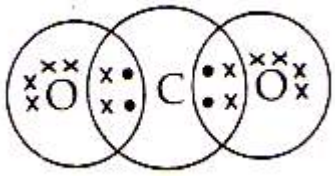
Chapter – 4 Carbon and Its Compounds NCERT Solved Questions

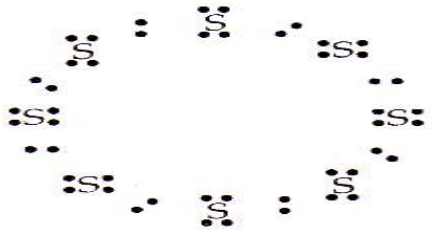
Q 1. What would be the electron dot structure of carbon dioxide which has the formula CO_2?

Ans. The electron dot formula of CO_2 is given below:



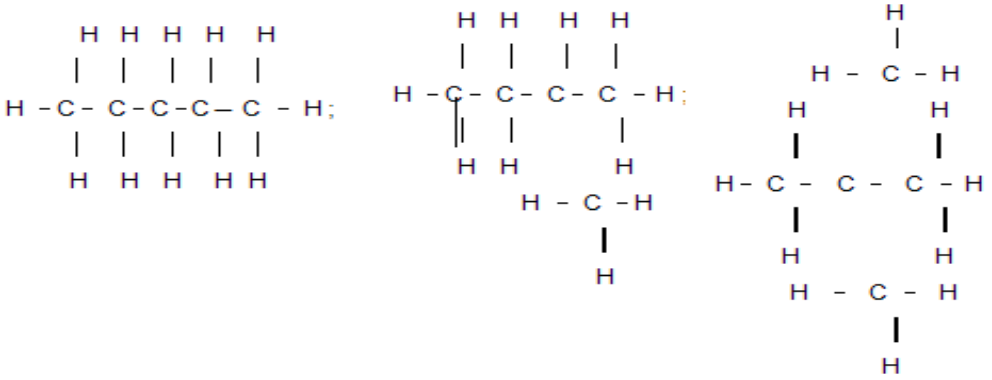
Q 2. What would be the electron dot structure of a molecule of sulphur which is made up of eight atoms of sulphur? [Hint: The eight atoms of suphur are joined together in the form of a ring.]

Ans. The electron dot structure of a molecule of sulphur which is made of eight atoms of suphur is given below: Electron-dot structure of sulphur molecule, S_8



Q 3. How many structural isomers can you draw for pentane?

Ans. Three structural isomers can be drawn for pentane:

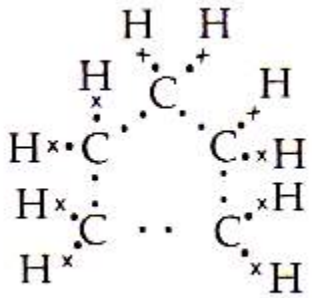


Q 4. What are the two properties of carbon which lead to the huge number of carbon compounds we see around us?

Ans. The two properties of carbon are its tetra covalency and the catenation which lead to huge number of carbon compounds we see around us.

Q 5. What will be the formula and electron dot structure of cyclopentane?

Ans. The formula of cyclopentane will be C_5H_{10}. Its electron dot structure will be as shown below



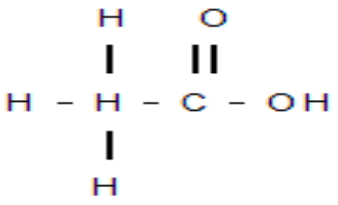
Q 6. Draw the structures for the following compounds:

(i) Ethanoic acid **(ii)** Bromopentane* **(iii)** Butanone **(iv)** Hex anal.

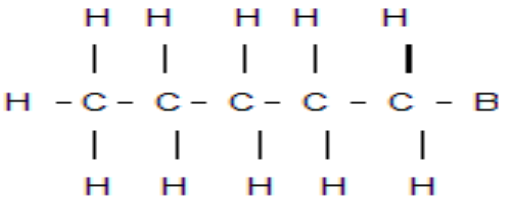
* Are structural isomers possible for bromopentane?

