

5

Coal and Petroleum

TOPICS COVERED

5.1 Natural Resources : Inexhaustible and Exhaustible Resources

5.2 Fossil Fuels : Coal

5.3 Petroleum, Natural gas and Natural Resources Limitations

IMPORTANT POINTS TO REMEMBER

- Resources which are found in nature are called **natural resources**. Examples: coal, petroleum, air, water, soil, etc.
- Resources which are available in huge quantity and cannot be finished by human activities are called **inexhaustible** natural resources, e.g. air, water, sunlight, etc.
- Resources which are available in limited quantity and can be finished by human activities are called **exhaustible** natural resources, e.g. coal, petroleum, minerals, etc.
- Coal and petroleum were formed from dead remains of plants and animals. Due to this, they are called **fossil fuels**.
- Dead remains of organisms which are more than 10,000 years old are called fossils.
- Coal is a fossil fuel. It is hard as stone and is black in colour. Coal was formed from plant remains which got buried in soil about 300 million years ago.
- The process of conversion of vegetation into coal is called **carbonization**.
- Coal burns in air to produce heat and carbon dioxide. Due to its ability to produce high heat, coal is used as fuel.
- Coal is processed to make useful products; like coke, coal tar and coal gas.
- Petroleum is a dark and thick liquid with unpleasant smell. It is taken out from oil wells. Petroleum was formed from organisms which got buried under sand and clay in sea, millions of years ago.
- In oil refinery, petroleum is subjected to fractional distillation. This separates various constituents of petroleum.
- **Natural gas** is found along with petroleum in oil wells. Natural gas is stored under high pressure and then it is called Compressed Natural Gas (CNG). CNG is used as a fuel in automobiles and factories.
- In our country, there is a network of pipelines which carries natural gas to many states. This is called **HVJ (Hazira – Vijaipur – Jagdishpur) Pipeline**. It starts from Gujarat (Hazira) and ends in Uttar Pradesh (Jagdishpur).
- Fossil fuels are exhaustible resources and cause environmental pollution.

5.1 NATURAL RESOURCES: INEXHAUSTIBLE AND EXHAUSTIBLE RESOURCES

Natural Resources: Resources which are obtained from nature are called natural resources.

Example: Air, water, soil, coal, petroleum.

Types of Natural Resources

Exhaustible Natural Resources: These resources are present in limited quantity in nature and are likely to be exhausted by human activities over a certain period of time.

Examples: Forests, wildlife, numericals, coal, petroleum, natural gas etc.

Inexhaustible Natural Resources: These resources are present in unlimited quantity in nature and are not likely to be exhausted by human activities.

Examples: Air, water, sunlight, soil, rainfall etc.

Exercise 5.1

I. Very Short Answer Type Questions (1 Mark)

1. Give one word for the following:

- (a) Resources which are obtained from nature. _____
- (b) An example of natural resource. _____
- (c) Natural resources present in limited quantity. _____
- (d) An example of exhaustible natural resource. _____
- (e) Natural resources present in unlimited quantity. _____
- (f) An example of inexhaustible natural resource. _____

2. Fill in the blanks:

- (a) Resources which are not likely to be exhausted by human activities are called _____ .
- (b) Resources which are likely to be exhausted by human activities are called _____ .
- (c) _____ is an exhaustible natural resource.
- (d) _____ is an inexhaustible natural resource.
- (e) Dead remains of sea animals get converted into _____ .

II. Short Answer Type Questions-1 (2 Marks)

- 3. Sunlight and air are inexhaustible natural resources. Explain.
- 4. Name any two exhaustible natural resources. Why are they called so?
- 5. What are exhaustible natural resources? Give examples.
- 6. What are inexhaustible natural resources? Give examples.

