

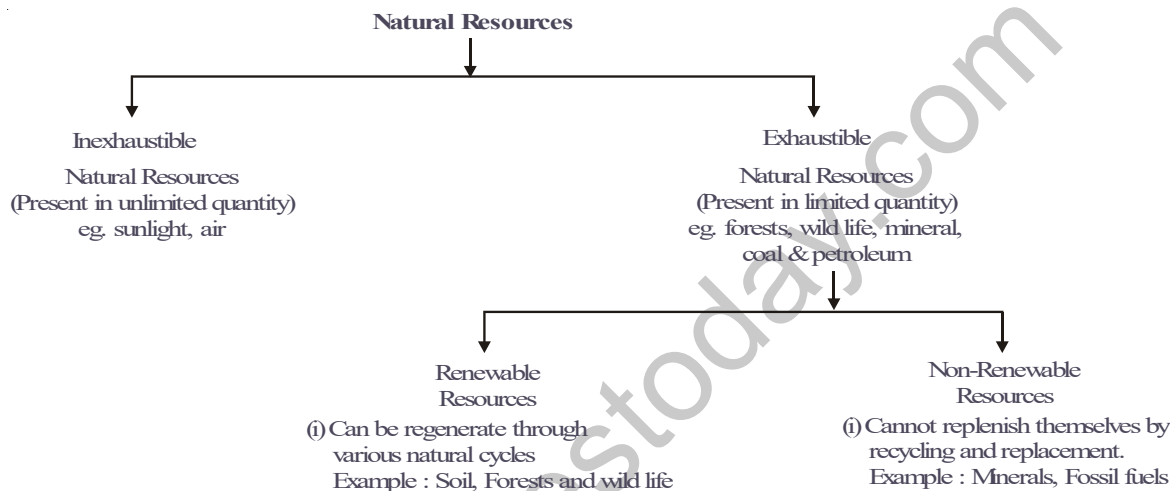
COAL & PETROLEUM

INTRODUCTION

We use various materials for our basic needs. Some of them are found in nature and some have been made by human efforts. The variety of substances that man gets from earth and nature to meet his basic needs are called natural resources.

Types of Natural Resources :

These are two types namely renewable and non-renewable.



Fossil fuels : Exhaustible natural resources like coal, petroleum or natural gas were formed from the dead remains of living organism (fossils). So, these are called fossil fuels. Coal and petroleum are very important natural resources and play a vital role in modern society. They are found in the earth's crust.

Coal : Coal is a complex mixture of carbon, hydrogen and oxygen compounds. Some nitrogen, sulphur and phosphorus compounds are also present in it. It is found in coal mines deep under the surface of earth.

Occurrence of coal : Russia, China, UK, Germany, Africa and Australia have rich deposits of coal. In India, big coal mines are found at Jharia and Bokaro in Jharkhand and Raniganj in West Bengal.

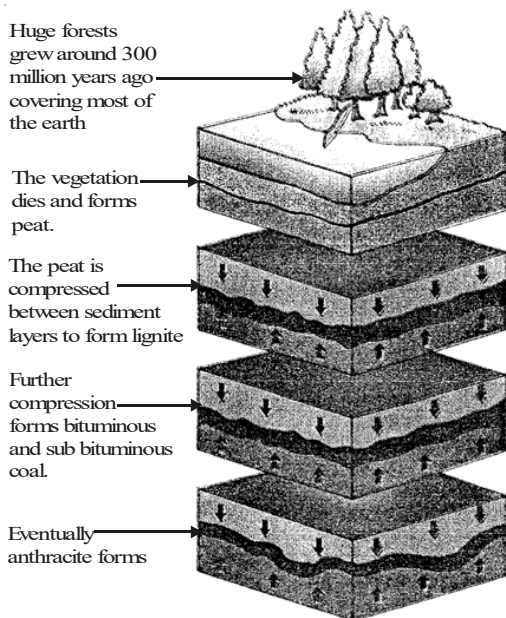
Types of coal :

The different varieties of coal with varying carbon content are given below in table

S.No.	Types of coal	Carbon content (%)
1.	Peat	28-30
2.	Lignite (soft coal)	30-50
3.	Bituminous (household coal)	50-70
4.	Anthracite (hard coal)	80-90

Formation : It is believed that millions of years ago, the ground below the forests was split open by natural forces such as earthquakes and volcanoes. The forests were buried in the chasms. Thus, the plants had no contact with oxygen. Successive layers of sediments sealed the buried plants. Over millions of years these deposits were subjected to tremendous pressure and heat which finally transformed them into coal.

Carbonisation : The chemical process involved in the transformation of plant matter into coal is called the carbonisation of plant matter.



Destructive distillation of coal : The process of heating coal in the absence of air is called the destructive distillation of coal. Coal contain a number of elements such as carbon, hydrogen, oxygen, nitrogen and sulphur. When coal is heated in the absence of air, a number of products are obtained.