Ans. The structure of the compounds are

(i) Ethanoic acid :

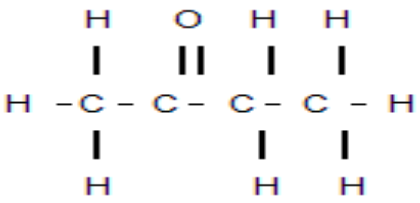


(ii) Bromopentane

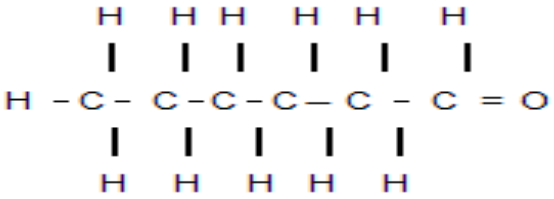


Yes, structural isomers are possible for bromopentane.

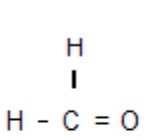
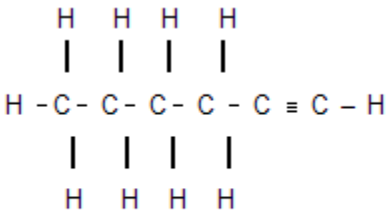
(iii) Butanone



(iv) Hex anal



Q 7. How would you name the following compounds?

(i) $CH_3 - CH_2 - Br$ (ii)  (iii) 

(i) Bromoethane **(ii)** Methanal **(iii)** 1 - Hexyne.

Q 8. Why is the conversion of ethanol to ethanoic acid an oxidation reaction?

Ans. The conversion of ethanol (CH_3CH_2OH) to ethanoic acid (CH_3COOH) is called an oxidation reaction because oxygen is added to it during this conversion.

$$\underset{\text{Ethanol}}{CH_3CH_2OH} + \underset{\text{Nascent oxygen}}{2[O]} \xrightarrow[\text{Heat}]{\text{Alkaline } KMnO_4} \underset{\text{Ethanoic acid}}{CH_3COOH} + \underset{\text{Water}}{H_2O}$$

Q 9. The mixture of oxygen and ethyne is burnt for welding. Can you tell why a mixture of ethyne and air is not used?

Ans. A mixture of ethyne and air is not used for welding, because burning of ethyne in air produces a sooty flame due to incomplete combustion which is not enough to melt metals for welding.

Q10. How would you distinguish experimentally between an alcohol and a carboxylic acid?

Ans. Take the samples of alcohol and carboxylic acid in different test tubes and add sodium hydrogen carbonate in both the test tubes.

The test tube from which the effervescence evolves is carboxylic acid. The effervescence is due to the evolution of carbon dioxide.

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

$$C_2H_5OH + NaHCO_3 \rightarrow \text{No evolution of } CO_2$$

Q11. What are oxidising agents?

Ans. An oxidising agent is one which oxidizes other substances by providing oxygen or removing hydrogen.

Q12. Would you be able to check if water is hard by using a detergent?

Ans. No, we cannot check the presence of hard water by using a detergent.

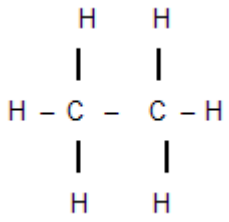
Q13. People use a variety of methods to wash clothes. Usually after adding the soap, they 'beat' the clothes on a stone, or beat it with a paddle, scrub wit a brush or the mixture is agitated in a washing machine. Why is agitation necessary to get clean clothes?

Ans. The molecules of soap are sodium or potassium salts of long-chain carboxylic acids. The ionic-end of soap dissolves in water while the carbon chain dissolves in oil. The soap molecules, thus form structures called micelles. When cloth is agitated, the micelles containing oily or greasy dirt particles get removed from the surface of dirty cloth and into water and clothes gets cleaned.

Q14. 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.

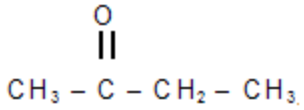
Ans. (b) [Hint : The structure of C_2H_6 is :



Q15. Butanone is a four-carbon compound with the functional group

(a) carboxylic acid **(b)** aldehyde **(c)** ketone **(d)** alcohol.

