Carbon and Its Compounds

4 Chapter

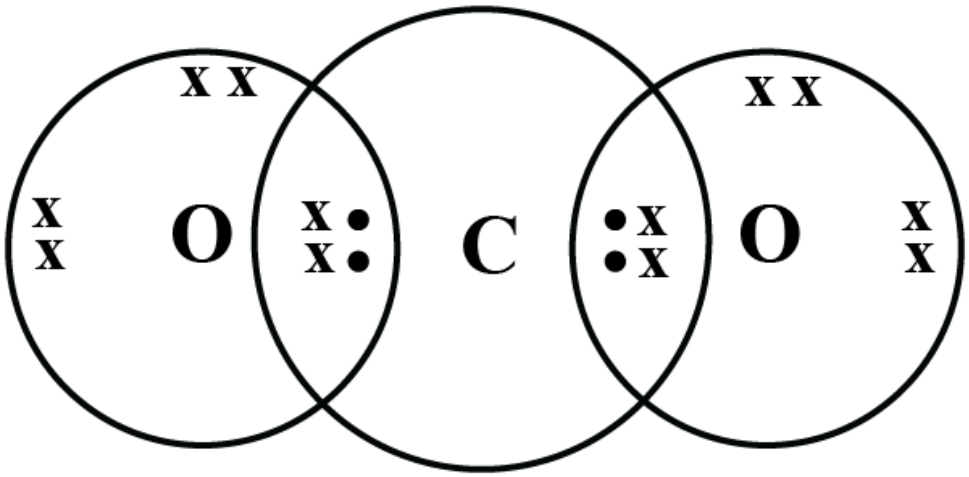
Intext Exercise 1

Question 1:

What will be the electron dot structure of carbon dioxide which has the formula CO_2?

Solution 1:

Cross dot structure of CO_2 is



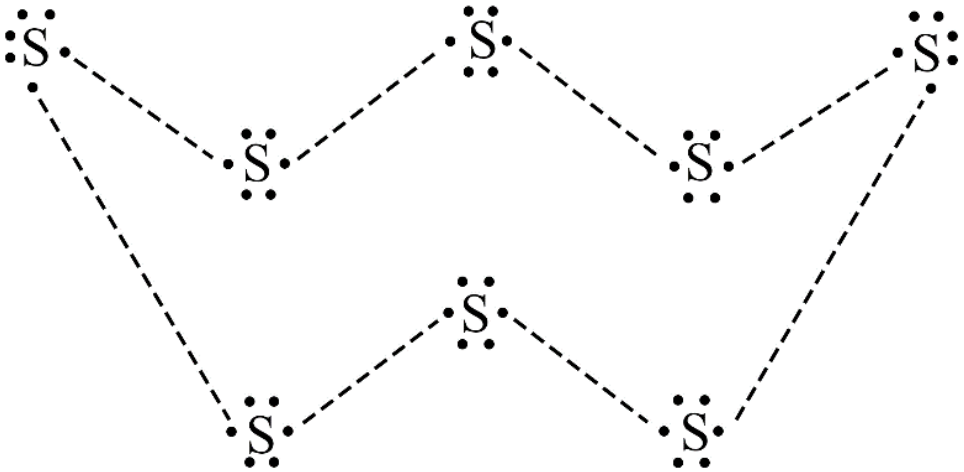
Question 2:

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 2:

Electron dot structure of a sulphur molecule



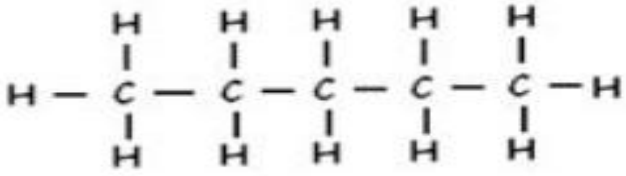
Intext Exercise 2

Question 1:

How many structural isomers can you draw for pentane?