The main products obtained by the destructive distillation of coal are as follows :

- (i) Coke (ii) Coal tar (iii) Ammoniacal liquor (iv) Coal gas

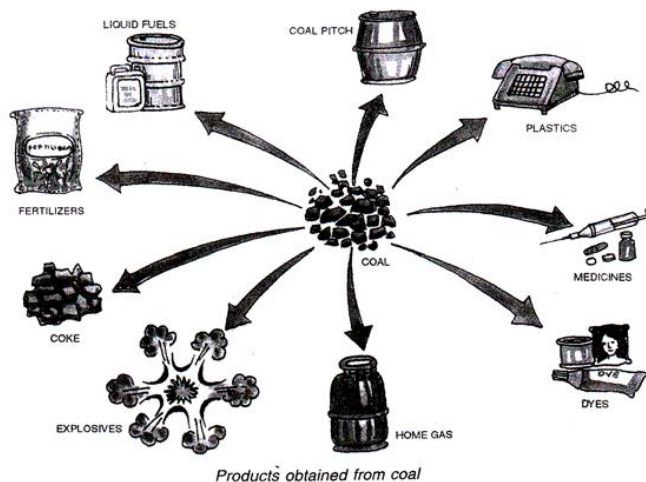
Coke : Coke contains 98% carbon. It is porous, tough black and the purest form of coal. Like charcoal, it is a good fuel and burns without smoke. But it is seldom employed as a fuel because it can be put to more valuable use. It is largely employed as a reducing agent in the extraction of metals from their ores, It is also used in making fuel gases like water gas and producer gas.

DO YOU KNOW?

Water gas is an equimolar mixture of carbon monoxide and hydrogen. ($\text{CO} + \text{H}_2$)

Producer gas is a mixture of carbon monoxide and nitrogen. ($\text{CO} + \text{N}_2$)

- (ii) **Coal tar :** Coal tar is a mixture of different carbon compounds. It is a thick, black liquid with unpleasant smell. The fractional distillation of coal tar gives many chemical substances which are used in the preparation of dyes, explosives, paints, synthetics fibres, drugs, and pesticides. Some of these chemical substances are benzene, toluene, phenol and aniline. Naphthalene balls used to repel moth and other insects are also obtained from coal tar. Bitumen is used in place of coal tar for metalling the roads.
- (iii) **Ammoniacal liquor :** The ammonia produced as a result of destructive distillation of coal is absorbed in water. The aqueous solution of ammonia, i.e. ammonium hydroxide solution, is called ammoniacal liquor. It is used in the preparation of fertilizers such as ammonium sulphate and ammonium superphosphate.
- (iv) **Coal gas :** Coal gas is mainly a mixture of hydrogen, methane and carbon monoxide. The gases present in coal gas are combustible, and hence it is an excellent fuel. It has high calorific value. It was used for lighting houses, factories and streets in Mumbai until 1950. It was also used for cooking until recently.



Coal gas was used for street lighting for the first time in London in 1810 and New York around 1820. Now it is used as a source of heat rather than light.

Uses of Coal

- It is used as a domestic and industrial fuel.
- It is used in the manufacturing of fuel gases like coal gas and water gas.
- It is used in the manufacturing of synthetic petrol.
- It is used to make coke which acts as a reducing agent in metallurgy.
- It is used as a source of organic compounds like benzene, toluene, phenol, aniline and anthracene.

Ques. Describe how coal is formed from dead vegetation. What is this process called ?

Ques. Explain why fossil fuels are exhaustible natural resources.

Ques. Describe characteristics and uses of coke.

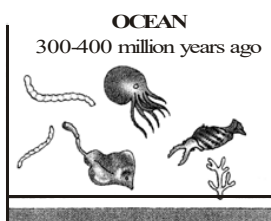
Ques. Name the petroleum product used for surfacing of roads.

Ques. Write the uses of coal tar.

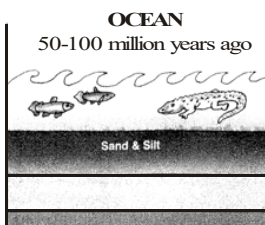
Petroleum : In the present day world, petroleum is the life line of modern civilization. In fact, the economy of a nation depends to a great extent on its petroleum wealth. That is why petroleum is called the **black gold**. It is dark coloured, viscous, strong smelling liquid. The name petroleum is derived from *petra* meaning rocks and *oleum* meaning oil. It is a natural product which is also obtained from oil wells. The crude oil (petroleum) is a complex mixture of solid, liquid and gaseous hydrocarbons mixed with water, salt and other particles. Thus, the crude petroleum oil is not a single chemical compound, but a mixture of compounds.

Origin of petroleum : It is fossil fuel formed in nature by the decomposition of animal and plant matter which were buried under the earth, millions of years ago.

