

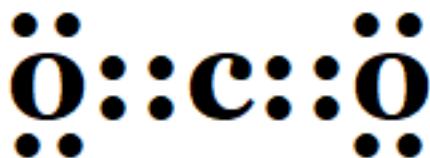
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page number 61

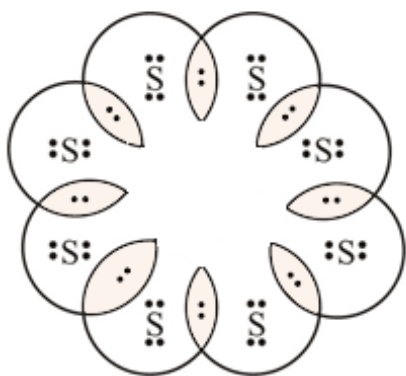
1. What would be the electron dot structure of carbon dioxide which has the formula CO_2 ?

Solution:



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:



page number 61

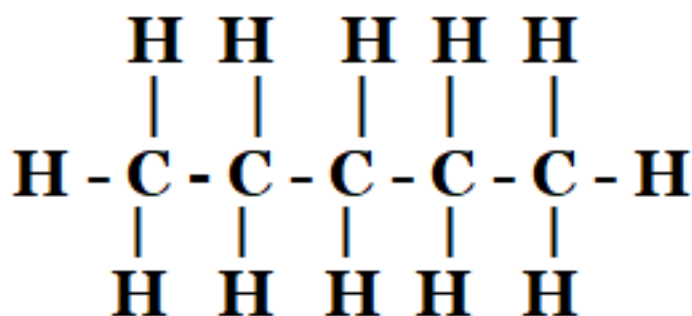
1. How many structural isomers can you draw for pentane?

Solution: The structural isomers of pentane are as follows:

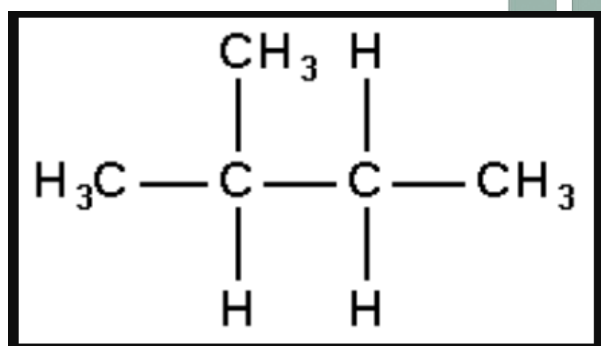
n-pentane

2-methylbutane

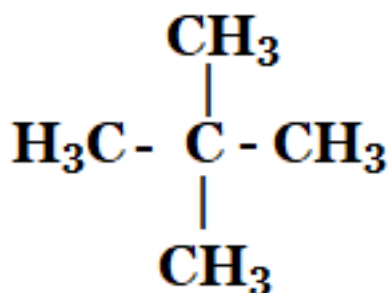
2, 2-dimethylpropane



n-pentane



2-methylbutane



2,2 dimethylpropane

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

Solution: Two fundamental properties of carbon that contribute to the extensive variety of carbon compounds around us are:

- Carbon contains six valence electrons, yielding a relatively high valency.

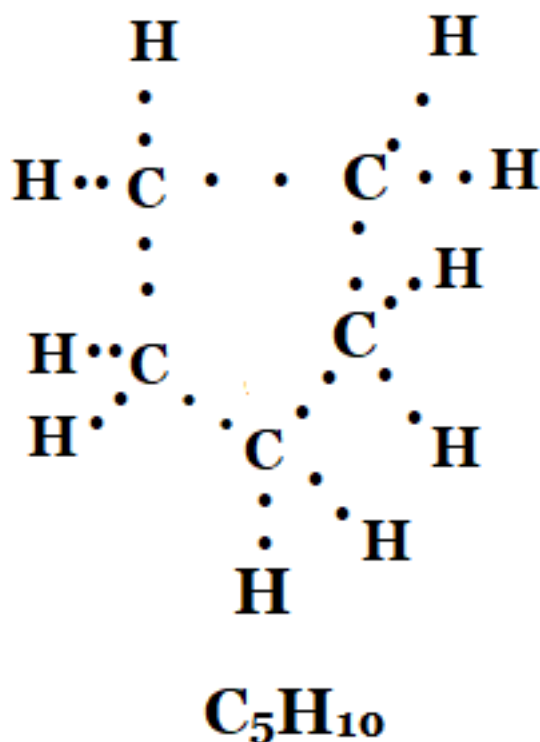
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Carbon readily forms covalent bonds with numerous elements such as oxygen, chlorine, nitrogen, sulfur, hydrogen, and others.