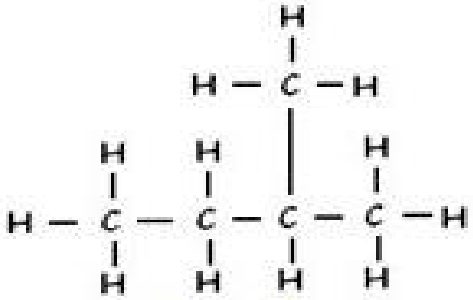
Solution 1:

Structural isomerism is also called constitutional isomerism.
It is a kind of isomerism where the molecules
have the same molecular formula with different orders and bondings.
Pentane has three structural isomers namely n-pentane, isopentane, and neo-pentane.
Structures of all the
three isomers are given here:
(a) Pentane



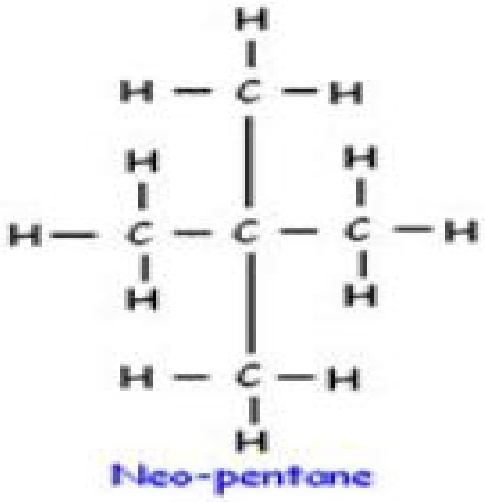
n-pentane

(b) 2-methyl but...



Iso-pentane

(c) 2,2-dimethyl propane



Question 2:

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

Solution 2:

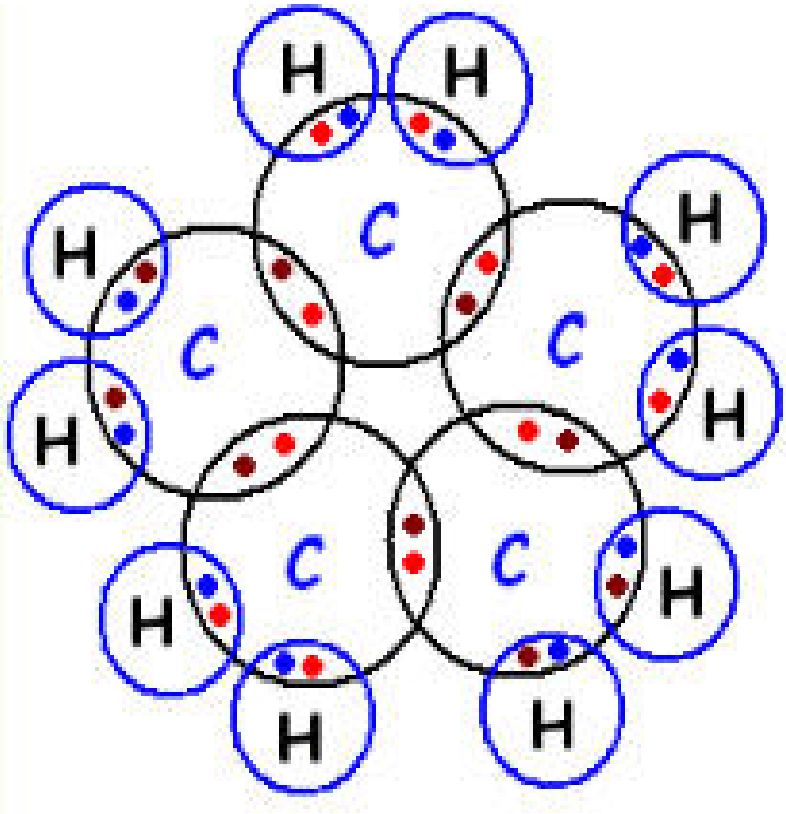
Carbon can form huge number of carbon compounds because of the following properties:
1. Catenation: Carbon can form bonds with other carbon atoms.
This property is called catenation. Because
of catenation, carbon can form long chains, branched chains and closed chains.
2. Carbon can form compounds with many other elements.