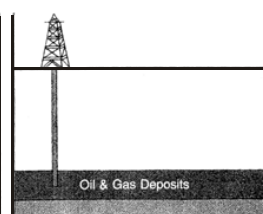
Petroleum and Natural Gas Formation



Tiny sea plants and animals died and were buried on the ocean floor. Over time, they were covered by layers of silt and sand

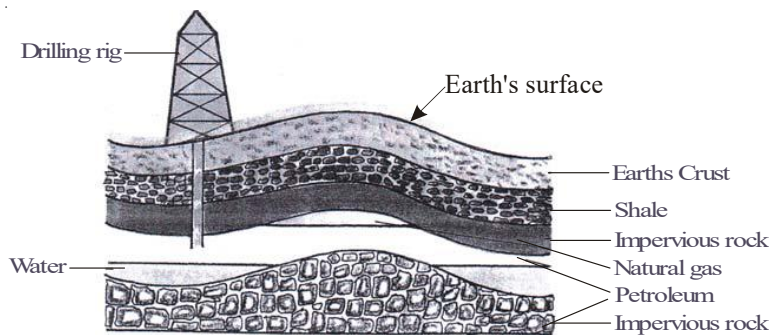


Over millions of years, the remains were buried deeper and deeper. The enormous heat and pressure turned them into oil and gas



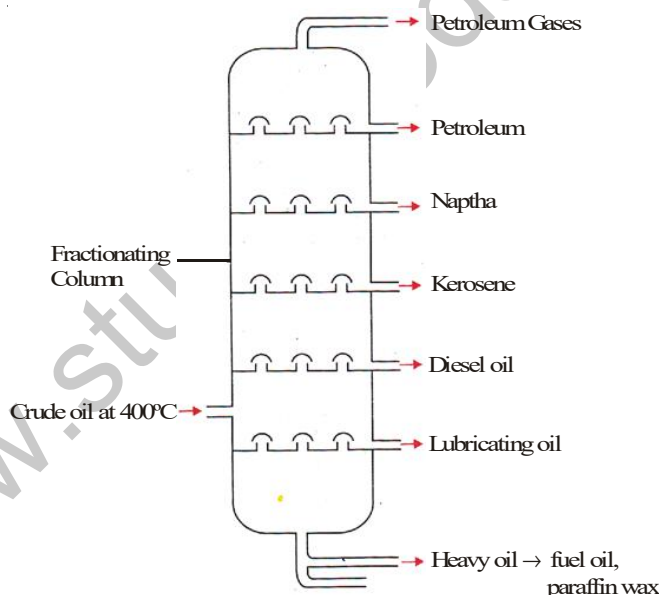
Today, we drill down through layers of sand, silt and rock to reach the rock formations that contain oil and gas deposits.

Occurrence of petroleum : Petroleum occurs deep down under the earth between layers of impervious rocks (non-porous rocks). Oil deposits are usually found mixed with water, salt and earth particles. Natural gas occurs above the petroleum oil, under the rock. This is shown in fig.



Occurrence of petroleum under the surface of the Earth

Refining : Petroleum is a mixture of several hydrocarbons. It is a foul-smelling brown black liquid. It also contains water, salt and rocky materials. It cannot be used in this crude form either as a fuel or as a basic material to produce other useful components. Before being put to use, it has to be purified or refined. 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 which is based on the fact that the different components of petroleum have distinctly different boiling points.



Fractional distillation of Petroleum

The first oil well was found in Pennsylvania in USA in 1859. In India, first oil well was found in 1867 in Maikam, Assam.

Petroleum Refining in India : There are about a dozen oil refineries in our country. The oil refineries in India are located at Mumbai, Chennai, Mathura, Barauni, Digboi, Guwahati, Haldia, Kochi, Kyyali and Vishakhapatnam. The oldest oil refinery in India is at Digboi in Assam which was established in 1901.

Most of the refining of petroleum and marketing of petroleum products are being done by a government organisation like Indian Oil Corporation Ltd. (IOC). Oil and Natural Gas Commission. (ONGC) is also engaged in exploring new sources of petroleum.

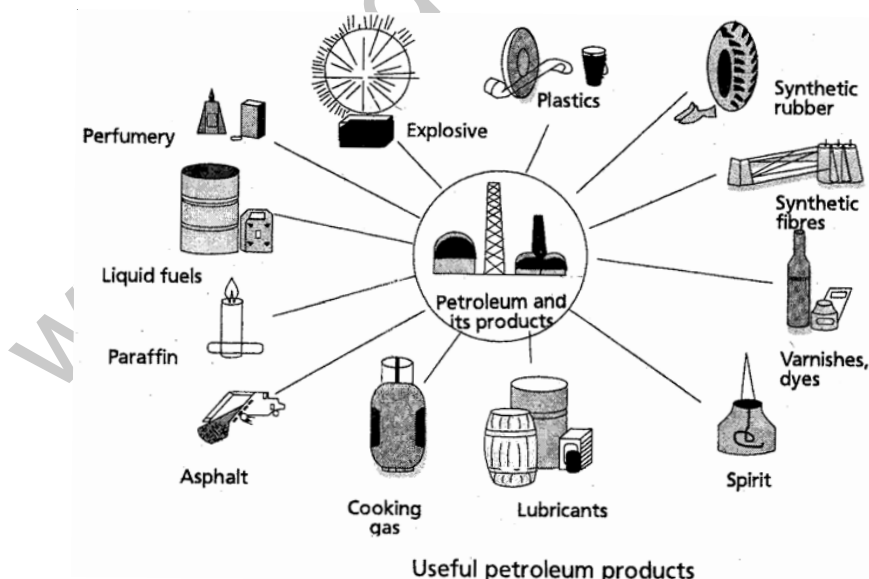
Petrochemicals : The chemicals which are prepared from the fractions of petroleum are called petrochemicals. Some of the important petrochemicals are methyl alcohol, ethyl alcohol, ethylene, benzene, toluene, acetone, D.D.T. and B.H.C.

