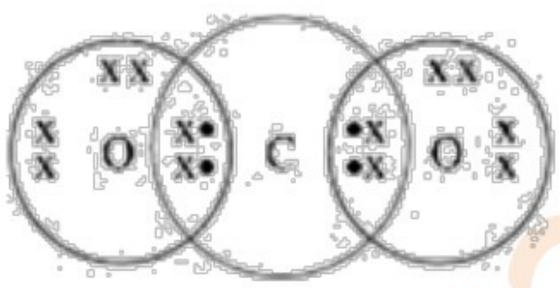
Chapter 4
Carbon and its Compounds

Intext Questions

On Page 61

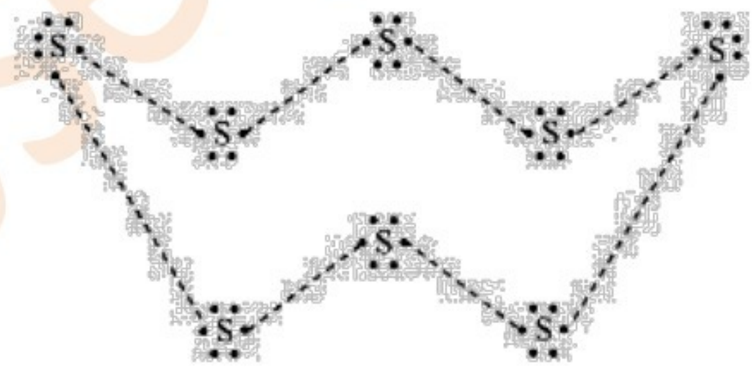
Question 1: What would be the electron dot structure of carbon dioxide which has the formula CO_2?

Solution: Electron dot structure of CO_2 is



Question 2: What would be the electron dot structure of a molecule of sulphur which is made up of eight atoms of sulphur? (Hint — the eight atoms of sulphur are joined together in the form of a ring.)

Solution: Electron dot structure of a sulphur molecule



CBSE Class 10th NCERT Solution: Science

On Page 68

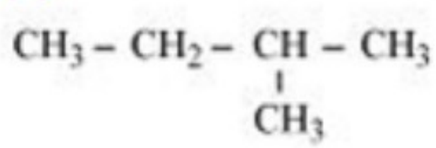
Queestion 1: How many structural isomers can you draw for pentane?

Solution:

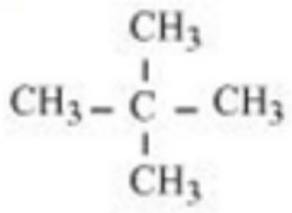
3 structural isomers are possible-

(i) $CH_3 - CH_2 - CH_2 - CH_2 - CH_3$

(ii)



(iii)



Question 2: What are the two properties of carbon which lead to the huge number of carbon compounds we see around us?

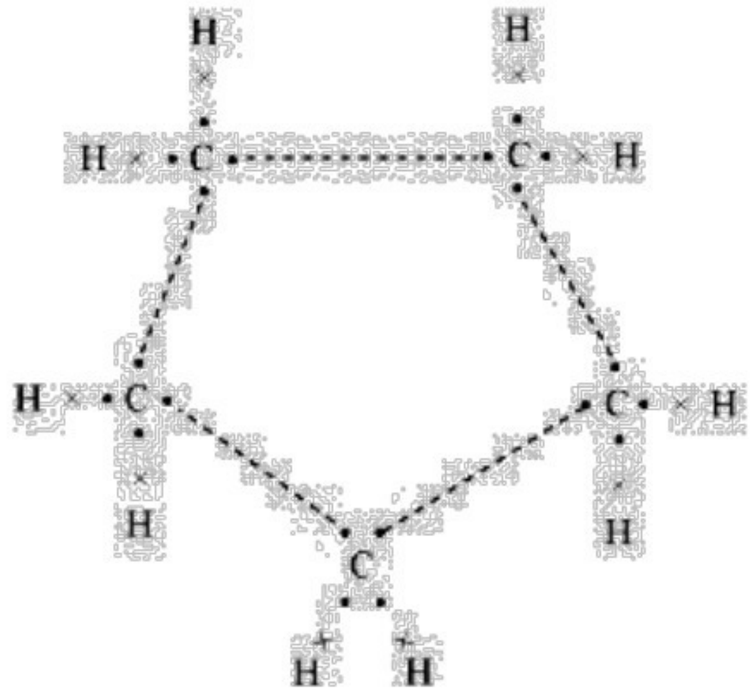
Solution: The two properties of carbon which lead to the huge number of carbon compounds we see around us are:

(i) Catenation — The ability to form bonds with other carbon atoms

(ii) Tetravalency — Carbon is capable of bonding with four other atoms

Question 3: What will be the formula and electron dot structure of cyclopentane?

