(iii) For Generating Electricity : Fuels such as coal and natural gas are used for generating electricity on a commercial scale, in Thermal power stations. Petrol, diesel and kerosene are also used for generating electricity in smaller generators commonly used at homes and shops, etc.

(iv) In Industry : Fuels such as coal, natural gas, diesel and furnace oil are used in the industry for generating steam in boilers. Steam is required in industry for heating purposes and also for generating electricity for their own use in factory. Industry in the rural areas also uses biomass such as bagasse—the cellulose material left after extracting juice from the sugarcane for running boilers.

(v) For Launching Space Vehicles : Space vehicles are launched with the help of rockets. Rockets use special fuels called propellants. A propellant is a combination of a fuel and an oxidizer.

COAL

III. INTRODUCTION :

Coal is a mineral of dark brown or black colour formed from the remains of plants buried in the earth's crust millions of years ago.

IV. COMPOSITION :

Coal is a very impure form of carbon. It mainly consists of atoms of carbon, hydrogen and oxygen. A small amount of sulphur is also present in it.

V. MINING

Coal is mined using two methods–opencast mining and underground mining. Opencast mining is used when the deposits of coal are near the surface of the earth. Underground mining is used when coal deposits lie deep inside the earth's crust.

VI. FORMATION

Coal is formed from vegatable matter burried under the earth. About 300 million years ago, the earth was covered with dense forests, marshlands and rivers. The forests grew and died and fell into the waters of the surrounding swamps. These plants were covered with tons of earth over a period of millions of years. Due to the huge pressure and temperature inside the earth, this vegetable matter got converted into coal. For this reason, coal is known as fossil fuel. It is also a non-renewable source of energy.

VII. TYPES OF COAL

Coal comes in four main varieties. The percentage of carbon in air-dried samples are as follows.

(i) Peat : This is a material in the first stage of coal formation. It contains only 27% carbon and is considered to be the lowest grade of coal.

(ii) Lignite : This variety of coal contains 28-30% carbon. It has poor heating power. It is brown in colour but lustrous when dry.

(iii) Bituminous : It is a soft coal containing 78-86% carbon. It gives a large proportion of gas when heated and burns with a yellow, luminous flame.

(iv) Anthracite : It is a hard coal and contains 94-98% carbon. It is lustrous. It burns without smoke and gives much heat and little ash.

Bituminous coal is by far the most useful as a fuel, but anthracite is considered to be the most superior in quality.

VIII. USES :

(i) Coal is used as a fuel to convert water into steam to run thermal power plants for the generation of electricity. It is also used as a fuel in homes and factories, and to run steam engines.

(ii) Coal is used in the preparation of fuel gases, such as coal gas.

(iii) Coal is used in the preparation of synthetic oil and synthetic natural gas.

(iv) Coal is also used to obtain natural gas. For this, finely ground coal is heated with hydrogen

X. OIL WELLS IN INDIA :

In India, oil was first struck at Makum in Assam in 1867. The oil fields of Assam were the only source of petroleum in our country until about 40 years ago. Some other places in our country where oil wells have been dug are

(i) Ankleshwar and Kalol in Gujarat,

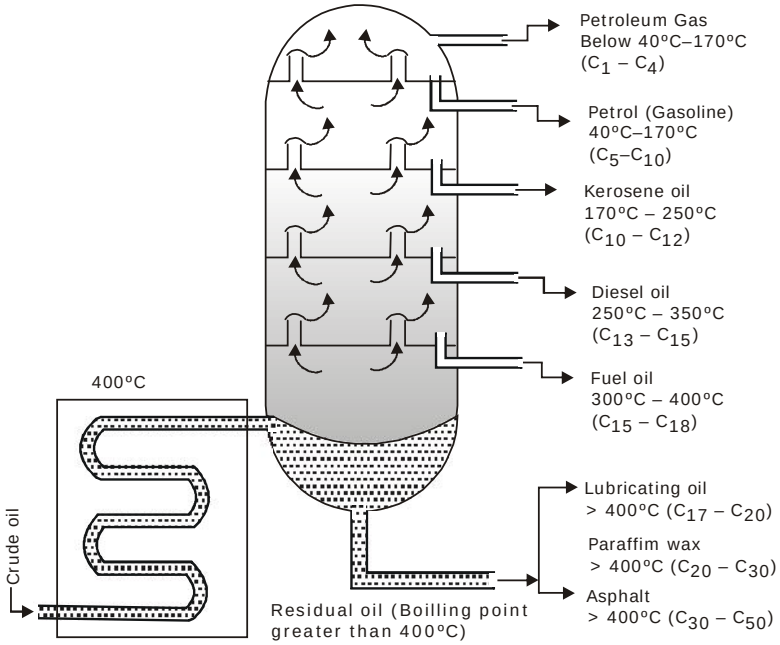
(ii) Offshore areas west of Mumbai, and

(iii) Offshore deltas of the Godavari and Kaveri rivers.