Use of Petroleum :

- Petroleum products are used as fuels.
- Lubricating oils, and vaseline are used as lubricants.
- Paraffin wax, products of petroleum, is used for manufacturing candles, polishes, waxed paper, water proofing, etc.
- Some of the by-products of petroleum after purification are used in the preparation of medicines, ointments, face creams and cosmetics.

Fractions of Petroleum and their uses

S.N.	Fractions	Uses
1.	Gas	Gaseous fuel, production of carbon black
2.	Petroleum ether	Solvent, dry cleaning
3.	Gasoline	Motor fuel
4.	Kerosene	Fuel, illuminant
5.	Gas oil and diesel oil	Furnace fuel, fuel for diesel engines.
6.	Lubricating oils, grease, vaseline	Lubrication
7.	Paraffin wax	Candles, water proofing fabrics
8.	Pitch and tar	Artificial asphalt
9.	Petroleum coke	Fuel, Electrodes
10.	Bitumen	Paints, road surfacing



Useful petroleum products

Petroleum gas : It is a mixture of ethane, propane and butane. Its main constituent is butane which burns by giving off a lot of heat. Butane is easily liquefied under high pressure. In the liquid form it is supplied in cylinders and is commonly known as liquefied petroleum gas (LPG). It is a colourless, odourless and inflammable gas. A strong smelling substance called ethyl mercaptan (C_2H_5SH) is added to LPG to detect the leakage of gas from the cylinder. On being lighted it burns with blue flame. One gram of LPG produces about 50 kJ of heat.

Advantage of L.P.G.

- L.P.G. has a high calorific value, hence it is a good fuel.
- It burns with a smokeless flame, so it does not cause pollution.
- It does not produce any poisonous gas on burning
- It is very easy to handle and convenient to store.
- It is a very neat and clean domestic fuel.

Natural Gas :

Natural gas consists mainly of methane (about 85%), ethane (up to about 10%), propane (about 3%) and butane, Carbon dioxide, nitrogen, oxygen, hydrogen sulphide and sometimes helium may also be present.

Natural gas may be obtained from the earth's crust by digging well in prospective areas. There are some wells which give out only natural gas, but most wells produce natural gas as well as petroleum.

Natural gas is stored under high pressure as compressed natural gas (CNG). CNG is used for power generation. It is now being used as a fuel for transport vehicles because it is less polluting. It is a cleaner fuel. The great advantage of CNG is that it can be used directly for burning in homes and factories where it can be supplied through pipes. A network of pipelines exist in Vadodara (Gujarat). Some parts of Delhi and other places. Natural gas is an almost ideal fuel. It produces large amount of heat (calorific value 55 kJ/g) when burnt.

DO YOU KNOW?

In our country natural gas has been found in Tripura, Rajasthan, Maharastra and in the Krishna Godavri Delta.

Some natural resources are limited : Some natural resources are exhaustible like fossil fuels, forests, minerals etc.

We know that coal and petroleum are fossil fuels. It required the dead organisms millions of years to get converted into these fuels. Moreover, burning of these fuels is a major cause of air pollution. Their use is also linked to global warming. It is therefore necessary that we use these fuels only when absolutely necessary.

Conservation of fossil fuels : In India, the Petroleum Conservation Research Association (PCRA) has provided some tips to advise people how to save petrol /diesel. These tips are :

- Drive at a constant and moderate speed as far as possible.
- Switch off the engine at traffic light or at a place where you have to wait.
- Ensure correct tyre pressure
- Ensure regular maintenance of the vehicle

Ques. What are the advantage of using CNG and LPG as fuels ?

Ques. Explain the process of formation of petroleum.

Ques. Why is cooking gas better fuel than coal ?

Ques. Why cooking gas smells so bad ?

ALTERNATIVE ENERGY SOURCES

A large fraction of the worldwide consumption of fossil fuels is used for the production of electricity. In order to conserve fossil fuels, scientists, governments, industries and others are getting together to utilise other (renewable) energy sources for generating power.

Biomass energy : The energy derived from plants and animal excreta is referred to as biomass energy. Crop remains, sludge from sewage, municipal waste, cattle dung, and so on, can be turned into a gaseous fuel in a biogas plant. Inside the plant, bacteria act on the waste material to produce a gas, which is mostly methane. This gas is used directly as fuel or used to produce electricity. This source of energy is being used increasingly in rural India.