Solution: The formula for cyclopentane is C_5H_{10}. Its electron dot structure is given below.

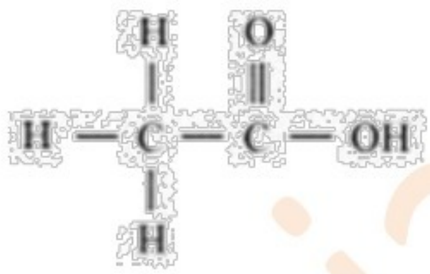


Question 4: Draw the structures for the following compounds.

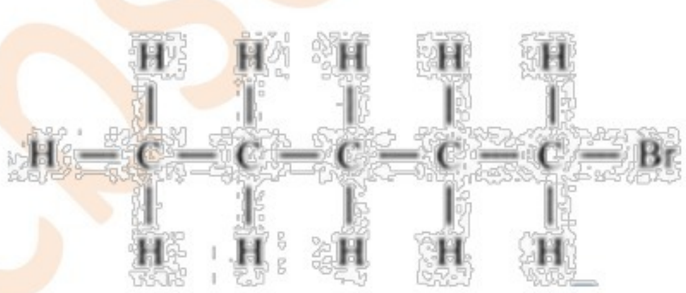
(i) Ethanoic acid
(ii) Bromopentane
(iii) Butanone
(iv) Hexanal

Solution:

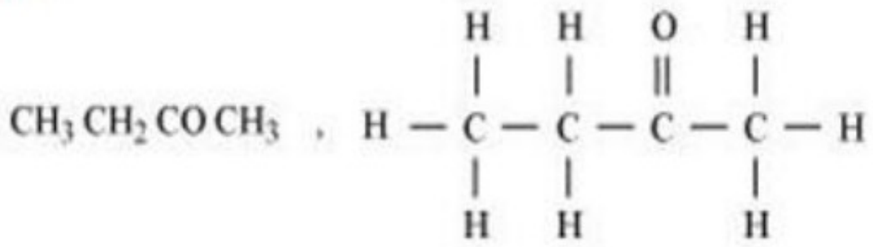
(i)



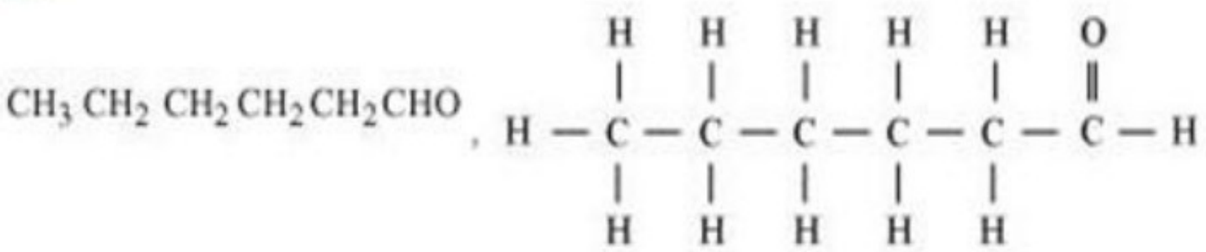
(ii)



(iii)



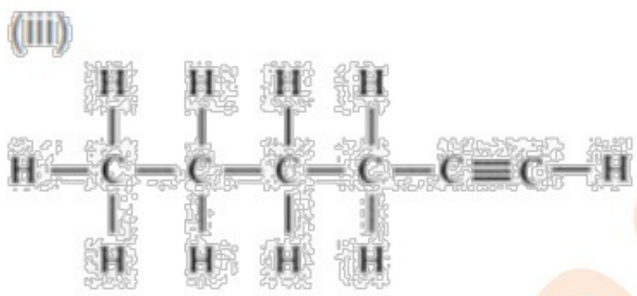
(iv)



Question 5: How would you name the following compounds?

