Carbon and its Compounds Chemistry Questions with Solutions

Q1. Which of the following organic compound has a triple bond?

(a) C_3H_2
(b) C_3H_4
(c) C_3H_6
(d) C_3H_8

Answer: (b), C_3H_4 has a triple bond.

Q2. Diamond is an insulator because of

(a) It is tough
(b) It has no free electrons to conduct electric current
(c) It is not soluble in water
(d) Its structure is very consolidated.

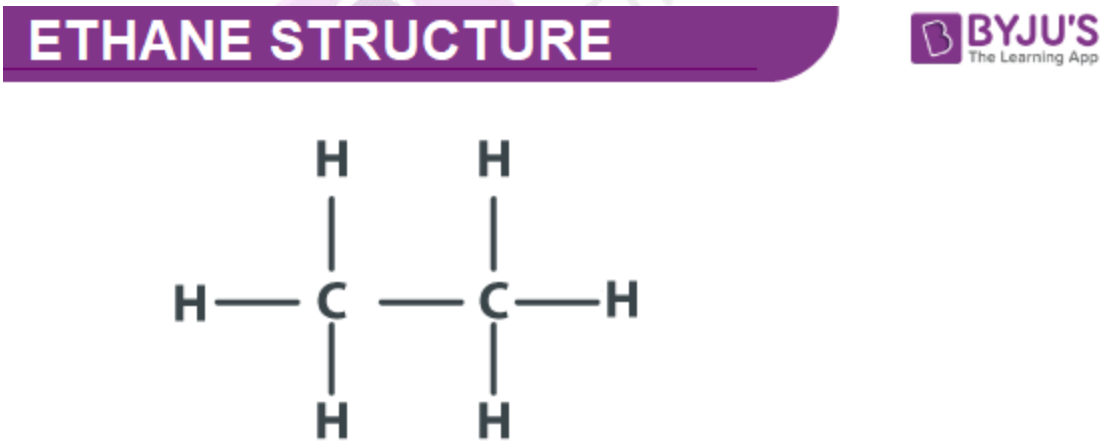
Answer: (b) Diamond is an insulator because it has no free electrons to conduct electric current.

Q3. How many covalent bonds are there in a molecule of ethane (C_2H_6)?

(a) Four
(b) Five
(c) Two
(d) Seven

Answer: (d), There are seven covalent bonds in ethane.

Structure of ethane:



Q4. Which of the following oxidising agents convert ethanol to ethanoic acid?

(a) Alkaline potassium permanganate or Acidified potassium dichromate
(b) Lithium aluminium hydride or Sodium borohydride
(c) Ozone or Hydrogen peroxide

(d) Nitric acid (HNO_3) or nitrate compounds

Answer: (a), Alkaline potassium permanganate or Acidified potassium dichromate is used to convert ethanol to ethanoic acid.

Q5. Which of the following functional group is present in CH_3COOH organic compound.

(a) Alcohol
(b) Aldehyde
(c) Ketone
(d) Carboxylic acid

Answer: (d), Carboxylic acid functional group is present in CH_3COOH organic compound.

Q6. Name the gas that will evolve when ethanoic acid is added to sodium carbonate. How would you prove the presence of this gas?

Answer: The gas that will evolve when ethanoic acid is added to sodium carbonate is carbon dioxide. We can detect the presence of carbon dioxide by passing it into lime water. If the lime water turns milky, it confirms the presence of carbon dioxide.

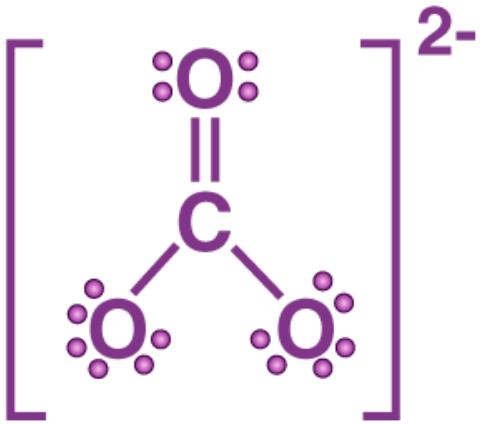
The reaction is given below

$2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa + CO_2 + H_2O$

$Ca(OH)_2$ (Lime Water) + $CO_2 \rightarrow$ CaCO3 (Milky precipitate) + H_2O

Q7. Draw electron dot structure of carbonate ion CO_3^{2-}.

Answer:



Q8. Why does carbon forms a large number of compounds?

Answer: Carbon forms multiple compounds for the following reasons:

- A carbon atom has tetra valency, i.e. carbon atom can form four covalent bonds with the other atoms.

- It has catenation, i.e. two carbon atoms can readily form covalent bonds, which are relatively more stable.
- It has varying bond order and hybridisation. That is, it can form double or triple bonds.
- It shares multiple electrons to form a double or triple bond.

Q9. Differentiate between saturated and unsaturated hydrocarbons.
Answer:

S. No.	Saturated Compounds	Unsaturated Compounds
1.	Saturated hydrocarbons contain only single covalent bonds between carbon atoms.	Unsaturated hydrocarbons have at least one double or triple bond between carbon atoms.
2.	They have less amount of carbon and more amount of hydrogen.	They have a high amount of carbon and less amount of hydrogen.
3.	They are less reactive.	They are more reactive.
4.	On burning, they give a blue and non-sooty flame.	On burning, they give a yellow and sooty flame.
5.	They are typically obtained from fossilised plant and animal materials.	They are usually obtained from plants.
6.	Examples: Alkanes and Cycloalkanes.	Examples: Alkenes, Alkynes and Aromatic Hydrocarbons.