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

Solution: The formula and electron dot structure of cyclopentane is as given below:



4. Draw the structures for the following compounds.

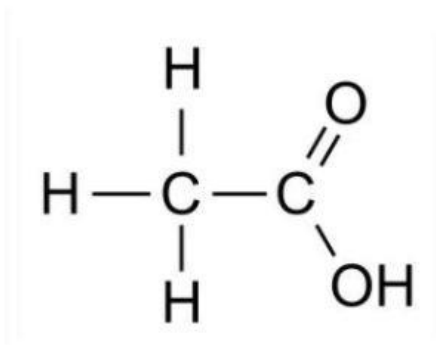
(i) Ethanoic acid

(ii) Bromopentane*

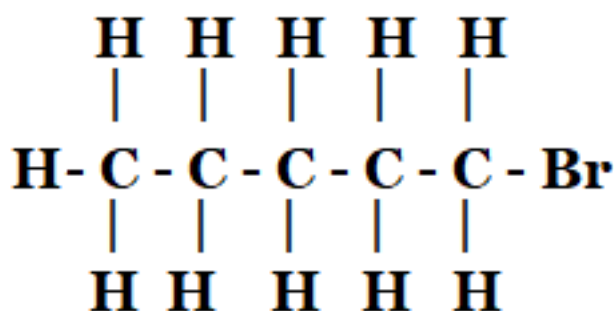
(iii) Butanone

(iv) Hexanal

Solution: i)

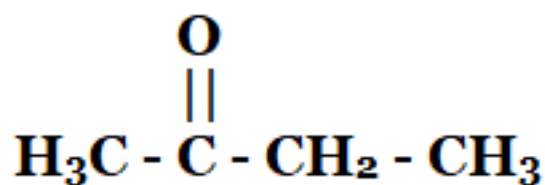


ii)



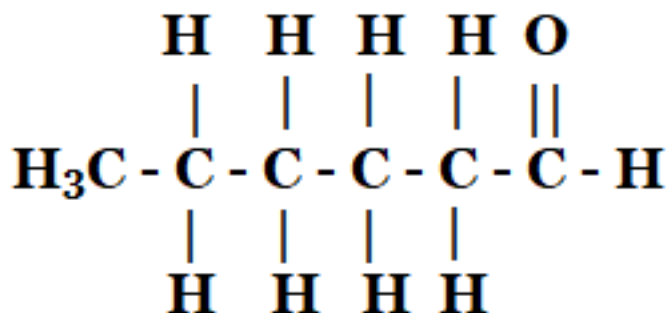
Bromopentane

iii)



Butanone

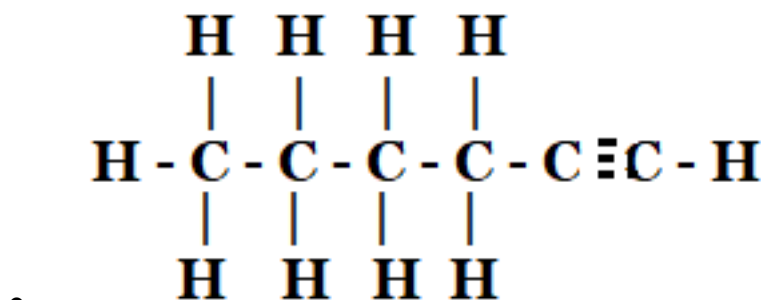
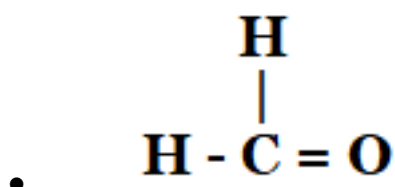
iv)



