CHAPTER

4

CARBON AND ITS COMPOUND

CLASS 10TH

NCERT EXERCISE AND SOLUTIONS - SCIENCE

Q. 1. **Ethane, with the molecular formula C_2H_6 has:**

(a) **6 covalent bonds**
(b) **7 covalent bonds**
(c) **8 covalent bonds**
(d) **9 covalent bonds**

ANSWER:-

(b) 7 covalent bonds.

Q. 2. **Butanone is a four-carbon compound with the functional group:**

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

ANSWER:-

(c) ketone

Q. 3. **While cooking, if the bottom of the vessel is getting blackened on the outside, it means that:**

(a) **The food is not cooked completely**
(b) **The fuel is not burning completely**
(c) **The fuel is wet**
(d) **The fuel is burning completely**

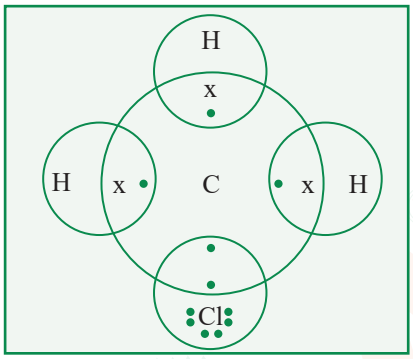
ANSWER:-

(b) the fuel is not burning completely.

Q. 4. Explain the nature of the covalent bond using the bond formation in CH_3Cl.

ANSWER:-

Carbon is tetravalent, meaning it has four electrons in its outermost shell. Losing or gaining four electrons requires a significant amount of energy. To achieve a stable octet, carbon shares its four electrons with other carbon or different atoms through covalent bonding. In this case, carbon forms a single bond with chlorine and three single bonds with hydrogen.

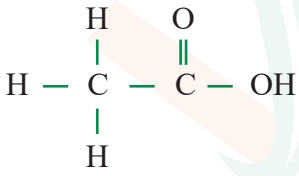


Q. 5. Draw the electron dot structures for

(a) Ethanoic acid
(b) H_2S
(c) Propanone
(d) F_2

ANSWER:-

(a)



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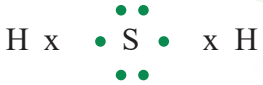

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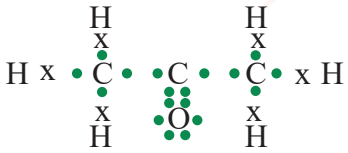


(d)

Q. 6. What is a homologous series? Explain with an example.

ANSWER:-

A homologous series is a group of carbon compounds that exhibit similar chemical properties but differ

in physical properties. Each successive compound in the series differs by a -CH_2 unit.
For example, the alkane family, which follows the general formula C_nH_{2n+2}:

- Methane (CH_4)
- Ethane (CH_3CH_3)
- Propane ($CH_3CH_2CH_3$)
- Butane ($CH_3CH_2CH_2CH_3$)

Q. 7. How can ethanol and ethanoic acid be differentiated on the basis of their physical and chemical properties?

ANSWER:-

Physical Properties:

- Ethanol has a melting point of -114.1°C, while ethanoic acid has a melting point of 16.6°C.
- Since ethanoic acid's melting point is below room temperature, it solidifies in cold weather.
- Ethanol remains a liquid at room temperature, whereas ethanoic acid can be solid.
- Ethanol has a pleasant odour, while ethanoic acid has a vinegar-like smell.

Chemical Properties:

- Ethanol belongs to the alcohol group, while ethanoic acid is a carboxylic acid.
- When carbonates or bicarbonates react with alcohols and carboxylic acids, only carboxylic acids react, releasing carbon dioxide , which turns lime water milky.

  Reaction:

$$CH_3\ COOH + NaHCO_3 (or\ Na_2CO_3) \rightarrow CH_3\ COONa + CO_2 + H_2O$$

Q. 8. Why does micelle formation take place when soap is added to water? Will a micelle be formed in other solvents such as ethanol also?

ANSWER:-

In the electrolytic refining process of metal M:

- Anode → Impure metal M
- Cathode → Pure metal M
- Electrolyte → A solution containing a salt of metal M

Q. 9. Why are carbon and its compounds used as fuels for most applications?

ANSWER:-

When saturated carbon compounds burn in the presence of air, they produce carbon dioxide, water, and a significant amount of energy and light. This reaction is smokeless, resulting in minimal pollution. Being an exothermic process, it releases heat efficiently, making these compounds suitable as fuels due to their high calorific value.

Q. 10. Explain the formation of scum when hard water is treated with soap.

ANSWER:-

Soaps are sodium or potassium salts of long-chain carboxylic acids. Hard water contains calcium and magnesium chlorides and sulphates. When soap is added to hard water, it forms less lather as some of the soap reacts with these ions, forming an insoluble substance known as scum.

Q. 11. What change will you observe if you test soap with litmus paper (red and blue)?

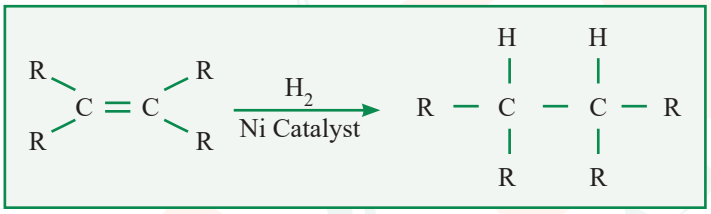
ANSWER:-

Soap is alkaline in nature, causing red litmus to turn blue, while blue litmus remains unchanged.

Q. 12. What is hydrogenation? What is its industrial application?

ANSWER:-

The process of adding hydrogen to unsaturated compounds is called hydrogenation. It is an addition reaction that occurs in the presence of a catalyst such as Ni, Pt, or Pd. This reaction converts unsaturated compounds into saturated ones. For example, vegetable oil is transformed into ghee through hydrogenation.



Q. 13. Which of the following hydrocarbons undergo addition reactions:

C_2H_6, C_3H_8, C_3H_6, C_2H_2 and CH_4.

ANSWER:-

Unsaturated hydrocarbons undergo addition reactions. The general formulas for unsaturated hydrocarbons are CnH_2n_2 or CnH_2n. In the given compounds, C_3H_6 and C_2H_2 are unsaturated and undergo addition reactions, while C_2H_6, $C2H_8$, and CH_4 are saturated hydrocarbons.

Q. 14. Give a test that can be used to differentiate between saturated and unsaturated hydrocarbons.

ANSWER:-

Cooking oil consists of unsaturated fats, while butter contains saturated fats. During hydrogenation, the unsaturated oil will react, but the saturated butter will not undergo this reaction.

Q. 15. Explain the mechanism of the cleaning action of soaps.

ANSWER:-

Cleansing action of soaps:

Soaps have two components: a hydrophilic part and a hydrophobic part. They are sodium or potassium salts of long-chain carboxylic acids. When dirty clothes are immersed in a soap solution, the hydrophobic ends of the soap molecules attach to the dirt and form a large cluster called a micelle, which traps the dirt.