Question 3:

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

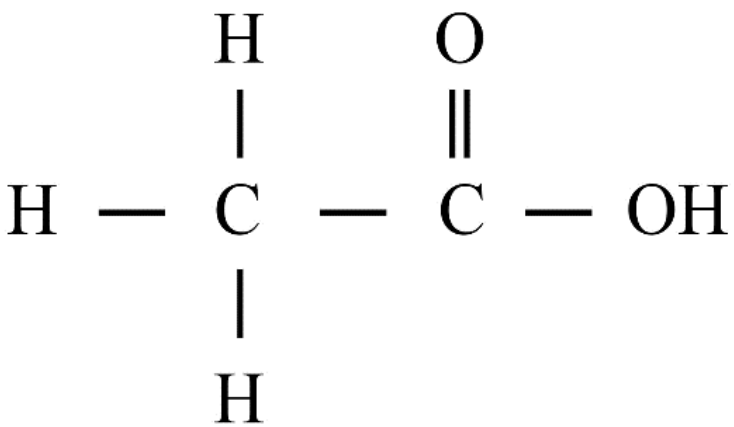
Solution 3:

The formula for cyclopentane is C_5H_{10}.



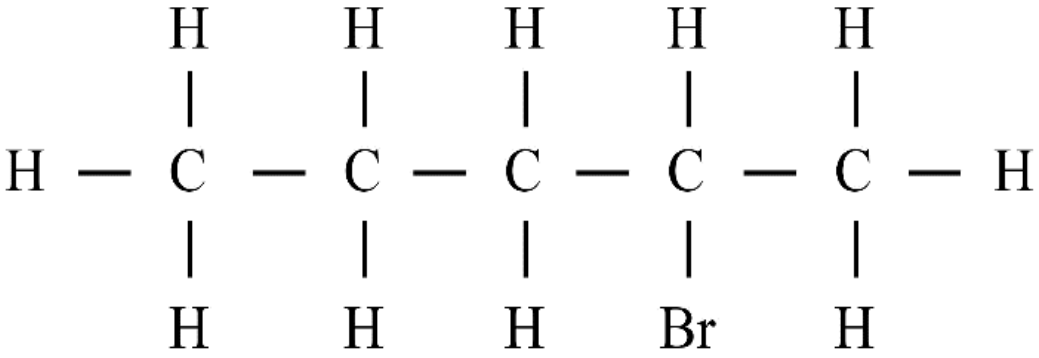
Question 4:
Draw the structures for the following compounds.
(i) Ethanoic acid (ii) Bromopentane*
(iii) Butanone (iv) Hexanal
*Are structural isomers possible for bromopentane?

