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## **Class 8<sup>th</sup>**

## **Chapter 3<sup>rd</sup>**

# **Coal & Petroleum**

## **Inexhaustible and Exhaustible Natural Resources**

**Anything in the environment 'which can be used' is called a 'resource'. All the natural resources can be classified into two main groups:**

**(i) Inexhaustible natural resources, and**

**(ii) Exhaustible natural resources.**

**Those natural resources which are present in unlimited quantity in nature and are not likely to be exhausted by human activities are called inexhaustible natural resources.**

**Examples of inexhaustible natural resources are: Sunlight, Air and Water. There is a never ending supply of inexhaustible resources in nature.**

**The inexhaustible resources can be used again and again.**

**Those resources which are present in a limited quantity in nature and can be exhausted by human activities, are called exhaustible natural resources.**

**Examples of exhaustible natural resources are: Coal, Petroleum, Natural gas, Minerals, Forests and Wildlife, etc.**

**The exhaustible natural resources do not last forever.**

## **FOSSIL FUELS**

**The natural fuels formed from the remains of living organisms buried under the earth long, long ago, are called fossil fuels.**

**Coal, petroleum and natural gas are fossil fuels. Coal, petroleum and natural gas are called fossil fuels because they were formed by the decomposition of the remains of pre-historic plants and animals (fossils) buried under the earth long, long ago.**

**Fossil fuels are exhaustible natural resources because once all the fossil fuels are used up, they will be gone forever.**

## **How Fossil Fuels were formed**

**The plants and animals which died millions of years ago, were gradually buried deep in the earth and got covered with sediments like mud and sand, away from the reach of air. In the absence of air, the chemical effects of heat, pressure and bacteria, converted the buried remains of plants and animals into fossil fuels like coal, petroleum and natural gas. Please note that the buried remains of large land plants were converted into coal whereas those of tiny marine plants and animals were converted into petroleum and natural gas.**

## **COAL**

**Coal is a hard, black combustible mineral that consists mainly of carbon.**

**Coal is found in deep coal mines under the surface of the earth.**

**India, coal is found mainly in Bihar, West Bengal, Orissa and Madhya Pradesh.**

## **Formation of Coal**

**Coal was formed by the decomposition of large land plants and trees buried under the earth about 300 million years ago.**

**Due to natural processes like earthquakes, volcanoes and floods, etc., forests were buried under the surface of earth.**

**As more soil deposited over them, they were compressed.**

**Due to high pressure and high temperature inside the earth, and in the absence of air, the wood of buried forest plants and trees was slowly converted into coal.**

**The slow process by which the dead plants buried deep under the earth have become coal is called carbonisation.**

## **Uses of Coal**

- (i) Coal is used as a fuel in homes and industry.**
- (ii) Coal is used as a fuel at Thermal Power Plants for generating electricity.**
- (iii) Coal is used to make coal gas which is an important industrial fuel.**
- (iv) Coal is used to make coke.**
- (v) Earlier, coal was used as a fuel to make 'steam' to run steam engines of trains.**
- (vi) Coal was also used as a source of organic chemicals.**

## **Products of Coal**

**When coal is heated strongly in closed retorts in the absence of air, a number of useful products are obtained.**

- (i) Coal gas,**
- (ii) Coal tar, and**
- (iii) Coke.**

**Coal gas, coal tar and coke are called products of coal.**

## **Coal Gas**

**Coal gas is used as a fuel in industries.**

**When coal gas burns, it also produces a good amount of light. So, in the past, coal gas has also been used for lighting purposes (or illumination purposes). however, coal gas is used as a source of heat rather than light.**

## **Coal tar**

**The useful carbon compounds (or organic compounds) present in coal tar include benzene, toluene, naphthalene, anthracene, phenol and aniline.**

**Naphthalene balls used to repel moths and other insects are obtained from coal tar.**

**The various compounds present in coal tar are separated by the process of fractional distillation.**

**The products of coal tar are used to make synthetic fibres, drugs (medicines), plastics, synthetic dyes, perfumes, paints, varnishes, pesticides, photographic materials, roofing materials and explosives, etc.**

**Coal tar has been traditionally used for metalling the roads.**

## **Coke**

**Coke is mainly used as a reducing agent in the extraction of metals.**

**Coke is used in the manufacture of steel. Coke is also used as a fuel. Coke is a better fuel than coal because it produces more heat on burning than an equal amount of coal.**

## **PETROLEUM**

**Petroleum is a dark coloured, thick crude oil found deep below the ground in certain areas.**

**It has an unpleasant odour.**

**petroleum found under the crust of earth trapped in rocks.**

**Petroleum is not a single chemical compound.**

**Petroleum is a complex mixture of compounds known as hydrocarbons.**

**Petroleum is insoluble in water.**

**Petroleum is a natural resource obtained from deep oil wells which are dug in certain areas of the earth. Just like coal, petroleum is also a fossil fuel.**

