Std.: 9 (English) **Science 1**

Chapter: 13

Q.1 **Fill in the blank and rewrite the completed statements** **5**

1 ..... is the essential element in all the organic compounds.

Ans **Carbon** is the essential element in all the organic compounds.

2 All the carbon bonds in a saturated hydrocarbon ..... electrons.

Ans All the carbon bonds in a saturated hydrocarbon **share** electrons.

3 At least one carbon bond in an unsaturated hydrocarbon is .....

Ans At least one carbon bond in an unsaturated hydrocarbon is **multiple.**

4 A carbon atom forms a ..... bond with other atoms. In this bond the two atoms ..... electrons.

Ans A carbon atom forms a **covalent** bond with other atoms. In this bond the two atoms **share** electrons.

5 The element hydrogen is present in …… organic compound.

Ans The element hydrogen is present in **all** organic compound.

Q.2 **Write Short Notes** **2**

1 Coal and its types.

Ans i. Coal is a fossil fuel. It contains carbon, hydrogen and oxygen. It also contains nitrogen, phosphorus and sulphur. It occurs in the solid state. It is of four types.

ii. **Peat:** Formation of peat is the first step in the formation of coal. It contains a high proportion of water and less than 60% of carbon.

iii. **Lignite:** Peat is transformed into lignite due to increased pressure and temperature inside the earth. It contains 60 to 70% of carbon. Lignite is the second step of the formation of coal.

iv. **Bituminous coal:** Bituminous coal was formed as the third step of formation of coal. It contains 70 to 90% of carbon.

v. **Anthracite:** Anthracite is known as the pure form of coal. This coal is hard and contains about 95% of carbon.

Q.3 **Chemical reaction with equation:** **4**

1 **Complete the following chemical reaction:**

i. [ ] [ ] ..... → $CO_2 + 2H_2O$ + Heat

ii. [ ] + [ ] ..... → $CH_3Cl + HCl$

Ans i. **$CH_4 + 2O_2$..... → $CO_2 + 2H_2O$ + Heat**

ii. **$CH_4 + Cl_2$ ..... → CH_3Cl + HCl**

2 **Complete the following chemical reaction:**

i. $2NaOH + CO_2$ ..... → [ ] + [ ]

ii. $2NaHCO_3 + H_2SO_4$ ..... → [ ] + [ ] + [ ]

Ans i. $2NaOH + CO_2$ ..... → **$Na_2CO_3 + H_2O$**

ii. $2NaHCO_3 + H_2SO_4$..... → **$Na_2SO_4 + 2H_2O + 2CO_2$**

Q.4 **Answer the following.** **20**

1 Give physical properties of Charcoal.

Ans 1. Charcoal is a light weight, black, amorphous form of carbon.
2. It is a highly porous and brittle material.
3. It is a bad conductor of heat and electricity.
4. It has low density.

2 Give uses of allotropes of carbon : **Coke**

Ans **Coke:** The uses of coke are:

a) Coke is used as domestic fuel.
b) Coke is used as a reducing agent.
c) Coke is used in production of water gas ($CO+H_2$) and producer gas ($CO+H_2+CO_2+N_2$)

3 Give uses of allotropes of carbon : **Graphite**

Ans **Graphite:** The uses of Graphite are

a) Graphite is used for making lubricants.
b) Graphite is used for making carbon electrodes.
c) Graphite is used in pencils for writing.
d) Graphite is used in paints and polish.
e) Graphite is used in arc lamps which give a very bright light.

4 Give physical properties of Diamonds.

Ans **The properties of Diamond are:**

i. Brilliant and pure diamond is the hardest natural substance.
ii. The density of diamond is 3.5 $g/cm^{3.}$
iii. The melting point of diamond is 3500°C.
iv. Diamond does not dissolve in any solvent.
v. Acids/Bases have no effect on diamond.

5 Give practical uses of Carbon dioxide.

Ans **The uses of Carbon dioxide are:**

i. Carbon dioxide is used to make aerated drinks.
ii. Solid carbon dioxide is used in cold storage and also to keep milk and milk products and frozen substances cool during transport. It is also used for getting special effects of a mist in dramas and movies.
iii. Liquified Carbon dioxide is used to remove caffeine from coffee.
iv. Liquid Carbon dioxide is used as solvent in modern eco-friendly dry cleaning.
v. Carbon dioxide obtained by chemical reaction or kept under pressure is used in fire extinguishers.