Hydroelectricity : The power generated by utilising the energy of flowing water is called hydroelectricity. About 25% of the power generated in our country comes from hydroelectric power stations.

Solar energy : Solar energy is used directly for cooking and heating in solar cookers and solar heaters. It can also be used to produce electricity with the help of solar cells and solar panels.

Wind energy : The energy of the wind is used to turn turbines in wind power plants. Europe accounts for 70% of the total wind generated power produced in the world.

Ocean energy : Ocean currents, waves and tides are being used to generate electricity in some European countries. We have not yet managed to tap this source **efficiently**.

Geothermal energy : Geysers are natural fountains of hot water and steam. They occur in places where groundwater heated by a bed of hot rocks finds its way out through cracks in the surface. The fountain of hot water and steam can be used to generate electricity. The USA, New Zealand and Iceland have put this source of energy to good use.

Alternative fuels : The term synthetic petrol is used to mean petrol made from sources other than crude oil, or petroleum. Petrol can be made from coal or natural gas through a complex chemical process. This is done in countries which are rich in coal or natural gas but do not have enough petroleum to meet the demand for petrol.

A lot of research has been done in recent years to produce vehicular fuel from vegetable matter and animal fat. Ethanol (alcohol) made from the decomposition of plants is being mixed with petrol in several parts of our country, for example. And special plantations of plants like mahua and Jatropha are being developed to produce biodiesel. Biodiesel is made from animal fat and vegetable oil.

SOME IMPORTANT POINTS FOR COMPETITIVE EXAMINATION

- » Hydrocarbons are organic compounds composed of carbon and hydrogen only.
- » Largest sources of all sorts of hydrocarbons are petroleum, natural gas and coal gas.
- » Methane (Alkane) is the simplest hydrocarbon.
- » Methane is the chief constituent of natural gas.
- » Methane is also known as 'Fire-damp' of coal mines, and 'marsh gas'.
- » Propane and Butane can be liquefied under pressure, hence are supplied in cylinder (LPG-Liquefied Petroleum Gas) for domestic use.
- » Petroleum and coal are fossil fuels.
- » Lignite is solid fossil coal which is formed from peat and contains 60 to 70% carbon, the newest of fossil coal.
- » Anthracite is the oldest form of fossil coal, having 95% carbon.
- » The main solid fuels are wood, charcoal and coal.
- » The main liquid fuels are kerosene, petrol and diesel.
- » The main gaseous fuels are natural gas, biogas and bottled gas (LPG).
- » The burning of fuel is an exothermic reaction.
- » Hydrocarbons containing upto 5 carbon atoms in their molecules are gaseous at ordinary temperature.
- » Biogas is produced by animal faeces and contains mainly methane.
- » Methane is produced in the intestine of ruminating animals and in termites.
- » Hydrocarbons with 6 or more carbon atoms in their molecules are liquid under normal conditions.
- » Methane gas is found in coal mines.
- » Combustion is a process of oxidation.
- » Very rapid combustion occurs in a explosion.
- » Charcoal is obtained by heating wood in the absence of air.
- » Coke is obtained by the destructive distillation of coal.
- » Bituminous coal is a solid fossil fuel of plant origin.
- » Paraffin wax is a hydrocarbon.
- » Unrefined form of petroleum is known as Crude oil.
- » Photosynthesis is a process in green plants with which food is manufactured from carbon dioxide and water in the presence of sunlight.
- » Distillation is the process of converting liquid into vapour and then changing again to liquid.

QUICK REVISION

Natural Resources : The resources, that are obtained from nature are called Natural resources, for example, air, water, soil and minerals.

Inexhaustible natural Resources : The resources, that are present in unlimited quantity in nature, and cannot be exhausted by human activities, for example, air, sunlight etc.

Exhaustible Natural Resources : The resources, that are present in limited quantity in nature, and can be exhausted by human activities, for example, coal, petroleum, minerals, forests etc.

Fossil : The remains of the part of plant or 'animal or' itself, preserved in the course of time, is called Fossil.

Fossil Fuels : Some exhaustible natural resources from dead remains of living organisms, are known as fossil fuels, for example, coal, petroleum and natural gas.

Coal : A fossil fuel, that forms by the decay of vegetation, which existed millions of years ago. It is a non-crystalline form of carbon.

Carbonisation : The slow process of conversion of dead vegetations into coal is called carbonisation.

Coke : It is an amorphous form of carbon, which is harder and denser than charcoal and is used as a fuel. It is obtained by heating soft coal in the absence or little supply of air. It is black in colour. It is used in the manufacture of steel.

Destructive Distillation : The process of heating coal in the absence of air is called destructive distillation.

Coal Tar : A black thick liquid, i.e., a mixture of about 200 substances and is used to get various materials of everyday life/industry, like ; drugs, dyes, plastics, perfumes, paints, naphthalene balls etc.

Coal Gas : It is a by-product, that is obtained during the processing of coal to form coke, and is used as a fuel.