### **How Petroleum was formed**

**Petroleum (oil) was formed by the decomposition of the remains of tiny plants and animals buried under the sea millions of years ago.**

**Millions of years ago, the tiny plants and animals which lived in the sea, died. Their dead bodies sank to the bottom of sea and were soon covered with mud and sand.**

**Due to high pressure, heat, action of bacteria, and in the absence of air, the dead remains of tiny plants and animals were slowly converted into petroleum.**

**The petroleum thus formed got trapped between two layers of impervious rocks (non-porous rocks), forming an oil deposit.**

### **Occurrence and Extraction of Petroleum**

**Petroleum is extracted by drilling holes (called oil wells) in the earth's crust, where the presence of oil has been predicted by survey.**

**The oil wells are drilled by using 'drilling rigs'.**

**When an oil well is drilled through the rocks, natural gas comes out first with a great pressure and for a time, the crude petroleum oil comes out by itself due to gas pressure.**

**After the gas pressure has subsided, petroleum is pumped out of the oil well.**

## **Refining of Petroleum**

**The process of separating crude petroleum oil into more useful fractions is called refining.**

**The refining of petroleum into different fractions is based on the fact that the different fractions of petroleum have different boiling point ranges.**

**The refining of petroleum is carried out in an oil refinery.**

**The crude petroleum oil extracted from oil wells is taken to the 'oil refinery' through pipes.**

**In the oil refinery, crude petroleum oil is refined (or separated) into different useful fractions.**

**The separation of petroleum into different fractions is done by the process of 'fractional distillation'.**

**Fractional distillation is a process in which fractions of petroleum having different boiling point ranges are collected separately. The various useful fractions obtained by the refining of petroleum are Lubricating oil , Paraffin wax and Bitumen , Petroleum gas, Petrol, Kerosene, Diesel.**

## **The Various Fractions of Petroleum**

### **(i) PETROLEUM GAS.**

**Petroleum gas is used as a fuel in homes and industry. Petroleum gas is used as a fuel as such or in the form of Liquefied Petroleum Gas (LPG).**

### **(ii) PETROL.**

**Petrol is used as a fuel in light motor vehicles (such as cars, motorcycles, and scooters, etc.). Petrol is also used as a solvent for dry cleaning.**

**(iii) KEROSENE.** Kerosene is used as a fuel in wick stoves and pressure stoves to cook food. Kerosene is also used for lighting purposes. A special grade of kerosene oil is used as aviation fuel in jet aeroplanes.

**(iv) DIESEL.**

Diesel is used as a fuel in heavy motor vehicles. Diesel is also used to run pump sets for irrigation in agriculture and in electric generators.

**(v) LUBRICATING OIL.**

Lubricating oil is used for lubrication in machines and engines (like car engines).

**(vi) PARAFFIN WAX.**

Paraffin wax is used for making candles, vaseline, ointments, wax paper, and grease.

**(vii) BITUMEN.**

Bitumen is used for road surfacing. It is also used for water-proofing the roofs of buildings. Bitumen is used in making black paints.

### **Liquefied petroleum gas**

The petroleum gas which has been liquefied under pressure is called liquefied petroleum gas.

The liquefied petroleum gas (or LPG) consists mainly of butane ( $C_4H_{10}$ ).

The gas used for domestic cooking is called liquefied petroleum gas because it is obtained from petroleum and it is liquefied by compression before filling into the gas cylinders.

When we turn on the knob of the gas cylinder, the pressure is released, due to which the highly volatile LPG is converted into gas.



**This gas goes into the burner of LPG stove. When a lighted matchstick is applied to the burner, the gas burns with a blue flame producing a lot of heat.**

**This heat is used for cooking food.**

**Liquefied petroleum gas (LPG) is a good fuel because of its following advantages:**

**(i) LPG burns easily.**

**(ii) LPG has a high calorific value. Due to this, a given amount of LPG produces a lot of heat.**

**(iii) LPG burns with a smokeless flame and hence does not cause air pollution.**

**(iv) LPG does not produce any poisonous gases on burning.**

**(v) LPG does not leave behind any solid residue on burning.**

## **NATURAL GAS**

**Natural gas consists mainly of methane with small quantities of ethane and propane.**

**Natural gas occurs deep under the crust of earth either alone or along with oil above the petroleum deposits.**

**Natural gas is formed under the earth by the decomposition of vegetable matter lying under water.**

**This decomposition is carried out by anaerobic bacteria in the absence of air.**

**Just like coal and petroleum, natural gas is also a fossil fuel. India has vast reserves of natural gas.**

**When natural gas is compressed by applying pressure, it is called Compressed Natural Gas (which is written in short form as CNG).**

**It becomes easier to store, transport and use natural gas in the form of CNG.**

**Natural gas is called a clean fuel because it burns without producing any smoke and does not cause air pollution**

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