III. Short Answer Type Questions-2 (3 Marks)

- 7. Distinguish between exhaustible natural resources and inexhaustible natural resources.
 - 8. What are natural resources? Give examples.
 - 9. Why should we conserve exhaustible natural resources?
-

IV. Long Answer Type Questions (5 Marks)

10. Why is petrol an exhaustible natural resource while sunlight is not? Explain.
(NCERT Exemplar)
11. Imagine that all the exhaustible natural resources are exhausted by human activities. Do you think survival of living beings would be possible? If yes, why? If not, why not?
(NCERT Exemplar)

ANSWERS

1. (a) Natural Resources (b) Air
(c) Exhaustible Resources (d) Coal
(e) Inexhaustible Resources (f) Water
2. (a) Inexhaustible Resources
(b) Exhaustible Resources
(c) Petroleum (d) Air (e) Fossils
3. Because they are not likely to be exhausted by human activities. They are present in unlimited quantity.
4. Coal and petroleum, because they are likely to be exhausted by human activities. They are non-renewable.
5. Those resources which are present in limited quantity in nature and are likely to be exhausted by human activities over a certain period of time are called exhaustible natural resources. For example, coal and petroleum.
6. Those resources which are present in unlimited quantity in nature and are not likely to be exhausted by human activities are called inexhaustible natural resources. For example, Sun, water, air etc.

7.	Exhaustible	Inexhaustible
	(i) They are limited.	They are unlimited.
	(ii) They are likely to be exhausted.	They are not likely to be exhausted.
	(iii) They may be renewable or non-renewable.	They are non-renewable.
	(iv) Coal, Petroleum	Air, Water

8. Resources which are obtained from nature are called natural resources. For example, sun, wind, coal, petroleum, etc. Natural resources are broadly categorised into two categories: Exhaustible Resources, e.g. Fossil fuels (Coal and Petroleum) and Inexhaustible Resources, e.g. Air, Water.
9. We should conserve exhaustible natural resources due to the following two reasons:
- (i) *Limited availability*: They cannot be replenished by quick recycling and replacement within a reasonable time.
- (ii) *Air pollution*: The burning of fossil fuels produces gases like CO_2 , CO , SO_2 which causes air pollution.
10. Petrol is a constituent of petroleum which is present in limited quantity and is likely to get exhausted in future, while sunlight is an exhaustible natural resource. It is present in unlimited quantity and is not likely to get exhausted in near future since sunlight is the ultimate source of energy.
11. Survival of living beings would be possible since they are not essential for the survival of living beings. Yes, life would become primitive, but it will continue.

5.2 FOSSIL FUELS: COAL

Fossil Fuels: Fuels formed from the dead remain of living organisms (fossils) are called fossil fuels.

Examples: Coal and Petroleum

Coal: It is a fossil fuel. It is hard and black in colour.

It is found in deep coal mines under the surface of the earth in the form of coal beds.

Formation of coal: It is formed by the gradual decay and compression of remains of plants and trees in the absence of air. It contains mainly carbon.

Carbonized: The slow chemical process for the conversion of dead vegetation (remains of dead plants) into coal, under the influence of high temperature and pressure is called carbonisation.

Different forms of coal: Peat, lignite-coal, bituminous anthracite.

Products of coal: When coal is heated in the absence of air, the products formed are coke, coal tar, coal gas and ammonical liquor. This process is called destructive distillation of coal.

Uses of coal:

- It was used in railway engines to produce steam to run the engines.
- It is used as a fuel in many villages to cook food.
- It is used in thermal power plants to produce electricity.
- It is also used in industries to produce useful organic compounds like phenol, benzene etc.

Forms of Carbon and their Uses

Coke: It is a tough, porous and greyish-black substance. It is almost the purest form of carbon.

Uses: It is used as a raw material in iron and steel products. It is also used as a reducing agent in the extraction of metals.

Coal tar: It is a black viscous liquid with an unpleasant smell, which is obtained during destructive distillation of coal. It is a mixture of more than 200 different carbon compounds.

Uses: It is used as a starting material for manufacturing dyes, explosives, paints etc.

Coal gas: It is a byproduct of coal obtained during destructive distillation of coal.

Uses: It burns and produce heat due to which it is used as an excellent fuel in many industries located near coal processing units.

Ammonical liquor: It is a concentrated solution of ammonium compounds and sulphur obtained during destructive, distillation of coal.

Uses: It is used to manufacture nitrogen compounds and used as a fertiliser.

Exercise 5.2

I. Very Short Answer Type Questions (1 Mark)

1. Give one word for the following:

(a) An example of fossil fuel. _____

(b) The process by which coal is formed. _____

(c) Any product of coal. _____

(d) A variety of coal. _____

(e) A product of coal used as a reducing agent in the extraction of metals. _____

(f) A porous black substance obtained from coal. _____

2. Fill in the blanks:

(a) Coal is a _____ fuel.

