CHEMISTRY STUDY MATERIALS FOR CLASS 10

(NCERT Based: Questions with Answers)

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CARBON AND ITS COMPOUNDS

SHORT ANSWER TYPE QUESTIONS II (3 MARKS)

1. What are esters? How are they prepared? List two uses of esters.

Answer. Esters are organic compounds (R—COO—R') formed by a reaction between an alcohol (R'—OH) and an organic acid (R—COOH), i.e. carboxylic acid and usually some catalyst with water as a by-product. Esters are used to make perfumes and soap. They are also used to produce pharmaceutical products, cosmetics, plasticizers and detergents.

2. Out of HCl and CH₃COOH, which one is a weak acid and why? Describe an activity to support your answer.

Answer. Acetic acid (CH₃COOH) is a weaker acid because it does not dissociate completely into aqueous solution.

Activity: Add zinc metal in HCl and CH₃COOH respectively. The hydrogen gas will be evolved faster in HCl and slowly in CH₃COOH. It shows acetic acid is a weak acid.

Alternative Method: If we use pH paper, the colour of pH paper will be dark red in HCl and light red in CH₃COOH which shows HCl is strong acid and CH₃COOH is a weak acid.

3. Describe two examples of different oxidations of ethanol. Name the products obtained in each case.

Answer. (i) When ethanol is heated with copper at 573K, ethanal is formed.

(ii) When ethanol is oxidised with alkaline potassium permanganate solution, ethanoic acid is formed.

$$CH_3CH_2OH + 2[O] \xrightarrow{Alkaline} CH_3 \xrightarrow{C}OH + H_2O$$

Ethanol Ethanoic acid

- 4. (a) Give chemical tests to detect the presence of
 - (i) Ethanol
- (ii) Ethanoic acid
- (b) Why ethanoic acid is called glacial acetic acid?
- **Answer.** (a) Add sodium hydrogen carbonate. Ethanol will not react. Ethanoic acid will give brisk effervescence due to carbon dioxide.
- (b) Pure ethanoic acid exist as solid like glaciers at 291 K, therefore, called glacial acetic acid.
 - List two tests for experimentally distinguishing between an alcohol and a carboxylic acid and describe how these tests are performed.
- **Answer.** (i) NaHCO₃ test: Add sodium hydrogen carbonate to alcohol and a carboxylic acid separately. Alcohol will not react, whereas carboxylic acid will give brisk effervescence. Pass the gas through lime water. It will turn milky.
- (ii) Blue litmus test: Add few drops of alcohol and solution of carboxylic acid on blue litmus paper separately. Blue litmus will remain as it is in case of alcohol, whereas it will turn red in carboxylic acid.
 - 6. Distinguish between Esterification and Saponification reactions of organic compounds with the help of the chemical equation for each. What is the use of (i) esters and (ii) Saponification process?

Answer.

Esterification: It is a process in which alcohol and carboxylic acid combine in the presence of conc. H₂SO₄ to form ester.

$$CH_3COOH + C_2H_5OH \xrightarrow{conc. H_2SO_4} CH_3COOC_2H_5 + H_2O$$

Ethanoic acid Ethanol Ethanol

Saponification: When an ester reacts with sodium hydroxide, sodium salt of acid and alcohol is formed.

$${\rm CH_3COOC_2H_5}$$
 + NaOH \longrightarrow ${\rm CH_3COONa}$ + ${\rm C_2H_5OH}$
Ethyl Sodium Sodium Ethanol ethanoate

Uses:

- (i) Esters are used in cold drinks, ice creams, perfumes and as artificial flavouring agents.
- (ii) Saponification process is used in the manufacture of soaps.

LONG ANSWER TYPE QUESTIONS (5 MARKS)

- 7. (a) State two properties of carbon which lead to a very large number of carbon compounds.
- (b) Why does micelle formation take place when soap is added to water?

 Why are micelles not formed when soap is added to ethanol?
- Answer. (a) (i)-Catenation (ii) Tetravalency
- (b) It is because large number of molecular ions of soaps get aggregated and form colloidal solution. Soap has hydrophobic tail (hydrocarbon) which dissolves in hydrocarbon part and hydrophilic part dissolves in water. Ethanol is non-polar solvent therefore micelles are not formed because hydrocarbon part gets attracted towards ethanol and ionic end will not dissolve in alcohol.
 - 8. (a) In tabular form, differentiate between ethanol and ethanoic acid under

the following heads:

- (i) Physical state
- (ii) Taste
- (iii) NaHCO₃ test
 - (iv) Ester test
- (b) Write a chemical reaction to show the dehydration of ethanol. Answer.

1)	Properties	Ethanol	Ethanoic acid
	(i) Physical state	It is liquid with specific smell.	It is also liquid with vinegar like smell.
	(ii) Taste	It has burning taste.	It has sour taste.
(iii) NaHCO ₃ test	It does not react.	It gives brisk effervescence due to CO ₂ .
	(iv) Ester test	Add acetic acid and conc. H ₂ SO ₄ , pleasant fruity smelling compound, ester is formed.	Add ethyl alcohol and conc. H ₂ SO ₄ , pleasant fruity smelling compound, ester is formed.

(b)
$$CH_3CH_2OH \xrightarrow{conc.H_2SO_4} CH_2 = CH_2 + H_2O$$

Ethanol Ethene

9. Explain isomerism. State any four characteristics of isomers. Draw the structures of possible isomers of butane, C_4H_{10}

Answer. Isomerism is a phenomenon due to which some compounds have same molecular formula but different structural formulae.

Characteristics:

- (i) They differ in structural formula.
- (ii) They differ in melting point.
- (iii) They differ in boiling point.
- (iv) They differ in solubility in same solvent.

- 10. Give reasons for the following:
- (i) Element carbon forms compounds mainly by covalent bonding.
- (ii)Diamond has a high melting point.
- (iii) Graphite is a good conductor of electricity.
- (iv)Acetylene bums with a sooty flame.
- (v)Kerosene does not decolourise bromine water while cooking oils do.

Anawer:-

- (i) It is because carbon has four valence electrons, it cannot gain or lose four electrons because high energy is needed. It can only share four electrons.
- (ii) It is due to strong covalent bonds and compact structure of diamond.
- (iii) It is due to presence of free electrons in graphite because each carbon is linked to three more carbon atoms.
- (iv) It is due to high percentage of carbon, it burns with sooty or smoky flame.
- (v) Kerosene oil is mixture of saturated hydrocarbons therefore does not decolourise bromine water.