There are some government agencies engaged in exploring and producing crude oil-Oil and Natural Gas Commission (ONGC) and Oil India Limited (Oil). There are many refineries in India. The larger refineries are at Jamnagar, Mathura, Bharuch, Digboi, Haldia and Barauni.

Refining

The process of separating the various components of petroleum from one another is known as the refining of petroleum. This is done by a process called fractional distillation whih is based on the fact that the different components of petroleum have distinctly different boiling points.



XI. PRODUCTS OF PETROLEUM REFINING

(i) Asphalt : Asphalt is a black and sticky substance. It is used for making the surface of roads. It does not burn readily.

(ii) Paraffin Wax : It boils at above 673 K. It is obtained by the fractionation of residual oil. It is used for making candles, vaseline, grease, polishes, etc.

(iii) Lubricating Oil : It boils at well above 673 K. It is obtained by the fractionation of residual oil. It is used for lubricating machinery.

(vi) Feul Oil : The boiling range of fuel oil is 623 K to 673 K. It is used in industries to heat boilers and furnaces. It is a better fuel than coal because it burns completely leaving behind no ash, whereas coal burns producing a large amount of ash which has to be removed regularly.

(v) Diesel Oil : Its boiling range is 573 K to 623 K. It contains straight-chain alkanes with the number of carbon atoms varying from 20 to 25. It is used in cars, trucks, buses, and locomotives.

SOLVED EXAMPLES

Ex.1 What are the advantages of using CNG and LPG as fuels?

Sol. The advantages of using CNG and LPG as fuel are :

(i) A non-polluting fuel for vehicles. (ii) It is used for power generation.

(iii) It can be used directly for burning in homes and factories.

Ex.2 Name the petroleum product used for surfacing of roads :

Sol. A petroleum product 'Bitumen' is used for surfacing of roads.

Ex.3 Describe how coal is formed from dead vegetation. What is the process called?

Sol. About 300 million years ago the earth had dense forests in low lying wetland areas. Due to natural process, like flooding, these forests got buried under the soil. As more soil deposit over them, they were compressed. The temperature also rose as they sank deeper and deeper. Under high pressure and high temperature, dead plants got slowly converted to coal.

As coal contains mainly carbon, the slow process of conversion of dead vegetation into coal is called carbonisation.

Ex.4 Fill in the blanks :

(a) Fossil fuels are ....., ... and .....

(b) Process of separation of different constituents from petroleum is called .....

(c) Least polluting fuel for vehicle is .....

Sol. (a) Coal, petroleum, natural gas (b) Refining (c) CNG.

Ex.5 Tick True/False against the following statements :

(a) Fossil fuels can be made in the laboratory (b) CNG is more polluting fuel than petrol.

(c) Coke is almost pure form of carbon. (d) Coal tar is a mixture of various substances.

(e) Kerosene is not a fossil fuel.

Sol. (a) False (b) False (c) True (d) False (e) False

Ex.6 Describe characteristics and uses of coke :

Sol. It is a tough, porous and black substances. It is almost pure form of carbon. "Coke is obtained by heating soft coal in the absence or little supply of air".

It is used in the manufacture of steel and in the extraction of many metals.

Ex.7 Explain the process of formation of petroleum :

Sol. Petroleum occurs deep down in the earth between layers of non-porous rocks. Crude oil petroleum is formed by the decomposition of animal and plant remains over millions of years inside the earth. Natural gas occurs above the petroleum oil trapped under the rocks.

Ex.8 The following table shows the total power shortage in India from 1991-1997. Show the data in the form of a graph. Plot shortage percentage for the years on the Y-axis and the year on the X-axis:

S.No.	1	2	3	4	5	6	7
Year	1991	1992	1993	1994	1995	1996	1997
Shortage (%)	9.7	7.8	8.3	7.4	7.1	9.2	11.5

Sol.