Hexanal

5. How would you name the following compounds?

- $\text{CH}_3\text{—CH}_2\text{—Br}$



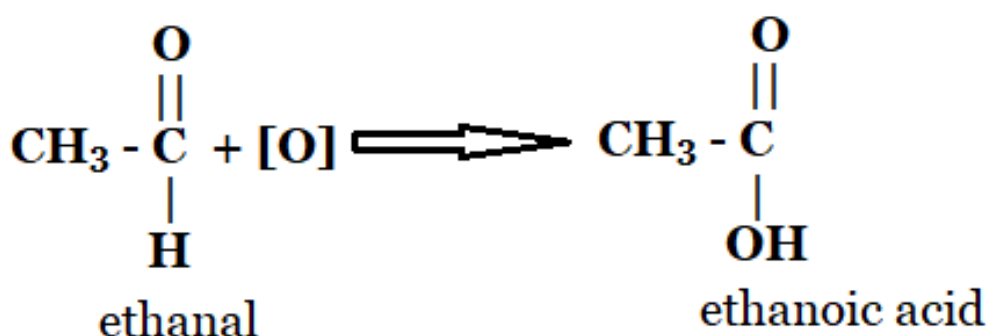
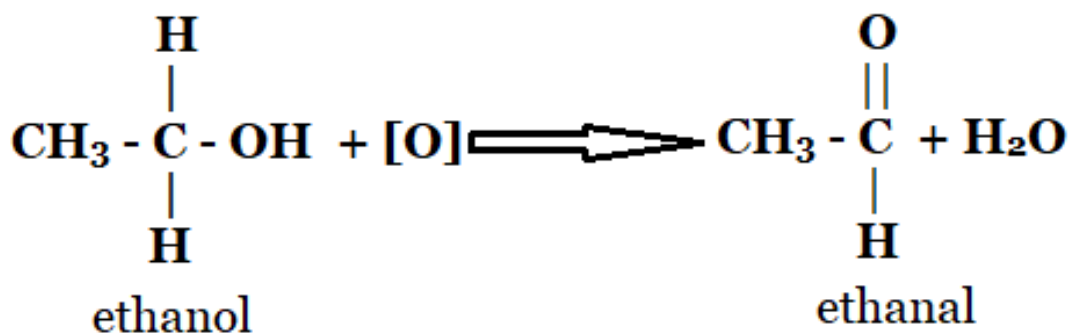
Solution:

- - Bromoethane
 - Methanal or Formaldehyde
 - 1 – Hexyne

page number 71

1. How is the conversion of ethanol to ethanoic acid an oxidation reaction?

Solution:



The conversion of ethanol to ethanoic acid involves the removal of hydrogen atoms and the addition of oxygen, which makes it an oxidation reaction. In the first step, a molecule of hydrogen (H_2) is removed from ethanol to form ethanal. Since the loss of hydrogen is oxidation, this reaction is an oxidation reaction. Similarly, when an oxygen atom is added to ethanal to form ethanoic acid, it is also considered oxidation because the gain of oxygen is called oxidation.

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: A mixture of oxygen and ethyne is used for welding instead of a mixture of ethyne and air because a high amount of heat is required for welding metals. When ethyne is burnt in oxygen, it burns completely and produces a very high temperature. The burning of oxygen and ethyne produces a very hot blue flame, whereas the mixture of air and ethyne produces a yellow, sooty flame due to unburnt carbon particles, which results in less heat.

page number 74

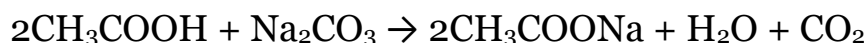
1. How would you distinguish experimentally between an alcohol and a carboxylic acid?