Petroleum : A fossil fuel, that is obtained by the decomposition of dead animals and plants due to geological changes under the earth. It means oil from rocks. It is a dark oily liquid, i.e., insoluble in water.

Various constituents of petroleum and their uses are as follows :

S.No.	Constituents of petroleum	Uses
1	Petroleum Gas in Liquid form (LPG)	Fuel for home and industry
2	Petrol	Motor fuel, aviation fuel, solvent for dry cleaning
3	Kerosene	Fuel for stoves, lamps and for jet aircrafts.
4	Diesel	Fuel for heavy motor vehicles, electric generators.
5	Lubricating oil	Lubrication
6	Paraffin wax	Ointment, candles, vaseline etc.
7	Bitumen	Paints, road surfacing

Petroleum Refining : The process of separating the different constituents/fractions of petroleum is known as petroleum refining.

Natural Gas : A very important fossil fuel, that is stored under high pressure and is easy to transport through pipes and referred as CNG (compressed natural gas). It is a non-polluting fuel. It helps in the manufacture of a number of chemicals and fertilizers.

SUMMATIVE ASSESSMENTS

- Which of the following gases remains liquid at -88°C ?
(A) Ethane and methane (B) Ethane and propane (C) Propane and butane (D) Butane and ethane
- If 20 ml of Petroleum is heated upto 250°C and gases formed were allowed to pass through a column to cool down upto 130°C . The liquid collected should mainly be a mixture of
(A) Petrol and fuel oil (B) Petrol and ethanol (C) Kerosene and fuel oil (D) Kerosene and naphtha
- Hydrocarbons contain :
(A) Carbon and hydrogen (B) Carbon and oxygen
(C) Carbon and nitrogen (D) Carbon and carbon dioxide
- Natural gas mainly contains :
(A) Propane (B) Butane (C) Methane (D) Ethane
- In the laboratory, methane is prepared by heating a mixture of :
(A) Sodium acetate and sodium carbonate (B) Sodium acetate and soda lime
(C) Soda lime and sodium hydroxide (D) Soda lime and calcium oxide
- Which of the following is known as 'Fire damp' in coal mines?
(A) Ethanol (B) Carbon monoxide (C) Carbon dioxide (D) Methane
- Which of the following gases can be liquefied under pressure?
(A) Propane and Methane (B) Methane and Ethane (C) Butane and Propane (D) Butane and Methane
- Which of the following gases is supplied in LPG (Liquefied Petroleum Gas) cylinders for domestic use?
(A) Methane and Propane (B) Methane and Ethane (C) Ethane and Butane (D) Propane and Butane
- 55000 kilo joule/kg heat value is present in :
(A) Methane (B) Ethane (C) Propane (D) Butane
- How many carbon atoms are present in one molecule of liquid hydrocarbon?
(A) 5 (B) 4 (C) 3 (D) 6 or more
- Petroleum is refined by :
(A) Simple distillation (B) Fractional distillation (C) Destructive distillation (D) None of the these
- Power alcohol is :
(A) Alcohol mixed with petrol (B) Alcohol mixed with kerosene
(C) Alcohol mixed with sulphur (D) Alcohol mixed with ethane
- Water gas contains :
(A) Hydrogen and carbon dioxide (B) Hydrogen and nitrogen
(C) Hydrogen and carbon monoxide (D) None of these
- Producer gas contains
(A) Nitrogen and carbon monoxide (B) Hydrogen and nitrogen
(C) Nitrogen and carbon dioxide (D) Hydrogen and carbon dioxide
- Coal gas mainly contains :
(A) Hydrogen, methane and carbon dioxide (B) Hydrogen, methane and nitrogen
(C) Methane and nitrogen (D) Hydrogen, methane and carbon monoxide
- Naphtha is used in :
(A) Jet engine (B) Lubrication (C) Automobile engines (D) Petrochemicals
- The burning of kerosene in stove is called :
(A) Spontaneous combustion (B) Rapid combustion
(C) Slow combustion (D) None of these