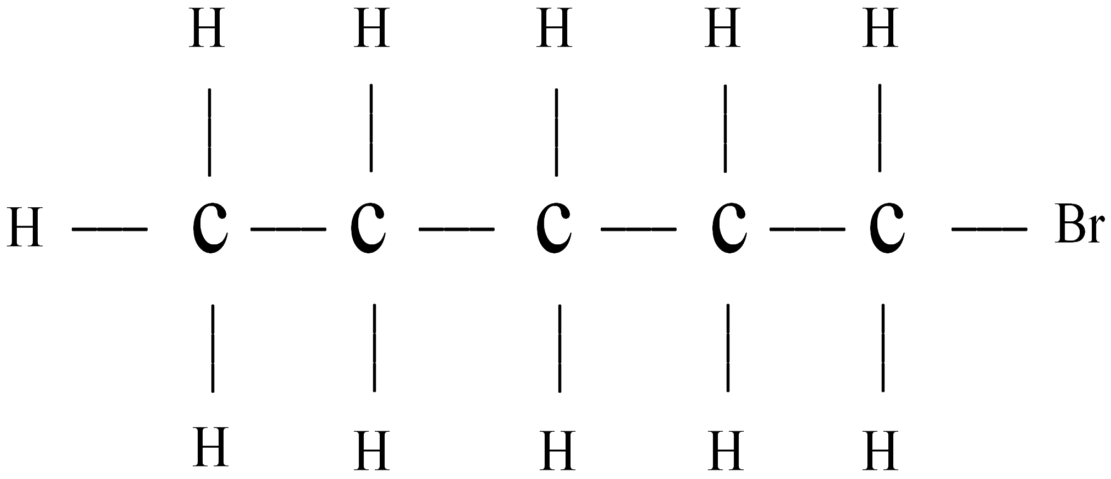
Solution 4:
(i) CH_3COOH

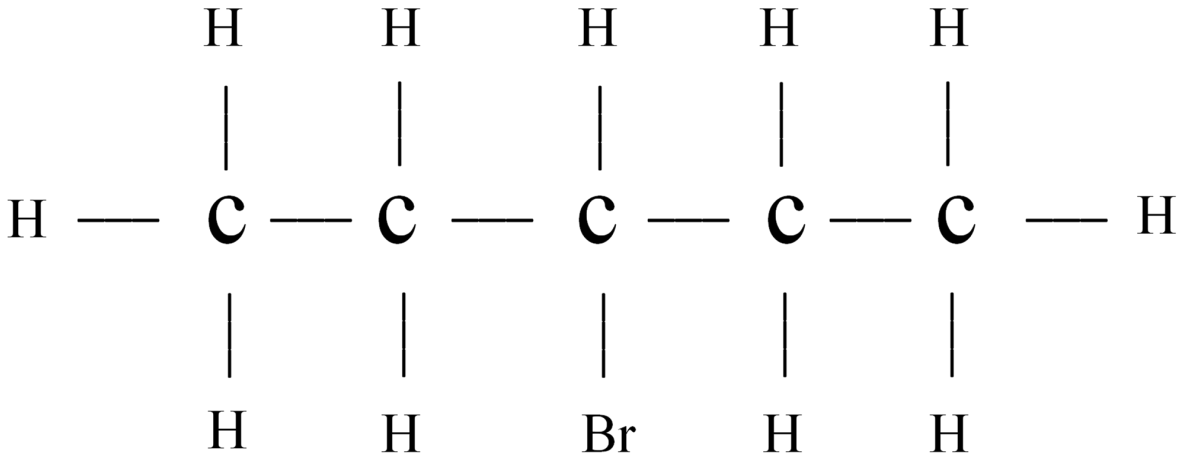


(ii) There are many structural isomers possible for bromopentane.
Among them, the structures of three isomers are given.

