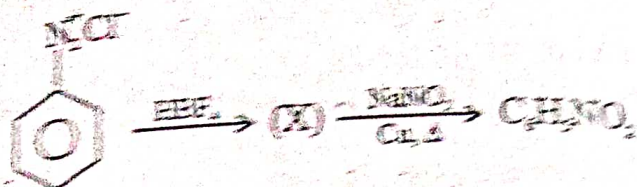
9. In the reaction



Identify the product formed in the given reaction :

- (a) $\text{CH}_3-\text{CH}_2-\text{CH}_2\text{CH}_2\text{CH}_2\text{CN}$
(b) $\text{H}_3\text{C}-\text{CH}=\text{CH}-\text{CH}_2\text{CH}_2\text{CHO}$
(c) $\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CHO}$
(d) None of the above

10. The intermediate 'X' in the following reaction is



- (a) $\text{C}_6\text{H}_5\text{N}=\text{BF}_4$ (b) $\text{C}_6\text{H}_5\text{N}_2\text{BF}_4$
 (c) $\text{C}_6\text{H}_5\text{N}_2\text{BF}_4$ (d) $\text{C}_6\text{H}_5\text{N}=\text{NBF}_4$

11. Which of the following isomer has the highest melting point?

- (a) 1, 2-Dichloro benzene (b) 1, 3-Dichloro benzene
 (c) 1, 4-Dichloro benzene (d) All isomers have same melting point

12. The C—O—C bond angle in the ether molecule is :

- (a) 111° (b) 90°
 (c) 120° (d) 180°

For questions number 13 to 16, two statements are given—one labelled as Assertion and the other labelled as Reason. Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

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

13. Assertion (A) : A carboxylate ion (RCOO^-) is stabilised by resonance to a greater extent as compared to the acid (RCOOH).

(a) Reason (R) : The contributing structures of RCOO^- are equivalent, while those of RCOOH are not.

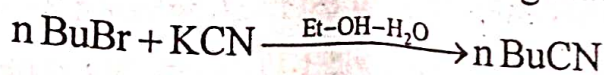
14. Assertion (A) : Like bromination of benzene, bromination of phenol is also carried out in the presence of Lewis acid.

(d) Reason (R) : Lewis acid polarises the bromine molecule.

15. Assertion (A) : The solubility of aldehydes and ketones in water decreases with increase in the size of alkyl group.
 Reason (R) : Alkyl groups are electron repelling groups.
16. Assertion (A) : The IUPAC name of $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NO}_2)]$ is diammine chloridonitrito-N-platinum (II).
 Reason (R) : The ligands are placed in the alphabetical order, then metal with oxidation state.

SECTION-B

17. (a) Write the mechanism of the following reaction—



- (b) With the help of resonating structures explain the effect of presence of nitro group at ortho position in chlorobenzene. 2

OR

- (a) Haloalkanes react with KNO_2 to form alkyl nitrites, while AgNO_2 forms nitroalkanes as chief product. Explain.
- (b) Although chlorine is an electron withdrawing group yet it is ortho, para directing towards electrophilic substitution reaction.
18. (i) Give reason : 2
 The C-O bond length in phenol is less than that in methanol.
- (ii) Write short note on 'Hydroboration'.
19. (a) Arrange the following compounds in the increasing order of their property indicated $\text{Cl-CH}_2\text{-COOH}$, $\text{F-CH}_2\text{-COOH}$, CH_3COOH (acidic character) 2
 (b) Why are α -hydrogen atoms of aldehydes and ketones are acidic in nature. 2
20. (a) Arrange the following in the increasing order of basic strength : 2
 $\text{C}_6\text{H}_5\text{NH}_2$, $\text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2$, $(\text{C}_2\text{H}_5)_2\text{NH}$ and CH_3NH_2
 (b) Convert : Aniline to Benzene 2
21. (a) Deficiency of which vitamin causes xerophthalmia and cheilosis. 2
 (b) Define denaturation with example. 2

SECTION-C

22. (a) Arrange the following compounds in the increasing order of the property indicated.

(i) p-nitrophenol, ethanol, phenol (acidic character) 3

(ii) propanol, propane, propanal (boiling point)

(b) Why does the reaction of CH_3ONa with $(\text{CH}_3)_3\text{C}-\text{Br}$ gives 2-methyl propene and not $(\text{CH}_3)_3\text{C}-\text{O}-\text{CH}_3$.

OR

What happens when :

(a) Phenol reacts with NaOH and CO_2 in acidic medium.

(b) Ethanol reacts with CH_3COCl /Pyridine.

(c) Anisole reacts with HI .

23. Give reasons for the following statements :

(i) The C-Cl bond length in chlorobenzene is shorter than that in CH_3Cl . 3

(ii) Neo-pentyl chloride does not follow SN^2 mechanism.

(iii) The solubility of haloalkanes in water is very low.

24. (a) Give chemical test to distinguish between Ethanol and Benzaldehyde with observation.

(b) Show how each of the following compounds can be converted to benzoic acid?

(i) Benzamide

(ii) Propyl benzene 3

25. Give reason :

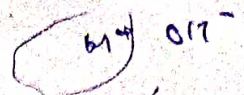
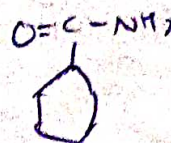
(i) Acylation of aniline reduces its activating effect. 3

(ii) Aniline does not undergo Friedel Craft reaction.

(iii) Write short note on Coupling reaction.

26. (a) What happens when maltose is hydrolysed? 3

(b) Give 2 differences between DNA and RNA.