Q10. Why do covalent compounds have low melting and boiling points?
Answer: Covalent compounds have a weak force of attraction between the molecules. Thus, little energy is required to break the strength of bonding. Therefore covalent compounds have low melting and boiling point.

Q11. Differentiate between soap and detergent.
Answer:

S. No.	Soap	Detergent
1.	Soaps are the sodium or potassium salts of long-chain fatty acids.	Detergents are the sodium salts of long-chain alkyl hydrogen sulphate or a long chain of benzene sulphonic acid.
2.	Soaps are biodegradable.	Detergents contain a branched

		hydrocarbon chain. Thus, they are non-biodegradable
3.	**They are originated from natural sources such as vegetable oils and animal fats.**	**They are formed in laboratories artificially.**
4.	**They are not effective in hard and saline water.**	**They are effective in hard and saline water.**
5.	**They form scum in hard water.**	**They don't form scum in hard water.**
6.	**Examples: Sodium Palmitate and Sodium Stearate.**	**Examples: Deoxycholic acid and Sodium Lauryl Sulfate.**

Q12. What is an esterification reaction? Mention any one application of esterification reaction.
Answer: Esterification reaction is used to prepare ester. It is a reaction between a carboxylic acid and an alcohol in the presence of a mineral acid catalyst like sulphuric acid.
$RCOOH + R'OH \leftrightharpoons RCOOR' + H_2O$
It is a reversible reaction.
Uses of esterification reaction:
Esters prepared from the esterification reaction are used as synthetic flavours in ice cream and sweets.

Q13. Distinguish between esterification and saponification reactions.
Answer:

S. No.	Esterification Reaction	Saponification Reaction
1.	**The esterification reaction is used to prepare ester.**	**The saponification reaction is used to prepare soap.**
2.	**It is a reaction between a carboxylic acid and an alcohol in the presence of a mineral acid catalyst like sulphuric acid to form an ester.**	**It is a de-esterification reaction in an ester to form a carboxylic acid and an alcohol in a mineral acid catalyst like sulphuric acid or sodium hydroxide.**
3.	**In the esterification reaction, the end products are ester and water.**	**In the saponification reaction, the end products are carboxylate ions and alcohol.**
4.	**It can take place in both acidic and basic mediums.**	**It occurs only in an alkaline medium.**
5.	**It requires heat.**	**It does not require heat.**

Q14. Give a chemical test to distinguish between saturated and unsaturated hydrocarbons.
Answer: The bromine water test distinguishes between saturated and unsaturated hydrocarbons. No change will occur if a saturated hydrocarbon is added to bromine water. However, if an unsaturated hydrocarbon is added to bromine water, it will decolourise.
Saturated hydrocarbon + Br_2 → No Reaction: no colour change
Unsaturated hydrocarbon + Br_2 → Reaction will occur: Decolourise

Q15. What is a homologous series?
Answer: A homologous series is a series of carbon and compounds with various numbers of carbon atoms but have an identical functional group. For example, methene, ethene, propene, butene and pentene are all part of the homologous alkene series.

Practise Questions on Carbon and its Compounds

Q1. Name two allotropes of carbon.
Answer: Diamond and Graphite are the two allotropes of carbon.

Q2. What is denatured alcohol?
Answer: Denatured alcohol is ethanol with additives to make it poisonous, bad-tasting, foul-smelling, or nauseating to discourage recreational consumption. It is sometimes dyed so that it can be identified visually.
Pyridine and methanol are added to ethanol to denature it.

Q3. What is the role of concentrated sulphuric acid in the esterification reaction?
Answer: In esterification reaction, concentrated sulfuric acid works as a catalyst. It enhances the rate of reaction. Moreover, it also works as a dehydrating agent. It forces the equilibrium reaction to the right.

Q4. Give a chemical test to distinguish between
(a) Ethene and Ethane
(b) Ethanol and Ethanoic acid
Answer: We can use the following test to distinguish between:
(a) Ethene and Ethane: Bromine Water Test
No change will occur if ethane is added to bromine water. However, if ethene is added to bromine water, it will decolourise.
$CH_3 - CH_3 + Br_2$ → No Reaction: no colour change
$CH_2 = CH_2 + Br_2 \rightarrow CH_2(Br) - CH_2(Br)$: Decolourise
(b) In reaction with sodium hydrogen carbonate, ethanoic acid gives a brisk effervescence while ethanol does not.

$CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + H_2O + CO_2$

Q5. Define fermentation. Name the enzyme which converts

(a) Milk to curd (yoghurt),

(b) Cane sugar to glucose and fructose

(c) Glucose to ethanol.

Answer: The chemical process of preparing ethyl alcohol from cane sugar is known as fermentation.

(a) The enzyme which converts milk to curd is lactase.

(b) The enzyme which converts cane sugar to glucose and fructose is invertase.

The enzyme which converts glucose to ethanol is zymase.