6 Give uses of allotropes of carbon : **Fullerene**

Ans **Fullerene:** The uses of Fullerenes are

a) Fullerenes are used as insulators.
b) Fullerenes are used as a catalyst in water purification.
c) At a certain temperature, fullerene exhibits superconductivity.

7 Give physical properties of Fullerence.

Ans 1. Fullerene, an allotrope of carbon, is rarely found in nature.
2. Molecules of fullerenes are found in the form of buckyballs and buckytubes.
3. Fullerenes are soluble in organic solvents such as carbon disulphide, chlorobenzene.
4. At a certain temperature fullerene exhibits superconductivity.

8 Give uses of Carbon dioxide in fire extinguisher.

Ans i. A Fire extinguisher contains sodium bicarbonate powder.
ii. Dilute sulphuric acid is placed in a glass capsule.
iii. The capsule breaks on pressing the knob, the sulphuric acid comes in contact with the sodium bicarbonate and the two react chemically to release CO_2.
iv. CO_2 based fire extinguishers do not cause corrosion and are non-conductors of electricity. Therefore these are used when electrical and electronic equipment catches fire.

v. CO_2 based fire extinguishers are used to extinguish small scale fire.

vi. In Modern fire extinguishers liquid and solid CO_2 is filled under pressure. On reducing the pressure it becomes gaseous and come out forcefully through the Horn-like hose pipe.

9 Give uses of allotropes of carbon : **Coal**

Ans **Coal:** The uses of coal are:

a) Coal is used as fuel in factories and homes.

b) Coal is used to obtain coke, coal gas and coal tar.

c) Coal is used in thermal power plants for generation of electricity.

10 Give uses of allotropes of carbon : **Diamond**

Ans **Diamond:** The uses of Diamond are:

a) Diamonds are used in glass cutting and rock drilling machines.

b) Diamonds are used in ornaments.

c) Diamonds knives are used in the eye surgery.

d) Diamond dust is used for polishing other diamonds.

e) Diamond is used to make windows giving protection from radiation in space and in artificial satellites.

Q.5 **Distinguish between** **4**

1 Diamond and Graphite

Ans

	Diamond	Graphite
i.	Diamond is brilliant, hard and crystalline allotrope of carbon.	Graphite is black, soft, brittle and slippery crystalline allotrope of carbon.
ii.	In diamonds, the carbon atoms forms a tetragonal three dimensional structure	In graphite, the carbon atoms forms a hexagonal layered structure
iii.	Diamond is a bad conductor of electricity.	Graphite is a good conductor of electricity.
iv.	Density of diamond is 3.5 g/cm^3	Density of graphite is 1.9 to 2.3 g/cm^3

2 Crystalline form of carbon and Non-Crystalline form of carbon.

Ans

	Crystalline for of Carbon	Non- Crystalline form of Carbon
i.	A Crystalline form has a regular and definite arrangement of atoms.	A non-crystalline form does not have a regular and definite arrangement of atoms.
ii.	They have high melting and boiling points	They have low melting and boiling points.
iii.	Diamond, Graphite and fullerene are different crystalline forms of carbon	Coal, Charcoal and coke are the different non-crystalline/ amorphous form of carbon.
iv.	The crystalline form has a definite geometrical shape.	The non-crystalline form does not have a definite geometrical shape.

Q.6 **Give scientific reasons** **10**

1 Biogas is an eco-friendly fuel.

Ans Biogas is formed by the anaerobic decomposition of animal dung, dry leaves, wet garbage etc. in a biogas plant to produce methane gas or biogas.

i. Biogas contains 55% to 60% of methane which burns completely without any smoke.

ii. Burning of animal dung, agricultural wastes and dry leaves would have resulted in the production of smoke and other green house gases.

iii. This will cause not only atmospheric pollution but also various respiratory disorders.

iv. Also the surroundings become clean and pathogens causing cholera, typhoid and jaundice are trapped as the wastes are decomposed in the biogas plant and not allowed to accumulate

v. Hence it is an eco-friendly gas.