(b) The slow process in which dead vegetative matter under high temperature and pressure gets converted into coal is called _____.

(c) When coal is heated in the absence of air, the process is called _____.

(d) The different varieties of coal are _____.

(e) _____ was used for street lighting in London.

II. Short Answer Type Questions-1 (2 Marks)

3. Give any two industrial uses of coke.

4. Give two uses of coal tar.

5. Define carbonisation.

6. Name the different varieties of coal. Which variety has the highest content of carbon?

7. What are fossil fuels? Give examples.

8. Why are coal and petroleum called fossil fuels?

III. Short Answer Type Questions-2 (3 Marks)

9. How is coal formed? Explain.

10. A student heated coal in a boiling tube fitted with a rubber cork.

(i) Name the process

(ii) Name the products formed

11. Name the four types of coal. Which type has the (a) highest and (b) lowest content of carbon?

12. Describe the characteristics and uses of coke.

(NCERT)

13. What are fossil fuels? Why are they called so?

IV. Long Answer Type Questions (5 Marks)

14. How is coal formed? Name and define the process which results in the formation of coal.

15. Name all the products formed, when coal is subjected to destructive distillation. Give one use of each of the product formed.

16. A substance 'A' is heated in the absence of air. The products formed are 'B', 'C', 'D' and 'E'. 'B' is used in the extraction of metals 'E' is a thick black liquid with an unpleasant smell. 'D' is used as a fuel in many industries. 'E' is converted into nitrogen compounds and used as fertiliser.

(i) Identify A, B, C, D, E.

(ii) Give one more use of 'B'.

(iii) 'C' is further processed to form new substances. Name the 'C' substances.

17. Coal reserves are said to be enough and last for only about another hundred more years. Do you think we need to worry in such a case? Why or why not?

(NCERT Exemplar)

18. What steps would you suggest for the judicious use of fossil fuels?

(NCERT Exemplar)

ANSWERS

- (a) Coal (b) Carbonisation
(c) Coke (d) Anthracite
(e) Coke (f) Coke
- (a) Fossil (b) carbonisation
(c) destructive distillation of coal
(d) peat, lignite, bituminous coal, anthracite
(e) Coal gas
- (i) It is a raw material for manufacturing iron and steel products.
(ii) It is also used as a reducing agent in the extraction of metals.
- It is used as a starting material for manufacturing dyes, explosives, paints etc.
- The slow chemical process of the conversion of dead vegetation (remains of dead plants) into coal, under the influence of high temperature and pressure, is called carbonisation.
- Peat – 50-60% carbon content
Lignite – 60% carbon content
Anthracite – 90-95% carbon content
Bituminous – 70% carbon content
- Fuels formed from the dead remains of living organisms (fossils) are called fossil fuels. For example, coal and petroleum.
- Because they are obtained from the dead remains of plants and animals (fossils) that got buried under the surface of the earth millions of years ago.
- Coal is formed by the gradual decay and compression of remains of plants and trees in the absence of air. It contains mainly carbon.
- (i) *Destructive distillation of coal.*
(ii) *Coke, Coal tar, Coal gas, Ammonical liquor*
- Peat – 50-60% carbon content (Lowest carbon content)
Lignite – 60% carbon content
Anthracite – 90-95% carbon content (Highest carbon content)
Bituminous – 70% carbon content
- Coke is tough, porous and greyish-black substance. It is almost the purest form of carbon.
- Fuels formed from the dead remains of living organisms (fossils) are called fossil fuels. For example, coal and petroleum. They are called so because they are likely to be exhausted by human activities. They are non-renewable.
- Coal is formed by the gradual decay and compression of remains of plants and trees in the absence of air. It contains mainly carbon.
This slow chemical process of the conversion of dead vegetation (remains of dead plants) into coal, under the influence of high temperature and pressure, is called carbonisation.
- When coal is heated in the absence of air, i.e. in destructive distillation the products formed are coke, coal tar, coal gas and ammonical liquor.
(i) Use of coke: It is a raw material for manufacturing iron and steel products.
(ii) Use of coal tar: It is used as a starting material for manufacturing dyes, explosives, paints etc.
(iii) Use of coal gas: It burns and produce heat due to which it is an excellent fuel in industries located near coal fields.
(iv) Use of ammonical liquor: It is used to manufacture nitrogen compounds which are used as fertilisers.
- (i) A – Coal
B – Coke
C – Coal tar
D – Coal gas
E – Ammonical liquor
(ii) B – Coke is used in industrial processes, and as household fuel.
(iii) Coal tar is subjected to fractional distillation to form benzene, toluene, phenol as a by-product.
- It took millions of years for the conversion of dead organisms into fossil fuels. They cannot be replenished by quick recycling and replacement within a reasonable time. So if coal is used at their present rate of consumption, the