18. Oldest form of fossil coal is :
(A) Lignite (B) Anthracite (C) Coke (D) Charcoal
19. Newest form of fossil coal is :
(A) Anthracite (B) Coke (C) Lignite (D) Charcoal
20. Fossil fuels are :
(A) Wood and coke (B) Wood and anthracite (C) Coal and petroleum (D) Charcoal and coaltar
21. The best fuel in terms of energy released per unit gram of the fuel is :
(A) Methane (B) Ethane (C) Propane (D) Butane
22. Biogas mainly contains :
(A) Producer gas (B) Coal gas (C) Water gas (D) Methane
23. Which hydrocarbon gas is produced in ruminating buffaloes and cows?
(A) Ethane (B) Methane (C) Carbon monoxide (D) Carbon dioxide
24. Which gas is found in coal mines?
(A) Ethane (B) Propane (C) Butane (D) Methane
25. The oldest oil refinery in India is located at :
(A) Mathura (B) Digboi (C) Haldia (D) Kochi
26. The process of separating useful fractions from petroleum is called :
(A) Refining (B) Distillation (C) Both (D) None of these
27. Which one is used for making shoe polishes?
(A) Paraffin wax (B) Petrol (C) Diesel (D) Lubricating oil
28. Which one is a house hold variety of coal?
(A) Peat (B) Bituminous (C) Lignite (D) Anthracite
29. Which one is an ideal fuel?
(A) Natural gas (B) Coal (C) Kerosene (D) Petrol
30. Anthracite is a
(A) Inferior type of coal (B) Superior type of coal (C) Cheapest form of coal (D) None of these
31. What percentage of energy requirement of our country is met by coal?
(A) 10 (B) 30 (C) 65 (D) 100
32. Biodiesel is made from :
(A) Waste paper (B) Cattle dung
(C) Animal fat and vegetable oils (D) Crop residue
33. The process of separating useful fractions from petroleum is called -
(A) Refining (B) Distillation (C) Destructive distillation (D) None of these
34. Coal gas is a mixture of -
(A) $\text{CO} + \text{H}_2$ (B) $\text{CO} + \text{N}_2$ (C) $\text{CH}_4 + \text{CO} + \text{H}_2$ (D) None of these
35. Which one is household variety of coal -
(A) Peat (B) Bituminous (C) Lignite (D) None of these
36. Ammoniacal liquor is -
(A) Ammonia absorbed in water (B) Ammonium hydroxide
(C) Aqueous solution of ammonia (D) All of the above
37. Which of the following products obtained by destructive distillation of coal is not properly matched -
(A) Coal tar- Dyes, explosives, paints (B) Coal gas-Fuel
(C) Coke-Drinking purposes (D) Ammoniacal liquor-Fertilizers
38. Which is the superior quality of coal -
(A) Anthracite (B) Peat (C) Lignite (D) Bituminous

39. Maximum carbon containing coal is -
 (A) Peat (B) Lignite (C) Bituminous (D) Anthracite
40. Which of the following names represents the foul smelling, black, thick, viscous liquid obtained from destructive distillation of coal -
 (A) Coke (B) Coal tar (C) Coal gas (D) None of these
41. Formation of coal from plant matter is called -
 (A) Destructive distillation (B) Carbonisation (C) Both (A) & (B) (D) None of these
42. Coal and petroleum are -
 (A) Inexhaustible resources (B) Fossil fuels (C) Renewable resources (D) All of these
43. Heating of coal in the absence of air is called -
 (A) Destructive distillation (B) Carbonisation (C) Both (A) & (B) (D) None of these
44. Producer gas is a mixture of -
 (A) CO and H₂ (B) CO and N₂ (C) CO and CO₂ (D) None of these
45. The distillation of crude petroleum to obtain various commercially useful fraction is called -
 (A) Compression (B) Refining (C) Mining (D) None of these
46. Which of the following is used for refining of petroleum -
 (A) Steam distillation (B) Distillation under reduced pressure
 (C) Solvent extraction (D) Fractional distillation
47. Which one of the following is not a petroleum product -
 (A) Kerosene (B) Gasoline (C) Asphalt (D) Bees wax
48. CNG stands for -
 (A) Conventional natural gas (B) Coal and natural gas
 (C) Compressed natural gas (D) Commercial natural gas
49. The main constituents of natural gas is -
 (A) Methane & Ethane (B) Ethane & Propane (C) Propane & Butane (D) Butane & Carbon di oxide
50. The substance added to detect the leakage of LPG is -
 (A) Methyl mercaptan (B) Ethyl mercaptan (C) Both (A) and (B) (D) None of these
51. Which of the following is used as a household fuel -
 (A) Gasoline (B) Paraffin wax (C) Kerosene (D) All of these
52. Which of the following is not true for natural gas -
 (A) It is generally found with petroleum deposits (B) It can be liquefied under pressure
 (C) It is a rich source of hydrogen (D) It has a low calorific value

OBJECTIVE						ANSWER KEY				EXERCISE					
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	C	C	A	C	B	D	C	D	A	D	B	A	C	A	D
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	D	A	B	C	C	A	D	D	D	B	A	A	B	A	B
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	C	C	A	C	B	D	C	A	D	B	B	B	A	B	B
Que.	46	47	48	49	50	51	52								
Ans.	D	D	C	A	B	C	D								

FILL IN THE BLANKS

1. Wood is converted into coal by the process of
2. is the best variety of coal.
3. Producer gas is a mixture of and
4. The slow process of conversion of dead vegetation into coal is called
5. The process of heating coal in the absence of air is called.
6. and are inexhaustible natural resources.
7. Minerals, forest wild life are natural resources.
8. CNG (natural gas) is fuel.
9. Process of separation of different constituents from petroleum is called.
10. Coke is used in the manufacture of
11. Fossil fuels are resources.
12. is used for running light vehicles.
13. is used for extraction of metals from their ores.
14. A marked rise in global standards of living is directly traceable to wide spread use of
15. Petroleum or crude oil pumped out from is not pure.
16. For the rural poor in developing countries is the primary source of energy.
17. The process by which the carbon content of coal increases is called
18. A worldwide increase in temperature is called. warming.
19. Petrol made from sources other than petroleum is called petrol.
20. is called black gold.
21. Wood is converted into coal by the process of
22. is the best variety of coal.
23. is used as domestic and industrial fuel.
24. The first oil well was dug in India at in the year.....