2 Graphite is a conductor of electricity.

Ans i. Graphite is a crystalline allotropic form of carbon.
ii. In Graphite, each carbon atom is bounded to three other carbon atom is such a way that a hexagonal layered structure is formed.
iii. Due to this structure, graphite has free electrons available.
iv. These free electrons move continuously within the entire layer.
v. Hence graphite is a good conductor of electricity.

3 Limewater turns milky when CO_2 is passed through it.

Ans When carbon dioxide is passed through limewater, it turns milky white due to the formation of white, insoluble calcium carbonate (C_aCO_3) which precipitates out of the solution.

$Ca(OH)_{2(aq)} + CO_{2(g)} \rightarrow CaCO_{3(s)}\downarrow + H_2O(l)$

Limewater	Carbon dioxide	Calcium Carbonate (White precipitate)	Water

4 Methane is called marsh gas.

Ans i. Methane gas is continuously formed by the decomposition of plants and animal matter in the absence of air, in swamps or marshy areas.
ii. So methane is found abundantly in marshy areas, and hence it is called as marsh gas.

5 Graphite is not used in ornaments.

Ans i. Graphite is a crystalline allotropic form of carbon.
ii. It is a black, soft, brittle and dull form of carbon.
iii. It is neither malleable nor ductile.
iv. These properties of graphite make it unsuitable for the making of ornaments.
v. Hence, graphite is not used for making ornaments.

Q.7 **Give explanation using the given statement:** **9**

1 Petrol, diesel, coal are fossil fuels. Explain.

Ans i. A fossil fuel is formed by natural processes, such as decomposition of buried dead organisms, existed in the ancient past. Fossil fuels contain high percentage of carbon.
ii. Coal is formed from the remains of trees and other vegetation. These remains were trapped at the bottom of the seas/ swamps and acted by the internal heat of the earth and extreme pressure of the sea water.
iii. Gradually the remains accumulated in the form of layers and created a dense material called peat. Peat is the first step in the formation of coal.
iv. Petrol and diesel are obtained from mineral oil. Mineral oil is also called as crude oil or petroleum oil is formed from plants and animals that lived in the seas millions of years ago.
v. Thus petrol, diesel and coal are called fossil fuels.

2 Diamond, Graphite and fullerenes are crystalline forms of carbon. Explain.

Ans i. Carbon shows the property of allotropy. Allotropy means existence of elements in more than one form having same chemical properties but different physical properties.
ii. Carbon exists in crystalline as well as non-crystalline form.
iii. The crystalline form has a regular and definite arrangement of atoms. They have high melting and boiling points. They have a definite geometrical shape, sharp edges and plane surfaces. Carbon has three crystalline allotropes such as Diamond, Graphite and Fullerene.
iv. In the structure of diamond, every carbon atom is bonded to four neighboring atoms by covalent bonds. Therefore, diamond has a tetragonal three dimensional structure which makes it very hard.
v. In the structure of graphite, every carbon atom is bonded to three other carbon atoms in such a way that a hexagonal layered structure is formed.
vi. In fullerene, there are 30 to 900 carbon atoms in one molecule of a fullerene. The molecules of fullerene are found in the form of buckyballs and buckytubes. Fullerene is rarely found in nature.

3 Lime water turns milky when CO_2 is passed through it. Explain.

Ans i. Lime water is a weak solution of the alkali Calcium hydroxide $Ca(OH)_2$.
ii. When CO_2 is passed through limewater it reacts with Calcium hydroxide to form insoluble precipitate of Calcium carbonate ($CaCO_{3)}$ (weak basic salt)
iii. Calcium carbonate is white nd insoluble in water and hence remain suspended through out lime water.

iv. **Chemical reaction:**

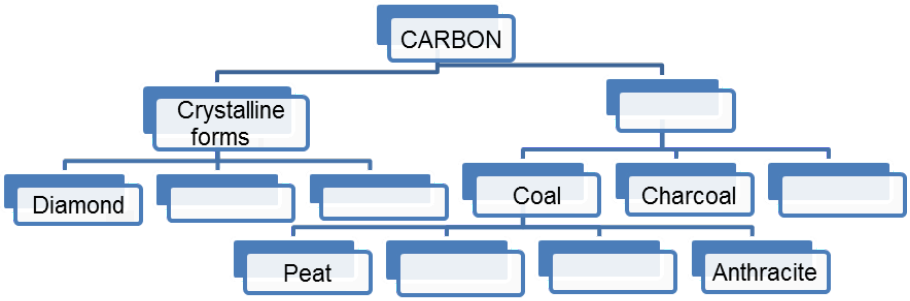
CO_2 + $Ca(OH)_2$ ----------→ à $CaCO_3$ + H_2O