(i) 

(ii) 

(iii) 

Solution:

(i) Bromoethane
(ii) Methanol
(iii) Hexyne

On Page 71

Question 1: Why is the conversion of ethanol to ethanoic acid an oxidation reaction?

Solution: $CH_3CH_2OH \xrightarrow{[O]} CH_3COOH$

This conversion involves the addition of oxygen to ethanol and it is an oxidation reaction.

Question 2: A mixture of oxygen and ethyne is burnt for welding. Can you tell why a mixture of ethyne and air is not used?

Solution: $2CH \equiv CH + 5O_2 \rightarrow 4CO_2 + 2H_2O + Heat$

When ethyne is burnt in air, incomplete combustion takes place. It is caused by limited supply of air which results in formation of sooty flame. However, if ethyne is burnt with oxygen, complete combustion takes place. It gives a clean flame with temperature 3000°C. This flame can be used for welding. This is not possible in earlier case. Hence, mixture of ethyne and air is not used for welding.

On Page 74

Question 1: How would you distinguish experimentally between an alcohol and a carboxylic acid?

Solution:

Carboxylic acid and alcohol can be distinguished on the basis of their reaction with carbonates and hydrogen carbonates.

Acid reacts with carbonate and hydrogen carbonate to evolve CO_2 gas. This gas turns lime water milky.

On the other hand, alcohols do not react with carbonates & hydrogen carbonates.

$$\text{Metal carbonate/Hydrogencarbonate} + \text{Carboxylic acid} \rightarrow \text{salt+water} + \text{carbon dioxide}$$

Question 2: What are oxidising agents?

Solution:

Oxidising agents: Substances that are capable of adding oxygen to others are known as oxidising agents. For example- alkaline potassium permanganate and acidified potassium dichromate

CBSE Class 10th NCERT Solution: Science

On Page 76

Question 1: Would you be able to check if water is hard by using a detergent?

Solution: No, we can't use detergents for checking if water is hard as we know that detergents are sulphonate salts of long chain carboxylic acids. They do not react with calcium and magnesium ions present in hard water to form scum. They give lather with hard as well as soft water. This means that detergents can be used in both soft and hard water.

Question 2: People use a variety of methods to wash clothes. Usually after adding the soap, they 'beat' the clothes on a stone, or beat it with a paddle, scrub with a brush or the mixture is agitated in a washing machine. Why is agitation necessary to get clean clothes?

Solution:

A soap molecule is formed of two parts- hydrophobic and hydrophilic part. With the help of these parts, soap attaches to the dirt particle and forms micelle. These micelles remain suspended as a colloid. To remove these micelles, agitation of clothes is required.

Exercise

Question 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.

Solution: (b) Ethane has 7 covalent bonds.

Question 2: Butanone is a four-carbon compound with the functional group
(a) carboxylic acid.
(b) Aldehyde
(c) ketone
(d) alcohol

Solution: (c) The functional group of butanone is ketone.

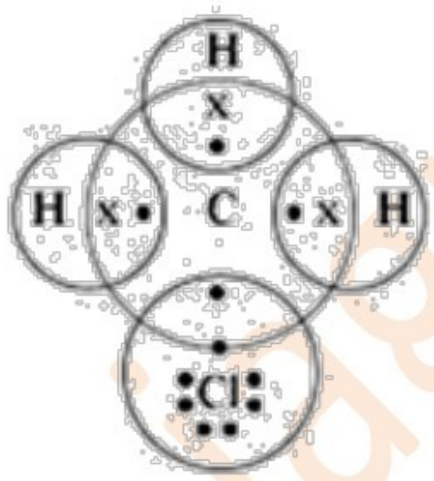
Question 3: While cooking, if the bottom of the vessel is getting blackened on the outside, it means that
(a) the food is not cooked completely.
(b) The fuel is not burning completely.
(c) The fuel is wet.
(d) The fuel is burning completely.

Solution: (b)While cooking, if the bottom of the vessel is getting blackened on the outside, then it means that the fuel is not burning completely.

Question 4: Explain the nature of the covalent bond using the bond formation in CH_3CI.