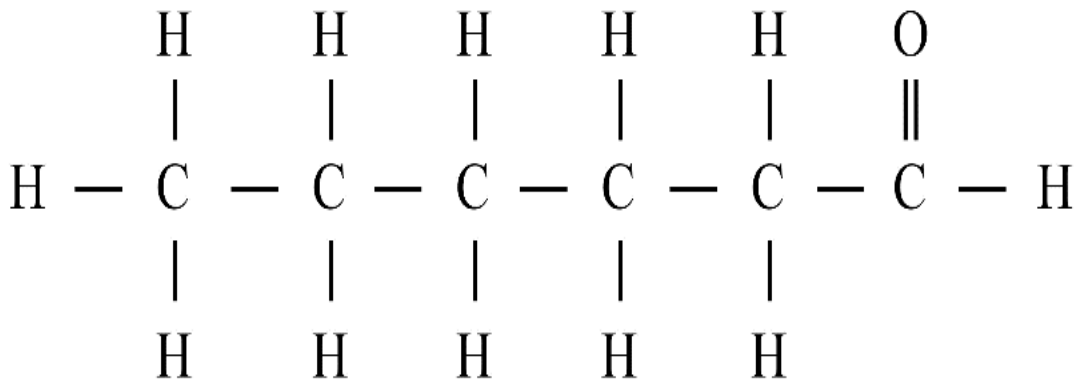
$CH_3CH_2CH_2CH(Br)CH_3$



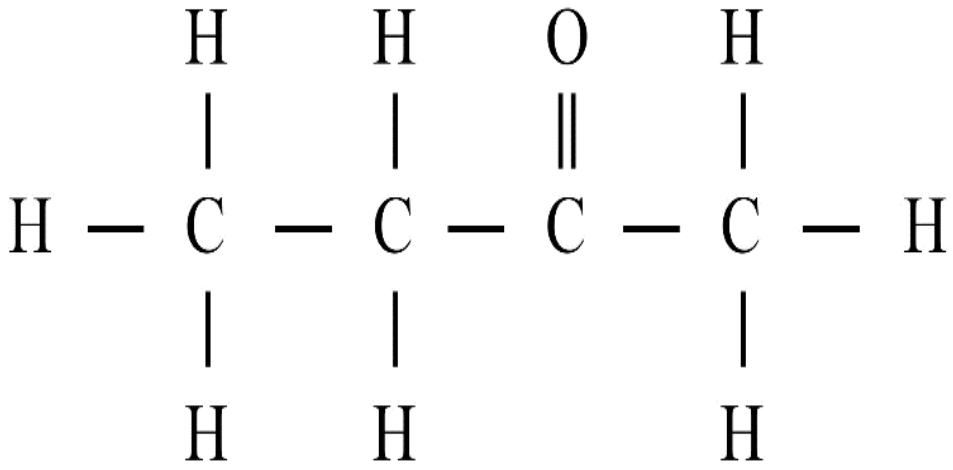




(iii) $CH_3\ CH_2\ CH_2\ CH_2\ CH_2\ CHO$

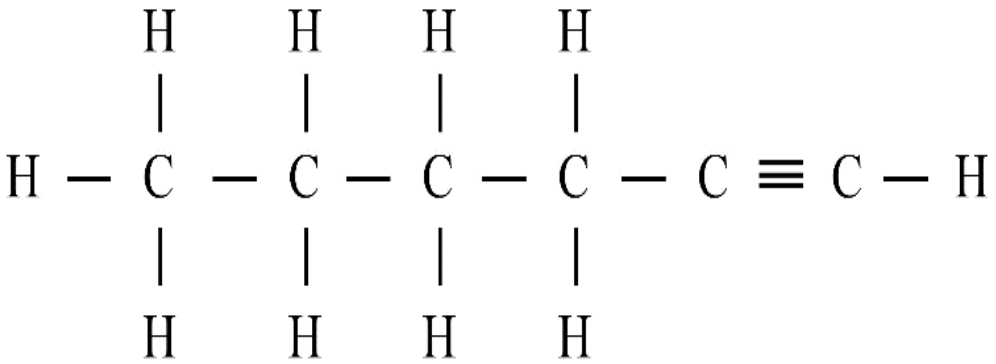


(iv) $CH_3\ CH_2\ CO\ CH_3$

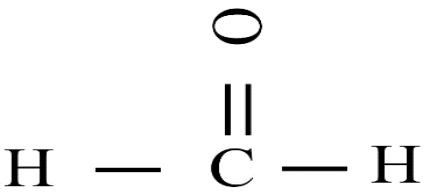


Question 5 :
Write the name the following compounds.
(i)

(ii)



(iii)



Solution 5:
(i) Bromoethane
(ii) Hexyne
(iii) Methanal

Intext Exercise 3

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

The conversion of ethanol to ethanoic acid is as follows:

$$CH_3H_2OH \xrightarrow{\text{Alkaline } KMnO_4} CH_3COOH$$

In this reaction one oxygen is added to ethanol, hence 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 2:
When a mixture of oxygen and ethyne is burnt,
it gives a clean flame with high temperature due to complete combustion of ethyne.
But when ethyne is burnt with air,
it results in incomplete combustion. Incomplete combustion will not give a high temperature.
The flame obtained in this case is sooty.
This is the reason why oxygen is used instead of air to burn ethyne.

Intext Exercise 4

Question 1:
How would you distinguish experimentally between an alcohol and a carboxylic acid?
Solution 1:
When an acid reacts with carbonate or hydrogen carbonate,
it gives carbon dioxide which turns lime water milky.
On the other hand,
alcohol does not give carbon dioxide on reaction with carbonate or hydrogen carbonate.Thus, the reaction with carbonate or hydrogen carbonate
can be used to distinguish between carboxylic acid and alcohol.