known reserves of these fossil fuels will last only a few hundred years causing energy crisis.

18. (i) Use light only when required.

(ii) Use solar cooker, solar water heater, which uses renewable source of energy – Sun.

(iii) Fuel efficient engines (vehicles) must be used and engines must be properly maintained.

(iv) Regular maintenance of gas pipes, oil pipes.

(v) Use CFL's which consume less energy. Judicious use of energy has two main advantages.

(vi) It helps in developing technologies to meet the energy requirement of the growing population.

(vii) It gives our scientists and engineers more time to develop highly efficient alternate sources of energy.

5.3 PETROLEUM, NATURAL GAS AND NATURAL RESOURCES LIMITATIONS

Petroleum: Petroleum is a fossil fuel. It is a dark coloured oily liquid. It has an unpleasant smell. In Greek language, 'petro' means rocks and oleum means 'oil'. So petroleum means 'oil from rocks'.

Formation of Petroleum: It is believed that millions of years ago, the plants and animals which lived in the sea died. Their dead bodies sank to the bottom of sea and were soon covered with clay and sand. Over million of years under high temperature and pressure and in the absence of air, they slowly get converted into petroleum.

Refining of Petroleum: The process of separating various constituents of useful fractions of petroleum is known as refining of petroleum.

The useful components are petroleum gas, petrol, kerosene, diesel, lubricating oil, fuel coil, paraffin wax etc. It is done in a fractionating tower in oil refineries.

Petrochemicals: Many useful substances which are obtained from petroleum and natural gas are called petrochemicals. These petrochemicals are used in the manufacture of synthetic fibres, rubber, plastics, perfumes, dyes, drugs etc. Due to its great commercial importance, petroleum is called 'black gold'.

Natural Gas: It is an important fossil fuel, which occurs deep inside the earth. It is a mixture of hydrocarbons like methane, butane and propane, which is also present in small proportion.

Compressed Natural Gas (CNG): Natural gas is stored under high pressure as compressed natural gas.

Uses of CNG

- It is used for power generation.
- It is used as a fuel for transport, in vehicles because it is less polluting.
- It is used as a fuel in homes through a network of pipelines.
- It is also used as a raw material for the manufacture of a number of chemicals and fertilisers.

Natural Resources Limitations (Fossil Fuels)

(i) Limited availability

(ii) Causes air pollution

Care and Reservation of Existing Natural Resources

- Use light only when required.
-

- Use solar cooker, solar water heater, which use renewable source of energy Sun.
- Fuel efficient engines (vehicles) must be used and engines must be properly maintained.
- Regular maintenance of gas pipes, oil pipes.
- Use CFL's which consume less energy.

Two main advantages of judicious use of energy

- It helps in developing technologies to meet the energy requirements of the growing population.
- It gives our scientists and engineers more time to develop more efficient alternate sources of energy.

Petroleum Conservation Research Association (PCRA)

It advises people how to save petrol/diesel while driving. Their main tips are:

- Drive at a constant 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.

Exercise 5.3

I. Very Short Answer Type Questions (1 Mark)

1. Give one word for the following:

(a) A dark oily liquid with an unpleasant smell formed by the dead remain of sea animals and marine plants. _____

(b) It is also called black gold. _____

(c) A constituent of petroleum which is used in making roads. _____

(d) Fuel for heavy motor vehicles. _____

(e) Main component of natural gas. _____

(f) Full form of CNG. _____

(g) Another name for petroleum. _____

2. Fill in the blanks:

(a) The process of separating the various constituents of petroleum is known as _____ .