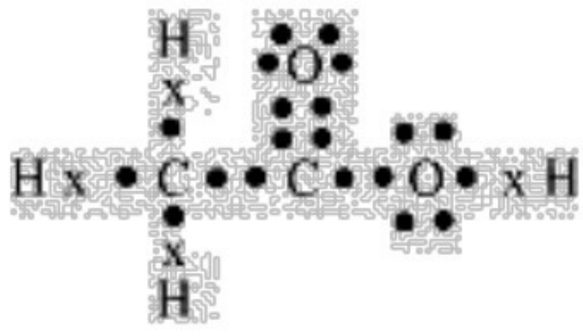
Solution: Carbon forms bond by sharing its four electrons with other atoms. These bonds that are formed by sharing electrons are known as covalent bonds. In this bonding, both atoms share the valence electrons.

Here, carbon requires 4 electrons to complete its octet and each hydrogen atom requires one electron to complete its octet. Chlorine requires an electron to complete the octet. Thus, all of these atoms share the electrons. With this formation, carbon forms 3 bonds with hydrogen and one bond with chlorine.



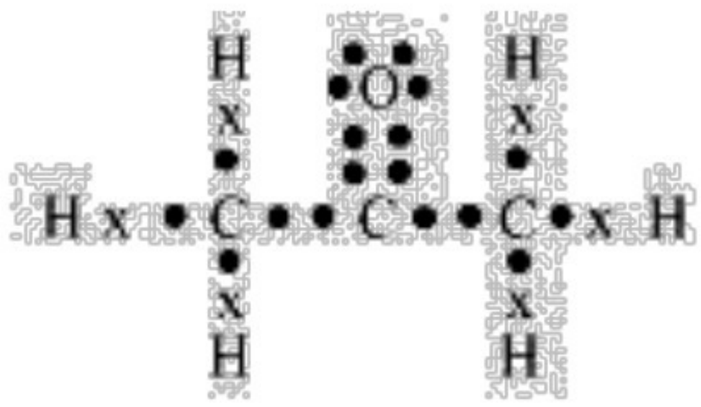
Question 5: Draw the electron dot structures for
(a) ethanoic acid.
(b) H_2S
(c) Propanone
(d) F_2

Solution: (a) Ethanoic acid



(b) H_2S

(c) Propanone



(d) F_2

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

Solution:

Homologous series: it is a series of organic compounds that contains different numbers of carbon atoms with same functional groups.

For example, methane, ethane, propane, butane, etc.

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

Solution:

Ethanol	Ethanoic acid
Ethanol is liquid at room temperature	Ethanoic acid has vinegar like smell
Its melting point is 17°C. Thus, it freezes during winters.	It doesn't freezes during winters.
Ethanol does not react with metal	Ethanoic acid reacts with metal

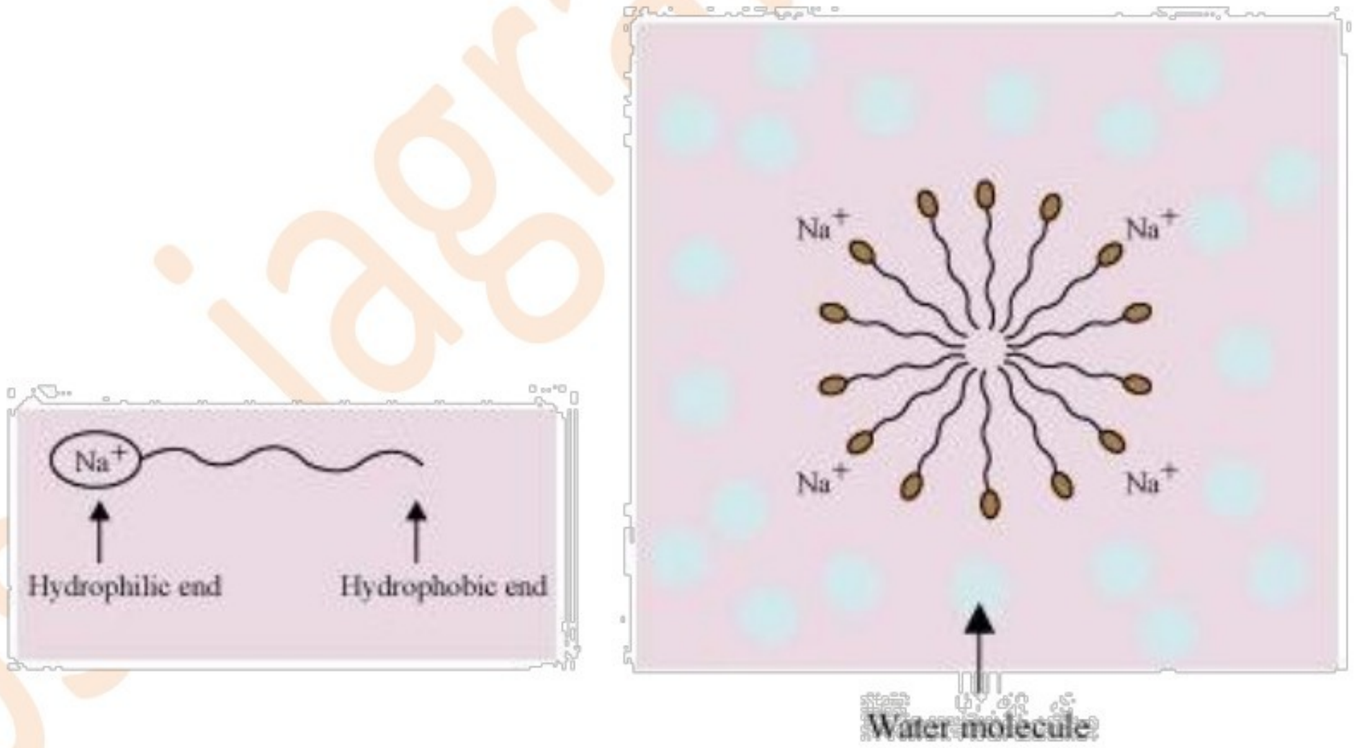
carbonates and metal hydrogencarbonates.	carbonates and metal hydrogencarbonates to form salt, water, and carbon dioxide gas