MARK 'T' IF THE STATEMENT IS TRUE AND 'F' IF IT IS FALSE

1. Natural gas mainly contain methane.
2. Water gas is a mixture of carbon dioxide and nitrogen
3. CNG is more polluting fuel than petrol.
4. Kerosene is not a fossil fuel
5. Coal tar is black thick liquid with unpleasant smell.
6. Petroleum is called black gold.
7. Coal tar is a mixture of various substances
8. Coke is almost pure form of carbon.
9. Excessive use of coal for energy improves the quality of air.
10. Coke and coal are two names for the same substance.
11. Coal is mainly used to produce electricity.
12. The petroleum pumped out from oil wells can be used as it is.
13. Natural gas mainly contains methane.
14. Anthracite has maximum carbon content.
15. Global warming leads to green house effect.
16. ONGC deals with exploration of petroleum in India.
17. Petroleum is a complex mixture of many organic compounds.

MATCH THE FOLLOWING

1. Match the substances given in column A with their uses given in column B.

Column-A

- (i) Methane
 (ii) $\text{CO} + \text{H}_2$
 (iii) $\text{CO} + \text{N}_2$
 (iv) $\text{CH}_4 + \text{CO} + \text{H}_2$
 (v) Butane

Column-B

- i. LPG
 ii. Coal gas
 iii. Natural gas
 iv. Water gas
 v. Producer gas

2. Match the following :

Column-A

- (i) Petroleum
 (ii) Candles, vaseline
 (iii) Liquid form of Gas
 (iv) Fuel for heavy motor vehicles,
 electric generator

Column-B

- i. Petrol and diesel
 ii. Paraffin wax
 iii. L.P.G.
 iv. Diesel

3. Match the following :

Column-A

- (i) Petrol
 (ii) Diesel
 (iii) Kerosene
 (iv) Paraffinwax
 (v) Bitumen

Column-B

- i. Road surfacing
 ii. Vaseline
 iii. Light vehicles
 iv. Heavy vehicles
 v. Fuels for lamps
 vi. Lubrication

VERY SHORT ANSWER TYPE QUESTIONS

- Name two fossil fuels.
- Name four varieties of coal
- Which process is used to separate the components of petroleum ?
- What is the source of natural gas ?
- Name the petroleum product used for surfacing of roads.
- What is the use of LPG?

SHORT ANSWER TYPE QUESTIONS

- How is petroleum formed in nature ?
- State two important uses of coal.
- Differentiate between inexhaustible and exhaustible natural resources.

4. Give the uses of the following
(i) coke (ii) coal tar (iii) coal gas
5. Write a short note on the formation of coal.
6. Give the uses of the following :
(i) Kerosene (ii) Lubricating oil (iii) Paraffin wax (iv) Diesel
7. Write two ways to conserve fossil fuels.
8. Why is petroleum called black gold ?
9. Comment on the uses of natural gas.

LONG ANSWER TYPE QUESTIONS

1. Describe the characteristics and uses of coke.
2. What is natural gas ? Write the use of natural gas.
3. What are the constituents and uses of petroleum ?
4. What is coal gas ? Describe the use of coal gas.

OBJECTIVE

ANSWER KEY

EXERCISE

Fill in the blanks

1. Carbonization 2. Anthracite 3. CO, N₂ 4. Carbonisation 5. Destructive distillation 6. Sun and Air
7. Exhaustible 8. Fossil fuel 9. Refining 10. Steel 11. Exhaustible 12. Petrol 13. Coal 14. Fossil Fuels
15. Oil well 16. Coal 17. Carbonisation 18. Global 19. Synthetic 20. Petroleum 21. Carbonisation
22. Anthracite 23. Coal 24. Makum assam, 1867

True/False

1. T 2. F 3. F 4. F 5. T 6. T 7. T 8. T 9. F 10. F 11. T 12. F 13. T 14. T 15. F 16. T 17. T

Match the column

1. (1) → (iii), (2) → (iv), (3) → (v), (4) → (ii), (5) → (i) 2. (1) → (i), (2) → (ii), (3) → (iii), (4) → (iv)
3. (1) → (iii), (2) → (iv), (3) → (v), (4) → (ii), (5) → (i)

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

Ans. 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.

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

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

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

Ans. 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.

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

Ans. i) Coal, petroleum, natural gas.

ii) Refining

iii) CNG.

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.

Ans. (a) False

(b) False

(c) True

(d) False

(e) False

6. Explain why fossil fuels are exhaustible natural resources :

Ans. Fossil fuels are limited in nature, and is used by human activities so called as exhaustible natural resources.

7. Describe characteristics and uses of coke :

Ans. 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.

8. Explain the process of formation of petroleum :

Ans. 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.

9. 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

Ans.