(b) The fuel used by light vehicles is _____ .

(c) A liquified gas used as household fuel _____.

(d) In an oil well, _____ gas is always collected above petroleum.

(e) _____ is used for lubricating machinery.

(f) Refining of petroleum is carried out in a _____ in oil refineries.

(g) A substance made of petrochemicals is _____.

II. Short Answer Type Questions-1 (2 Marks)

3. What is the full form of LPG? State two uses of LPG.

4. State two ways of conserving fuels used in automobiles.

5. What are petrochemicals? Give two examples.

6. State any two constituents of petroleum and give their uses.
7. Why is crude oil extracted from the earth called 'petroleum'?
8. Name the process by which crude oil is refined. Explain it.

III. Short Answer Type Questions-2 (3 Marks)

9. State two uses of (i) Asphalt, (ii) paraffin wax.
10. How is petroleum formed in nature?
11. What is liquefied petroleum gas? State its uses.
12. Why is petroleum called 'black gold'?
13. While driving, what are the tips we must follow to save petrol/diesel/natural gas.
14. How is CNG regarded as an ecofriendly fuel? Give reasons.

IV. Long Answer Type Questions (5 Marks)

15. How do fossil fuels cause air pollution?
16. Why is CNG considered a very important fuel. Give reasons.
17. What steps would you suggest for the judicious use of fossil fuels.
18. Write some important uses of various constituents of petroleum.
19. How is petroleum mined? What is the purpose of refining of petroleum?
Name four important products obtained during the refining of petroleum.
20. We read in newspapers that burning of fuels is a major cause of global warning. Explain why? *(NCERT Exemplar)*
21. Explain the process of formation of petroleum.

ANSWERS

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> 1. (a) Petroleum (b) Petroleum
(c) Bitumen (d) Diesel
(e) Methane
(f) Compressed Natural Gas
(g) Crude oil 2. (a) refining (b) petrol
(c) Liquefied Petroleum Gas
(d) natural gas (e) Lubricating oil
(f) fractionating tower
(g) Vaseline 3. Liquefied Petroleum Gas
<i>Uses: (i) It is used as a gas.
(ii) It is used in the manufacture of petrol by polymerisation.</i> 4. (i) Drive at a constant speed as far as possible.
(ii) Switch off the engine at traffic light or at a place where you have to wait. 5. The useful products obtained from petroleum are termed as petrochemicals. These petrochemical are used in the manufacture of detergents, artificial fibres, plastics, dyes etc. | <ol style="list-style-type: none"> 6. <i>Petrol or Gasoline: (i) Used as a fuel for cars, scooters.
(ii) Used as a solvent for dry cleaning.
Kerosene: (i) Used as a fuel in wick stoves to cook food, and lamps for lighting purposes.
(ii) Used as an aviation fuel in jet aeroplanes.</i> 7. Crude oil is a dark-coloured, viscous and foul-smelling liquid which is always formed and trapped between the impervious rocks (non-porous rocks). Its name is derived from the latin word 'petro' meaning rock and 'oleum' meaning oil. Thus, petroleum literally means rock oil. 8. The process of separating various useful constituents or fractions of petroleum is known as refining of petroleum. The useful components are petroleum, gas, petrol, kerosene, diesel, lubricating oil, fuel oil, paraffin wax etc. It is done in a fractionating tower in oil refineries. |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
-

9. *Asphalt*: (i) It is used for making roads.
(ii) It is used for damp proofing foundation of buildings.

Paraffin wax: (i) It is used for making vaseline, ointments.

(ii) It is used for making candles.

10. It is believed that millions of years ago, the plants and animals which lived in the sea died. Their dead bodies sank to the bottom of sea and were soon covered with clay and sand. Over million of years under high temperature and pressure and in the absence of air, they slowly got converted into petroleum.

11. Liquefied Petroleum Gas is a household gas.

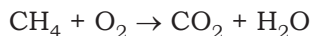
Uses: (i) It is used as a gas, (ii) It is used in the manufacture of petrol by polymerisation.