Question 2:
What are oxidising agents?
Solution 2:
An oxidizing agent is a reactant that removes electrons from other reactants during a redox reaction. for example: Alkaline potassium permanganate ($KMnO_4$) and acidified potassium dichromate($K_2Cr_2O_7$)

Intext Exercise 5

Question 1:
Would you be able to check if water is hard by using a detergent?
Solution 1:
Soaps are the sodium or potassium salt of long chain of carboxylic acid. Detergents are ammonium or sulphonate salts of long chain hydrocarbons. Hard water contains the chloride and sulphates of calcium and magnesium. When soap will add in the hard water form less lather so some amount of salt is unused. This insoluble salt is known as scum.
Detergent will give the good amount of lather in hard water as well as soft water. we can't identify through this that water is hard or soft.

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 2:

Soap contains the two parts. One part is hydrophilic and other part is hydrophobic. Soaps are the sodium or potassium salt of long chain of carboxylic acid. When the dirty clothes dip in the soap solution. the hydrophoic ends attach the dirt and form a huge cluster. This cluster is known as micelle and trap the dirt.

NCERT Exercises

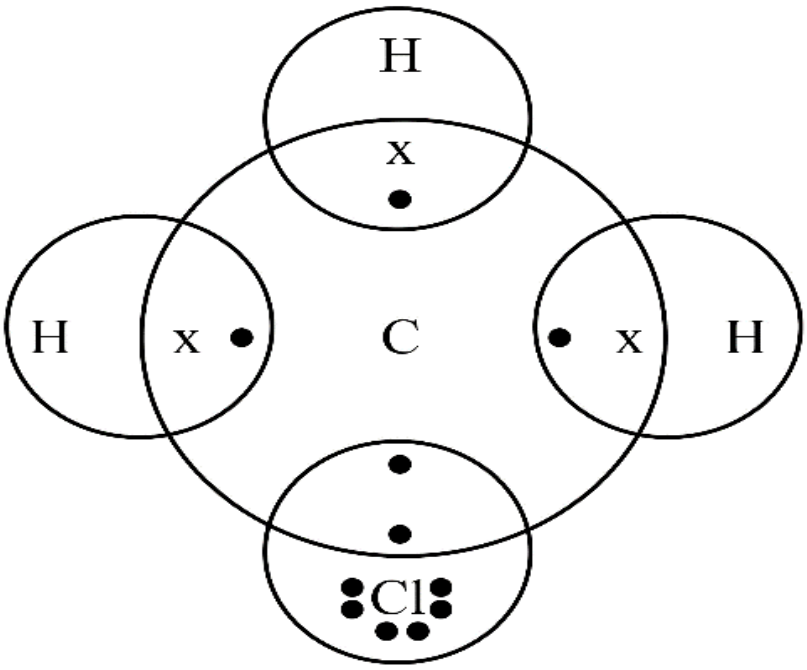
Question 1:
How many covalent bonds are in C_2H_6?
(a) 6 covalent bonds.
(b) 8 covalent bonds.
(c) 7 covalent bonds.
(d) 5 covalent bonds.
Solution 1:
(c) 7 covalent bonds.

Question 2:
What is the functional group in the Butanone?
(a) Ketone
(b) aldehyde.
(c) Ether
(d) alcohol.
Solution 2:
(a) ketone.