Question 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?

Solution:

A soap is a sodium or potassium salt of long chain fatty acids. It consists of polar and non-polar end. The polar end is hydrophilic in nature. The non-polar end is. When soap is added to water, soap molecules arrange themselves in a cluster. In this arrangement, they keep the non-polar portion out of water and the polar ends are on the surface of the cluster. The dirt present on clothes is insoluble in water. Thus, the hydrophobic ends of the clusters attach themselves to the dirt. This cluster formation in which the dirt is entrapped is the micelle.

Micelle formation does not takes place in alcohol because the alkyl chain of soap becomes soluble in alcohol.



Question 9: Why are carbon and its compounds used as fuels for most applications?

Solution: Generally carbon compounds give a lot of heat and light when burnt in air. They have high calorific values. When saturated hydrocarbons burn, they produce a clean flame and no smoke is produced. The hence, carbon and its compounds are used as fuels for most applications.

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

Solution: A soap is a sodium or potassium salt of long chain fatty acids. In hard water, soap molecules do not work. Hard water contains salts of calcium and magnesium ions. When soap is added to hard water, these ions displace sodium or potassium ions from the soap molecules. This results in formation of an insoluble substance. This is known as scum.

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

Solution: Soap is basic in nature. Thus, it turns red litmus blue. The colour of blue litmus will remain blue.

Question 12: What is hydrogenation? What is its industrial application?

Solution:

Hydrogenation: It is the process of addition of hydrogen.

Hydrogen atoms are added to unsaturated hydrocarbons in the presence of nickel catalysts to give saturated hydrocarbons.

$$R_2C = CR_2 \xrightarrow[Ni]{H_2} R_2CH - CHR_2$$

Question 13: Which of the following hydrocarbons undergo addition reactions?

C_2H_6, C_3H_8, C_3H_6, C_2H_2 and CH_4

Solution: C_3H_6 and C_2H_2 undergo addition reactions.

Question 14: Give a test that can be used to differentiate chemically between butter and cooking oil.

Solution: Oil has unsaturated fats whereas butter contains saturated fats. Thus, butter cannot be hydrogenated. That is why oil can be hydrogenated to saturated fats.

Question 15: Explain the mechanism of the cleaning action of soaps.

Solution:

Cleansing action of soaps:

The dirt present on clothes is insoluble in water. Therefore, it cannot be removed by only washing with water. When soap is dissolved in water, its hydrophobic ends attach themselves to the dirt and remove it from the cloth. Then, the molecules of soap arrange themselves in micelle formation. Micelle traps the dirt at the centre of the cluster. These micelles remain suspended in water. Hence, the dust particles are easily washed away by water.