12. The useful products obtained from petroleum are named as petrochemicals. These petrochemicals are used in the manufacture of detergents, artificial fibres, plaster, dyes etc. Due to its great commercial importance, it is termed as 'black gold'.

13. The ways to save petrol/diesel/fuels while driving are:

- (i) Switch off the engine at traffic light or at a place where you have to wait.
(ii) Ensures regular maintenance of the vehicles.

14. CNG is regarded as an eco-friendly fuel, because on burning the end products are carbon dioxide and water vapour which causes less pollution:



- (i) It is considered to be a clean fuel.
(ii) It is easily transportable.

15. The burning of fossil fuels (i.e. coal and petroleum) in the vehicles, industries, etc. releases harmful gases like CO_2 , SO_2 , CO, oxides of nitrogen and smoke, which leads to respiratory diseases and also indulge in making the air less potable for breathing. Thus, in this why fossil fuels causes respiratory diseases.

16. CNG is considered an important fuel since it:

(i) It does not causes log of pollution.

(ii) It is readily available.

(iii) It is less expensive.

(iv) It is easily transportable.

(v) It can directly used as fuel by transporting it through pipes at homes, factories and in vehicles.

17. The steps suggested for judicious use of fossil fuels are:

(i) Use eco-friendly fuels like CNG in vehicles rather than petrol.


(ii) Form car pools, so that four-five people going to the same place, may not use cars individually. It helps in saving petroleum to a great extent.

(iii) Utilising alternate sources of energy like sun, wind and water, rather than thermal power plants for the generation of electricity.








(iv) Regular maintenance of vehicles driven by petrol.

(v) Switching off the engine at red-light or at places, where we are waiting.

18.

S. No.	Constituents of petroleum		Boiling point	Number of carbon atoms	Uses
1.	Petroleum gas in liquid form is called Liquefied Petroleum Gas (LPG)		Below 40°C	2-4	Fuel for homes as LPG and for industries.

(Contd.)

S. No.	Constituents of petroleum		Boiling point	Number of carbon atoms	Uses
2.	Gasoline or petrol		40°C–170°C	5–9	Used as a fuel for cars, scooters and motor cycles; as a solvent for dry cleaning clothes and in the preparation of petrol gas in the laboratory.
3.	Kerosene		170°C–250°C	10–12	Used as a fuel in wick stoves to cook food and petromax lamps for lighting purposes. A special grade of kerosene oil is used as 'aviation fuel' in jet aeroplanes.
4.	Diesel		250°C–350°C	13–15	Used as a fuel for heavy vehicles like buses, trucks, tractors, railway engines and ships; to run water pumps required for irrigation in fields and to produce electricity on a small scale.
5.	Fuel oil		350°C–400°C	15–17	Used as an industrial fuel for furnaces and boilers.
6.	Lubricating oil		–	17–20	Used for lubricating machinery.
7.	Paraffin wax		Above 400°C	20–30	Paraffin wax is used for making candles, cosmetics such as face creams, vaseline, ointments, wax paper, toilet goods and grease.
8.	Bitumen		–	30–60	Used for making road surfaces, paints, damp proof foundation of buildings, in coating of underside of the electric poles to prevent them from rusting.

19. The prospective site of petroleum is located and mapped by geographic, geological and seismic methods with the help of giant rigs, a hole is drilled in the Earth's crust. When the hole reaches the rock cap, natural gas comes out with a great pressure. When the gas pressure subsidies, petroleum starts flowing out and is pumped out by electric motors.

The petroleum is refined by subjecting the crude oil to fractional distillation. It is heated to a temperature of 400°C or slightly above in a furnace and the vapours are fed into a tall fractionating column near its bottom. As the vapours rise, they lose heat and their temperature drops. Thus, a fractionating column maintains itself at different temperatures which decreases to the top. Due to the difference in temperature, the vapours with higher boiling point condenses first, while the vapours with the lower boiling point, rises up and condenses in different parts of fractionating column. The vapours which do not liquefy are taken out from the top of the fractionating column. Some of the important constituents of petroleum are:

Residual oil	400°C
Fuel oil	350–400°C
Diesel oil	250–350°C
Kerosene oil	170–250°C
Gasoline	40–170°C

Petroleum gas does not condense and is taken out from the top of the fractionating column.