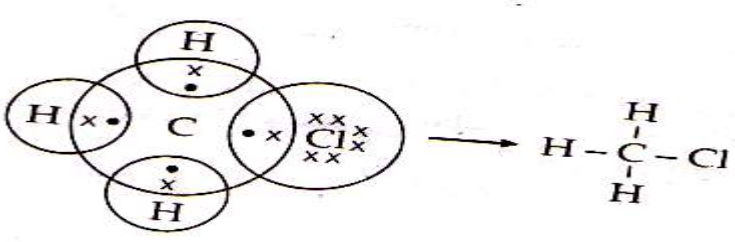
Ans. (c) [Hint : The structure of butanone is



Q16. 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. **Ans.** (b)

Q17. Explain the nature of the covalent bond using the bond formation in CH_3Cl.

Ans. Covalent bond is formed by sharing the electrons between two atoms:

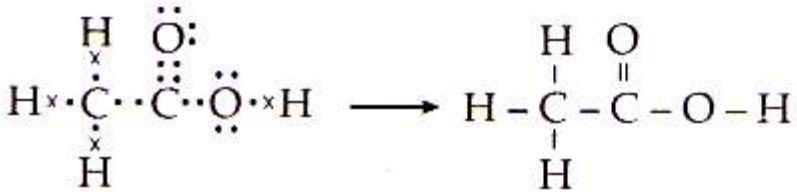


Q18. Draw the electron dot structure for

(a) ethanoic acid **(b)** H_2S **(c)** propanone **(d)** F_2

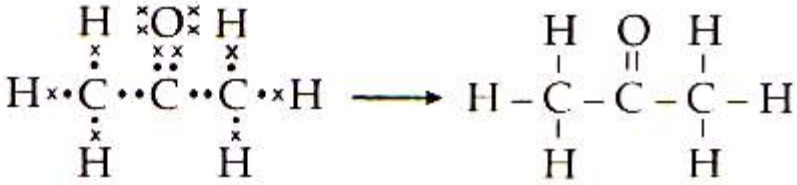
Ans. The electron dot structures are given below:

(a) Ethanoic acid:



(b) H_2S :

(c) Propanone :



(d) F_2 :

Q19. What is an homologous series? Explain with an example.

Ans. A series of compounds in which the same functional group substitutes for hydrogen in a carbon chain is called homologous series. These differ by – CH_2-unit.**Example:** Homologous series of alcohols: CH_3OH, C_2H_5OH, C_3H_7OH. These differ by – CH_2-unit.

Q20. How can ethanol and ethanoic acid be differentiated on the basis of their physical and chemical properties?

Ans. Differentiation of ethanol and ethanoic acid on the basis of their physical properties: Ethanol has a pleasant odour whereas Ethanoic acid smells like vinegar. Differentiation of ethanol and ethanoic acid on the basis of their chemical properties:

Take the samples of ethanol and ethanoic acid in different test tubes and add sodium hydrogen carbonate in both the test tubes. The test tube from which the effervescence evolves is ethanoic acid. The effervescence is due to the evolution of carbon dioxide.

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

$$C_2H_5OH + NaHCO_3 \rightarrow \text{No evolution of } CO_2$$

Q21. Why does micelle formation take place when soap is added to water? Will a micelle be formed in other solvents such as ethanol also?

Ans. Soap are sodium or potassium salts of long-chain carboxylic acids. The acid end of soap dissolves in water while the carbon chain dissolves in oil. When soap is added to the water, the hydrophilic end (acid end) will align along the surface of water and the hydrophobic tail (carbon chain) remains out of water. The cluster of molecules in which hydrophobic tail are in the interior of cluster and the ionic ends are on the surface of cluster is called micelle(see fig.). The soap micelles thus helps in dissolving the dirt in water and we can wash our clothes clean. No, micelle will not be formed in other solvents such as ethanol.