Carbon dioxide — Calcium hydroxide (lime water) — Calcium carbonate — water

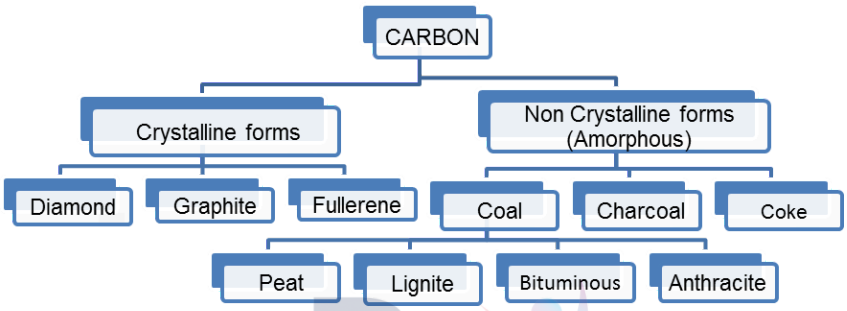
Hence, Lime water turns milky when CO_2 gas is passed through it.

Q.8 **Complete the table/ web/ flow chart** **3**

1 Classify Carbon



Ans



Q.9 **Answer the following** **9**

1 How will you verify the properties of carbon dioxide?

Ans The properties of Carbon dioxide can be verified in the following ways.

i. When a burning candle is placed in a gas jar of carbon dioxide, it extinguishes indicating that Carbon dioxide is a non-combustible gas and does not support combustion.

ii. When Carbon dioxide gas is passed through lime water, it turns lime water milky due to the formation of insoluble Calcium carbonate.

iii. Moist blue litmus turns red in a gas jar of Carbon dioxide indicating that it is acidic in nature.

iv. Carbon dioxide is fairly soluble in water forming Carbonic acid.

2 Why are carbon and its compounds used as fuels?

Ans i. The name 'carbon' is derived from Latin word 'carbo' meaning coal. In the earth's crust carbon is present to an extent of approximately 0.27% in the form of carbonate, coal, and petroleum.

ii. One of the non-crystalline and amorphous form of carbon is coal. Coal is a fossil fuel while charcoal and coke are the other amorphous forms of carbon used as fuel.

iii. Compounds of carbon such as hydrocarbons consist of carbon and hydrogen and are easily combustible. For example: Methane burns completely by reacting with oxygen in the air to form carbon dioxide and water.

iv. Thus, when hydrocarbons are burnt in air, large amount of heat is evolved with formation of carbon dioxide and water. Due to evolution of heat on combustion, carbon and its compounds are used as fuels.

3 In which compound form does carbon occur?

Ans Carbon in its combined state exists in form of various compounds such as:

i. Carbon dioxide and in the form of carbonates such as Calcium carbonate, marble, calamine ($ZnCO_3$)

ii. Fossil fuels-coal, petroleum, natural gas.

iii. Carbonaceous nutrients- carbohydrates, proteins, fats.

iv. Natural fibres-cotton, wool, silk.

v. Hydrocarbons- Compounds containing carbon and hydrogen.

Q.10 **Answer the following in detail** **5**

1 Explain the properties of carbon.

Ans **Allotropic nature of Carbon:** Carbon shows the property of allotropy. Allotropy means existence of elements in more than one form having same chemical properties but different physical properties. The two allotropic forms of carbon are:

i. Crystalline Form: Carbon has three crystalline allotropes: Diamond, Graphite and Fullerene.
The Properties of Crystalline forms of carbon are as follows:
a) A crystalline form has a regular and definite arrangement of atoms.
b) They have high melting and boiling point.
c) A crystalline form has a definite geometrical shape, sharp edges and plane surfaces.

ii. Non-crystalline Form: Coal, coke and charcoal are the non-crystalline forms of carbon.
The properties of non-crystalline forms of carbon are as follows:
a) The arrangement of carbon atoms in this form is not regular.
b) They have a low melting and boiling points.
c) Most of them are used as fuels.