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Solution: When carboxylic acids react with sodium carbonate, they produce carbon dioxide gas, which turns lime water milky. Alcohols do not show this reaction. Therefore, this experiment can be used to distinguish between an alcohol and a carboxylic acid.

The reaction of the carboxylic acid with sodium carbonate:



2. What are oxidising agents?

Solution: Oxidising agents are substances that either remove hydrogen or add oxygen to a compound. Examples include halogens, potassium nitrate, and nitric acid.

page number 76

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

Solution: It is not possible to test whether water is hard using a detergent because detergents are salts of ammonium or sulphonates of long-chain carboxylic acids. Unlike soaps, they do not react with calcium and magnesium ions, so they cannot be used to identify the nature of water.

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: Agitation is necessary to get clean clothes as it aids soap micelles to trap the oil, grease or any other impurities that have to be removed. When they are being beaten or agitated, the particles are removed from the clothes' surfaces and go into the water, thus cleaning the clothes.

page number 77-78

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

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Solution: Ethane, with the molecular formula C_2H_6 , has 7 covalent bonds.

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

- (a) carboxylic acid
- (b) aldehyde
- (c) ketone
- (d) alcohol

Answer: (c) ketone

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

Solution: While cooking, if the bottom of the vessel becomes blackened on the outside, it indicates that the fuel is not burning completely.

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

Solution: Carbon can neither lose four electrons nor gain four electrons because both processes would require a large amount of energy, making the system unstable. Therefore, in CH_3Cl , carbon completes its octet by sharing its four electrons with atoms of other elements. Hence, the type of bonding present in CH_3Cl is covalent bonding.

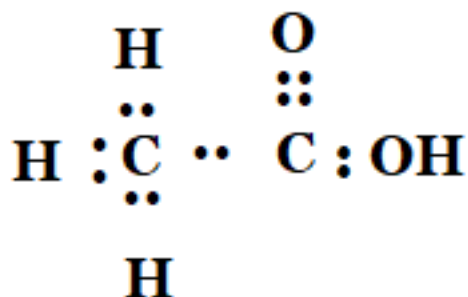
In this compound, carbon needs four electrons to complete its octet, each hydrogen atom needs one electron to complete its duplet, and chlorine needs one electron to complete its octet. Thus, they all share electrons, resulting in carbon forming three bonds with hydrogen atoms and one bond with a chlorine atom.

5. Draw the electron dot structures for

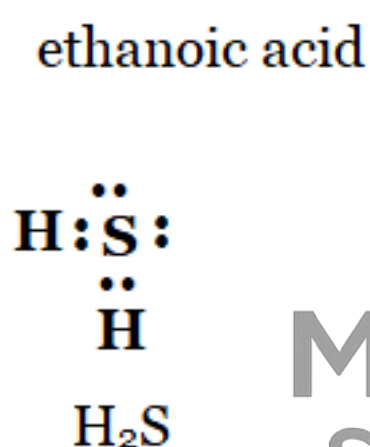
- (a) ethanoic acid
- (b) H_2S
- (c) propanone
- (d) F_2

Solution:

a)

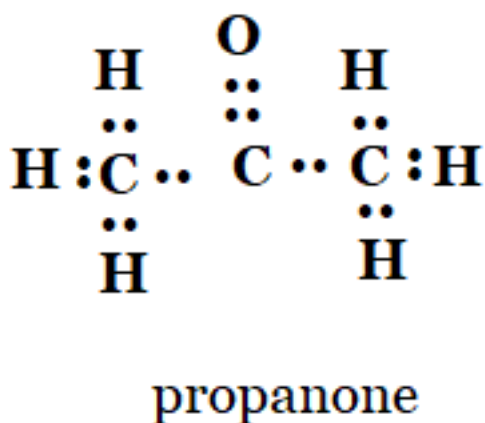


b)

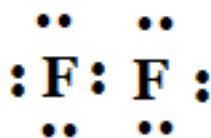


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c)



d)



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

A homologous series is a group of compounds that have the same functional group and similar general formula as well as chemical properties. However, their physical properties show a gradual change due to an increase in molecular size and mass.