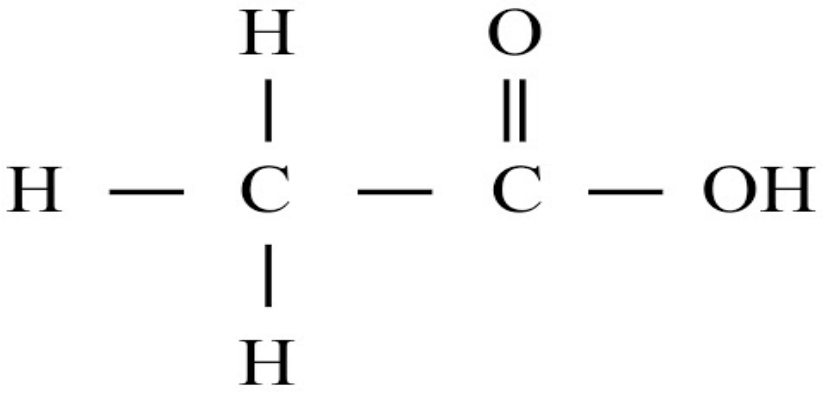
Question 3:
When the bottom of the vessel is getting blackened on the outside while cooking, it shows that
(a) the food is cooked completely.
(b) the fuel is not burning completely.
(c) the food is not cooked.
(d) the fuel is burning completely.
Solution 3:
(b) The bottom of the vessel is getting blackened on the outside, then it means that the fuel is not burnt completely.

Question 4:
Explain the nature of the covalent bond using the bond formation in CH_3Cl.
Solution 4:
Carbon is tetravalent in nature. In the outermost shell, carbon have four electrons removal of these electrons needs more energy and gain the four electrons needs more energy. To

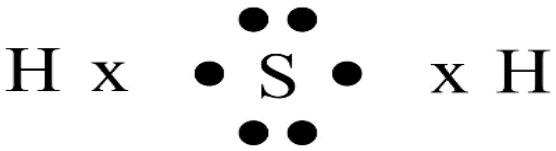
complete the octet, carbon needs to share the four electrons with other carbon atoms or different atoms. Carbon forms one bond with chlorine and three bonds with hydrogen.



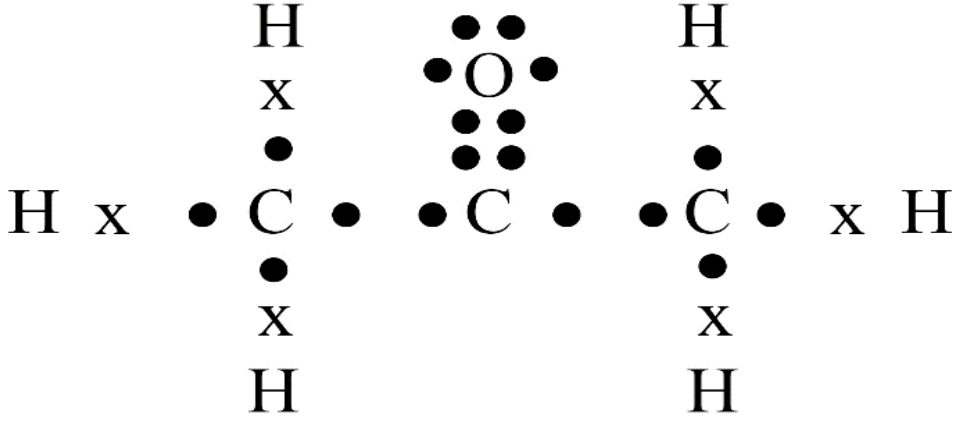
Question 5:
Draw the cross dot structures of the following compounds.
(a) Ethanoic acid.
(b) H_2S.
(c) Propanone.
(d) F_2.
Solution 5:
(a)



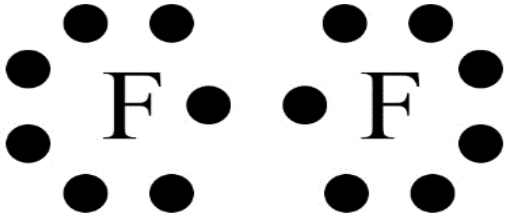
(b) H_2S



(c) Propanone



(d) F_2



Question 6:
What is a homologous series? Explain with an example.
Solution 6:
A homologous series is a series of carbon compounds that have same chemical properties but different physical properties and the differences between two successive compounds is $-CH_2$.