27. (a) $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ are of different colours in dilute solution. Why?
 (b) Draw the optical isomers of $[\text{Co}(\text{en})_3]^{3+}$
28. (a) Write the reactions of Williamson synthesis of 2-Ethoxy-3-methyl pentane starting from Ethanol and 3-Methyl pentan-2-ol.
 (b) Preparation of ethers by acid dehydration of secondary or tertiary alcohols is not a suitable method. Give reason.

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SECTION-D

The following questions are case based questions. Read the case carefully and answer the questions that follow.

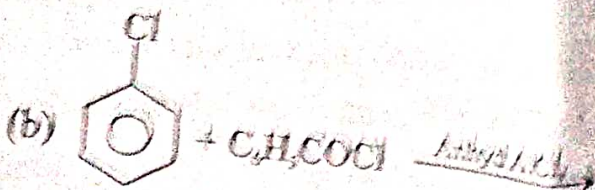
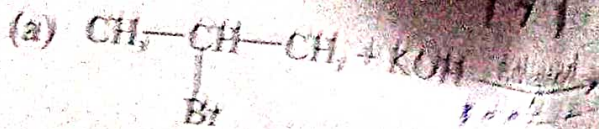
29. The polarity of C-X bond of alkyl halides is responsible for their nucleophilic substitution, elimination and their reaction with metal atoms to form organometallic compounds. Alkyl halides are prepared by the free radical halogenation of alkanes, addition of halogen acids to alkenes, replacement of -OH group of alcohols with halogen using phosphorus halides thionyl chloride or halogen acids. Aryl halides are prepared by electrophilic substitution of arenes. Nucleophilic substitution reactions are categorised into SN^1 and SN^2 on the basis of their kinetic properties. Chirality has profound role in understanding SN^1 and SN^2 mechanism.

Answer the following questions—

- (i) What happens when bromo benzene is treated with Mg in the presence of dry ether? 4
- (ii) Which compound in each of the following pair will react faster in SN^1 reaction with OH^- ? Give reason.
- (a) $(\text{CH}_3)_3\text{C}-\text{Cl}$ OR CH_3Cl
- (iii) Write the equations for the preparation of 1-iodobutane from
- (a) 1-chlorobutane (b) But-1-ene

OR

- (iii) Write the structure of the major products—



30. Carbohydrates are optically active polyhydroxy aldehydes and ketones. They are also called saccharides. All those carbohydrates which reduces Fehling's solution and Tollen's reagent are referred to as reducing sugars. Glucose, the most important source of energy for mammals, is obtained by the hydrolysis of starch. Vitamins are accessory food factors required in the diet.

Proteins are the polymers of α -amino acids and perform various structural and dynamic functions in the organisms.

Answer the following—

(a) The penta acetate form of glucose does not react with hydroxylamine. What does it indicate?

(b) Why cannot vitamin C be stored in our body?

(c) Write the reactions involved when D-glucose is treated with:

(i) HCN

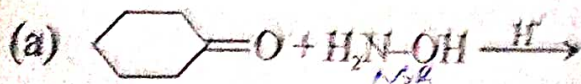
(ii) Br_2/water

OR

(c) Give 2 differences between fibrous and globular proteins.

SECTION-E

31. (i) Write the products of the following reactions—



(ii) Give reasons:

(a) Electrophilic substitution in benzoic acid takes place at meta position.

(b) Di-tert-butyl ketone does not give a NaHSO_3 adduct but acetone does.

1x5=5

[8]

OR

An organic compound 'A' C_8H_6 on treatment with dilute H_2SO_4 containing mercuric sulphate gave compound 'B'. This compound 'B' can also be obtained from a reaction of benzene with acetyl chloride in presence of anhydrous $AlCl_3$. 'B' on treatment with I_2 in aq. NaOH gives C and a yellow compound 'D'.

Identify A, B, C and D. Give the chemical reactions involved.

32. (i) $[NiCl_4]^{2-}$ is paramagnetic, while $[Ni(CO)_4]$ is diamagnetic though both are tetrahedral. Explain using valence bond theory. 2+2+1
- (ii) Draw the geometrical isomers of $[PtCl_2(en)_2]^{2+}$ ion.
- (iii) When 1 mole of $CrCl_3 \cdot 6H_2O$ is treated with excess of $AgNO_3$, 3 moles of $AgCl$ are obtained. What is the formula of the complex.

OR

- (i) For the complex ion $[Fe(en)_2Cl_2]^+$, write the hybridisation and magnetic behaviour. Draw one of the geometrical isomer of the complex ion which is optically active. 3+2=5
- (ii) On the basis of crystal field splitting energy theory, write the electronic configuration of d^4 in terms of t_{2g} and e_g in an octahedral field when
- (a) $\Delta_0 > P$ (b) $\Delta_0 < P$
33. (i) What happens when
- (a) N-Ethyl ethanamine reacts with benzene sulphonyl chloride?
- (b) Benzyl chloride is treated with ammonia followed by the reaction with chloromethane?
 $NH_3 + PCl_5 \rightarrow RNH_2$
 $RNH_2 + NaOH \rightarrow RNH_2$
- (c) Aniline reacts with chloroform in the presence of alcoholic potassium hydroxide?
 $\text{Aniline} + CHCl_3 \xrightarrow{alc. KOH}$
- (ii) How will you convert (any 2)— 1×5=5
- (a) Methanol into Ethanoic acid
 $CH_3OH \rightarrow CH_3CH_2COOH$
- (b) Hexanenitrite into 1-amino pentane
 NH_2
- (c) Phenol to N-phenylethanamide
- (d) Chloroethane to Methanamine
 $CH_3CH_2Cl \rightarrow CH_3NH_2$