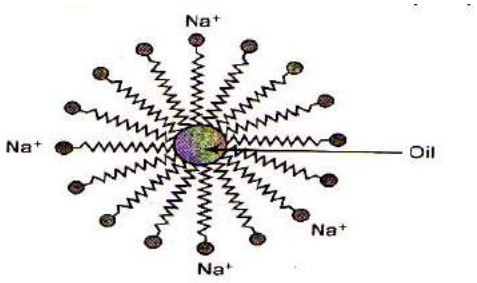


Fig. 4. 3. Formation of micelles

Q22. Why are carbon and its compounds used as fuels for most applications?

Ans. Carbon and its compounds are used as a fuel because when they are burnt , they give large amount of energy in the form of heat.

Q23. Explain the formation of scum when hard water is treated with soap.

Ans. Hard water contains soluble salts of sulphates and chlorides of calcium and magnesium. When soap is used to clean using hard water calcium and magnesium present in hard water produce an insoluble substance called scum that remains after washing the cloth with water.

Q24. What change will you observe if you test soap with litmus paper (red and blue)?

Ans. When we test soap with red and blue litmus paper red will turn blue but blue will remain as blue.

Q25. What is hydrogenation? What is its industrial application ?

Ans. Addition of hydrogen to an unsaturated hydrocarbon in presence of catalysis such as palladium or nickel to give saturated hydrocarbons is called hydrogenation. The process is used to make healthy vegetable oils in industry.

Q26. Which of the following hydrocarbons undergo addition reactions: C_2H_6, C_3H_8, C_3H_6, C_2H_2 and CH_4.

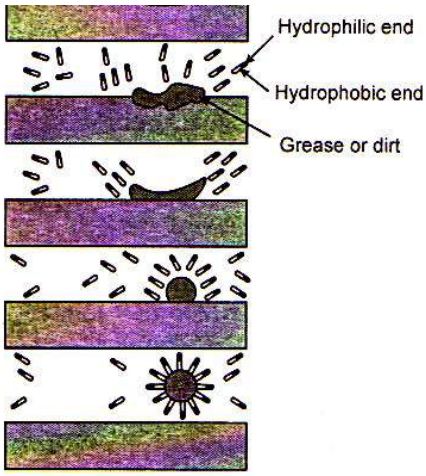
Ans. Unsaturated hydrocarbons undergo addition reactions. The following are the unsaturated hydrocarbons amongst the given examples: C_3H_6 and C_2H_2.

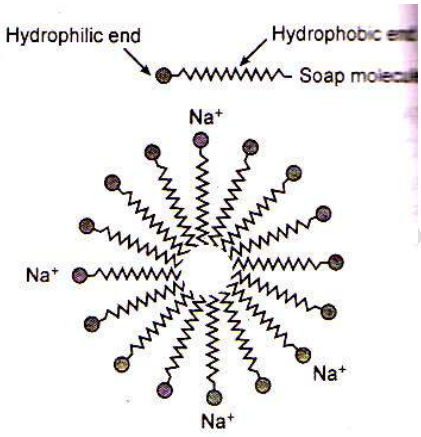
Q27. Give a test that can be used to differentiate chemically between butter and cooking oil.

Ans. Take butte rand cooking oil in two separate test tubes. Add bromine water to each test tube. The one containing cooking oil will decolourise the light brown colour of bromine water, i.e.,. bromine water will become colourless. The colour of Bromine water will remain as such in other test tube.

Q28. Explain the mechanism of the cleaning action of soaps.

Ans. Cleaning action of soap has been explained with the help of fig. Soaps are molecules in which the two ends have differing properties, one is hydrophilic, that is it dissolves in water, while the other end is hydrophobic, that is it dissolves in hydrocarbons.





When soap is at the surface of water the hydrophobic 'tail' of soap will not be soluble in water and the soap will align along the surface of water with the ionic ed in water and the hydrocarbon 'tail' protruding out of water. Inside water, these molecules have a unique orientation that keeps the hydrocarbon portion out of the water. This is achieved by forming clusters of molecules in which the hydrophobic tails are in the interior of the cluster and the ionic ends are on the surface of the cluster. This formation is called a micelle. Soap in the form of a micelle is able to clean, since the oily dirt will be collected in the centre of the micelle. The micelles are large enough to scatter light. Hence a soap solution appears cloudy.