For example : Alkanes family. The general formula of Alkane is C_nH_{2n+2}.
Methane CH_4
Ethane CH_3CH_3
Propane $CH_3CH_2CH_3$
Butane $CH_3CH_2CH_2CH_3$

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

Physical properties:

The melting point of ethanol is -114.1 °C and ethanoic acid is 16.6 °C. Ethanoic acid melting point is below the room temperature it freezes during winters. Ethanol is liquid at room temperature but ethanoic acid is solid at room temperature. Ethanol has pleasant smell and ethanoic acid is vinegar smell.

Chemical Properties:

Ethanol is alcohol and ethanoic acid is carboxylic acid. When alcohol and carboxylic acid reacts with carbonates and bicarbonates than only carboxlylic acid reacts with carbonates and bicarbonates and evolve the CO_2 gas that turns lime water milky.

$CH_3COOH + NaHCO_3$ or Na_2CO_3 $CH_3COONa + CO_2 + H_2O$

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 8:
Soap molecule has two ends. One end is hydrophilic and the another end is hydrophobic.
When soap is dissolved in water and clothes are put in the soapy solution,
the soap molecules converge in a typical fashion to make a structure called micelle.
The hydrophobic ends of different molecules surround a particle
of grease (dirt) and make the micelle, which is a spherical structure.
In this, the hydrophilic end is outside the sphere and hydrophobic end is towards
the centre of the sphere.
This is why micelle formation takes place when soap is added to water.

Since ethanol is not as polar as soap, micelles will not be formed in it.

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

Solution 9:
When the saturated carbon compounds burnt with air form a carbon dioxide , water with lot of energy and light. In this reaction no smoke will produce so less pollution. It is exothermic process. It is used as fuels because high calorific value.

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

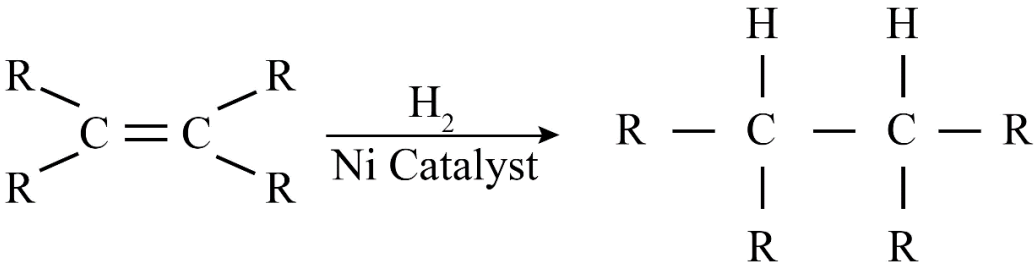
Solution 10:
Soaps are the sodium or potassium salt of long chain of carboxylic acid. Hard water contains the chloride and sulphates of calcium and magnesium. When soap will add in the hard water form less lather so some amount of salt is unused. This insoluble salt is known as scum.

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

Solution 11:
Soap is basic in nature so red litmus turns blue but blue litmus remains same.

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

Solution 12:
The addition of hydrogen on the unsaturated compounds are known as hydrogenation. it is a addition reaction in the presence of Ni/Pt/Pd as catalyst. Unsaturated compounds convert into the saturated compounds. Through this process the vegetable oil is converts into ghee.



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 13:

Unsaturated hydrocarbons undergo addition reactions. The unsaturated hydrocarbons General formula is $C_nH2n\text{-}2$ or C_nH_{2n}.

In the given compounds C_3H_6 and C_2H_2 undergo addition reactions while C_2H_6, C_2H_8 and CH_4 are saturated hydrocarbon.

Question 14:

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

Solution 14:

Saturated Hydrocarbons do not react with Bromine water whereas unsaturated hydrocarbons change the color of Bromine water.

Question 15:

Explain the mechanism of the cleaning action of soaps.

Solution 15:

Cleansing action of soaps:

Soap contains the two parts. One part is hydrophilic and other part is hydrophobic. Soaps are the sodium or potassium salt of long chain of carboxylic acid. When the dirty clothes dip in the soap solution. the hydrophoic ends attach the dirt and form a big cluster. This cluster is known as micelle and trap the dirt.