- Burning of fuel leads to emission of polluting gas like SO₂, CO₂, oxides of nitrogen which increases the temperature of the earth and thus leads to global warning.
- It is believed that millions of years ago, the plants and animals which lived in the sea died. Their dead bodies sank to the bottom of sea and were soon covered with clay and sand. Over million of years under high temperature and pressure and in the absence of air, they slowly got converted into petroleum. It is believed that millions of years ago, the plants and animals which lived in the sea died. Their dead bodies sank to the bottom of sea and were soon covered with clay and sand. Over million of years under high temperature and pressure and in the absence of air, they slowly got converted into petroleum.

Did You Know?

Forms of Coal

- PEAT is the youngest variety of coal and is light brown in colour. It contains 50% to 60% of carbon and burns with a sooty flame.
- Lignite*: It contains 60% of carbon.
- Bituminous*: It contains 70% to 80% of carbon.
- Antracite*: It is the oldest variety of coal which contains 90 to 95% of carbon.
- The world's first oil well was drilled in Pennsylvania USA in 1859. In India, oil is found in Assam, Gujarat, Mumbai high and in river basin of Godavari and Krishna.
- Scientist at New Mexico have succeeded in producing fuels such as petrol and methanol using sunlight and carbondioxide.

HOTS & VALUE BASED QUESTIONS

- What do you mean by 'destructive distillation of coal'? Name the products formed during this process. **(HOTS)**
- We say fossil fuels will last only for a few hundred years comment. **(HOTS)**
- Aman and Ajay were playing together in a park. Aman stated that petroleum is inexhaustible natural resource and renewable while Ajay explained that petroleum is exhaustible natural resources and is non-renewable.

- (i) Who do you think is correct and why?
 (ii) What values are possessed by Ajay? **(VBQ)**
4. Ritika goes with her father to a car showroom. Her father is confused whether to buy a CNG model or a petrol model.
 (i) What would you suggest him and why?
 (ii) What do we learn on opting a CNG model. **(VBQ)**
5. Vihaan went to visit an oil refining with his father. He saw a fractionating tower where refining of petroleum takes place.
 (i) At what fractions and how the different constituents of petroleum are separated?
 (ii) What values are possessed by Vihaan? **(VBQ)**

ANSWERS

1. When coal is heated in the absence of air, it is called destructive distillation of coal.
 The products formed are: coke, coal gas, coal tar, ammoniacal liquor.
2. Yes we need to be cautious about these exhaustible natural.
 These cannot be replenished by quick recycling and replacement within a reasonable time.
3. (i) Ajay is right, since petroleum is present in limited quantity and is likely to get exhausted. It is non-renewable as it cannot be recycled or replaced within a reasonable period of time. It takes millions of years for dead sea animals to get converted into petroleum.
 (ii) Ajay has a scientific bent of mind, critical thinking and scientific awareness.
4. (i) Ritika's father should buy a CNG model due to the following reasons:
 - It does not cause a lot of pollution.
 - It is readily available.
 - It is less expensive.
 - It is easily transportable.
 (ii) Scientific awareness, logical reasoning.
5. (i) The prospective site of petroleum is located and mapped by geographic, geological and seismic methods with the help of giant rigs, a hole is drilled in the Earth's crust. When the hole reaches the rock cap, natural gas comes out with great pressure. When the gas pressure subsides, petroleum starts flowing out and is pumped out by electric motors. The petroleum is refined by subjecting the crude oil to fractional distillation. It is heated to a temperature of 400°C or slightly above in a furnace and the vapours are fed into a tall fractionating column near its bottom. As the vapours rise, they lose heat and their temperature drops. Thus, a fractionating column maintains itself at different temperatures which decrease. Due to the difference in temp, the vapours with higher boiling point condense first, while the vapours with the lower boiling point, rise up and condense in different parts of fractionating column. The vapours which do not liquify are taken out from the top of fractionating column. Some of the important constituents of petroleum are:

Residual oil	400°C
Fuel oil	350–400°C
Diesel oil	250–350°C
Kerosene oil	170–250°C
Gasoline	40–170°C

 Petroleum Gas does not condense and is taken out from the top of the fractionating column.
 (ii) Scientific awareness, logical and analytical reasoning.