For example, methane, ethane, propane, and butane belong to the alkane homologous series. The general formula of this series is $\text{C}_n\text{H}_{2n+2}$.

* Methane: CH_4

* Ethane: CH_3CH_3

* Propane: $\text{CH}_3\text{CH}_2\text{CH}_3$

* Butane: $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

It can be observed that there is a difference of one $-\text{CH}_2$ unit between each successive compound.

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

Solution:

Ethanol

It does not react with sodium hydrogen carbonate

A good smell

No action in litmus paper

Burning taste

Ethanoic acid

Bubbles and fizzes with sodium hydrogen carbonate

Smells like vinegar

Blue litmus paper to red

Sour taste

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?

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Solution: Micelle formation occurs due to the presence of dirt particles in water. Two mediums are involved in this process — pure water and dirt (impurities). Soap molecules also have two parts:

- (i) an organic tail, and
- (ii) an ionic head.

The organic tail of the soap dissolves in dirt, oil, or grease, while the ionic head mixes with water. As a result, when the material being cleaned is rinsed with water, the dirt gets removed along with the soap molecules. Thus, soap cleans by forming closed structures called micelles, which are held together by the mutual repulsion of their similarly charged heads.

Other solvents, such as ethanol, cannot dissolve the sodium salts of fatty acids and therefore do not form micelles.

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

Solution: Carbon and its compounds are widely used as fuels in most applications because they have high calorific values and release a large amount of energy. When most carbon compounds are burnt in air, they produce a great amount of heat and light.

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

Solution: Scum is formed when hard water reacts with soap. The calcium and magnesium ions present in hard water combine with soap to form an insoluble substance called scum.

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

Solution: When soap is dissolved in water, it forms an alkaline solution due to the presence of sodium hydroxide (NaOH) or potassium hydroxide (KOH). This alkaline solution turns red litmus paper blue, while blue litmus paper remains unchanged.

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

Solution: Hydrogenation is a chemical process in which hydrogen reacts with other compounds, usually in the presence of a catalyst such as nickel, palladium, or platinum. This process is mainly used to saturate organic compounds.

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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: Unsaturated hydrocarbons undergo addition reactions. C_3H_6 and C_2H_2 are unsaturated hydrocarbons which undergo addition reactions.

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

Solution: The bromine water test is used to distinguish between unsaturated compounds (such as alkenes and alkynes) and saturated compounds. Bromine water is a solution of bromine in water, which has a red-brown colour due to the presence of bromine. When bromine water is added to an unsaturated compound, bromine reacts with it, and the red-brown colour of the solution disappears. This happens because bromine gets added across the double or triple bond of the unsaturated compound.

Therefore, if an organic compound decolourises bromine water, it is an unsaturated hydrocarbon. In contrast, saturated hydrocarbons (alkanes) do not react with bromine water and thus do not cause any colour change.

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

Solution: Water contains many impurities and dirt particles, most of which do not dissolve in it. Soap molecules are salts of sodium or potassium that have long chains of carboxylic acids. When soap is added to water containing oil or grease, the carbon chain (hydrophobic tail) of the soap dissolves in the oil, while the ionic end (hydrophilic head) dissolves in water. This allows the soap to trap and lift away dirt.

During this process, soap molecules form structures called micelles, which capture the oil droplets with their hydrophobic tails, while the ionic heads face outward toward the water. This forms an emulsion, helping to remove dirt and impurities when the clothes are washed.

Soap molecules thus have two distinct ends — the hydrophilic end, which is attracted to and dissolves in water, and the hydrophobic end, which dissolves in hydrocarbons and repels water. The hydrophobic tail aligns itself along the surface of the water because it is not soluble in it.

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