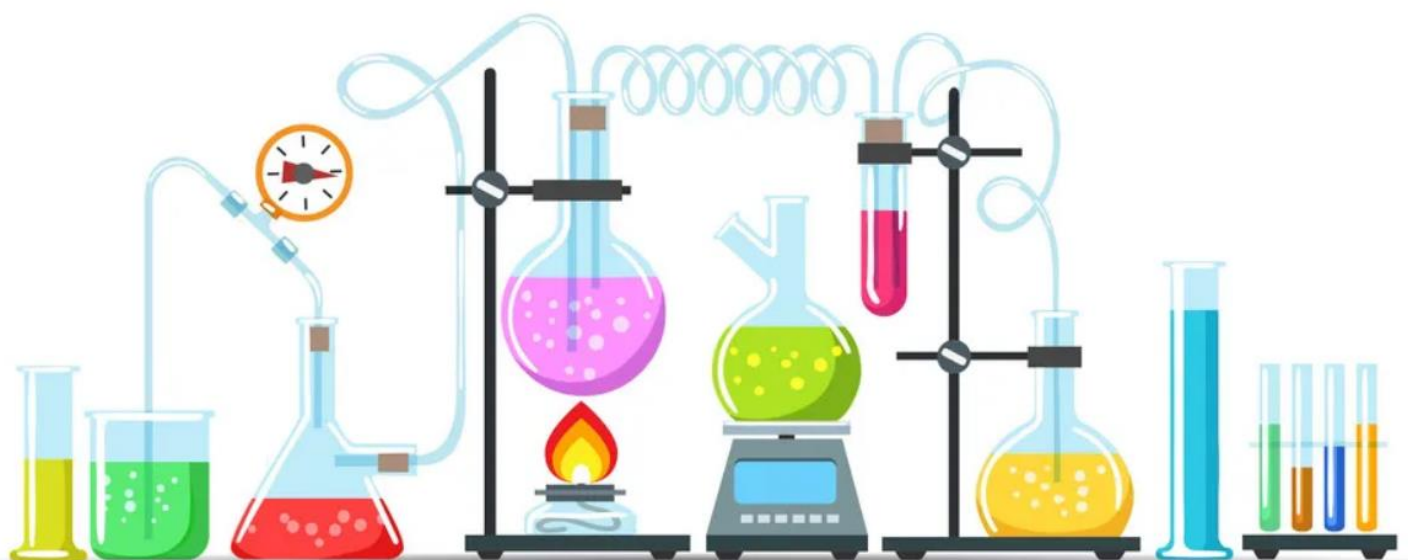


SCIENCE

Chapter 5: Coal and Petroleum



Coal and Petroleum

Classification of Natural Resources

Natural resources can be classified into two types:

- **Inexhaustible Natural Resources:** The 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: Sunlight, air
- **Exhaustible Natural Resources:** The resources which are present in a limited quantity in nature and can be exhausted by human activities are called exhaustible natural resources. Examples: Forests, wildlife, minerals, coal, petroleum

Fossil fuels: The natural fuels formed from the remains of living organisms buried under the Earth long, long ago are called fossil fuels.

Difference between exhaustible and inexhaustible resources

Exhaustible Natural Resources	Inexhaustible Natural Resources
Available in limited quantity in nature	These are abundant in nature
Formed over a large period of time.	These are formed almost everyday
They can not be used over and over again. They do not last forever	They can be used over and over again. They last forever.
Example:- Coal, petroleum, natural gas etc.	Example:- Sunlight, wind, water etc.

Resources:

Various materials which are used to fulfill or accomplish needs of a human. In other words, we can say that

A 'resource' is anything in the environment that can be used.

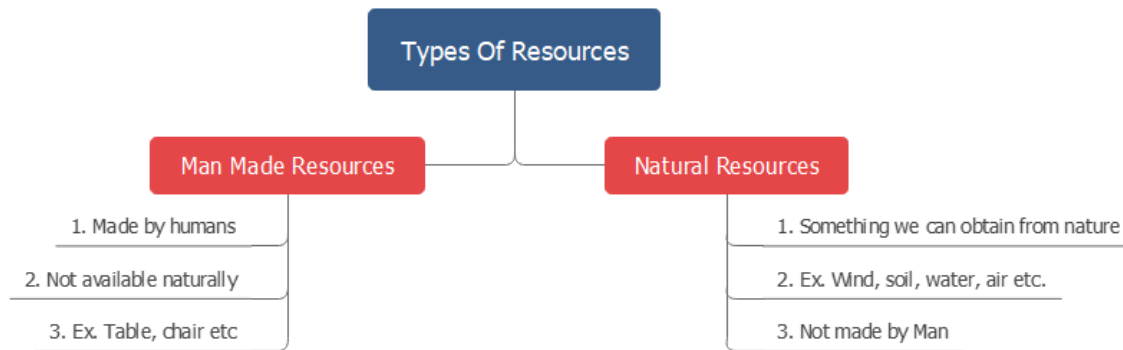
Resources can be broadly divided into following two categories

Natural Resources

- Natural gas which can be obtained naturally.
- Some of the examples of natural resources includes Air, Soil, Water, Sunlight, Coal etc.

Man-made Resources

- These are the resources which are made by man.
- Some of its examples includes Table, Chair, Car, Bus, Plastic etc.



Coal

- Coal is a hard, black, combustible mineral which consists mainly of carbon.
- It is found in deep coal mines under the surface of the Earth.



Coal An Exhaustible Resource

Formation of Coal

- Coal was formed by the decomposition of large land plants and trees buried under the Earth about 300 million years ago.
- About 300 million years ago, the Earth had dense forests in the low-lying wet areas.
- Due to natural calamities such as earthquakes, volcanoes and floods, these forests were buried under the surface of the Earth.
- As more soil got deposited on them, they were compressed.

- As a result, the temperature also rose as they sank deeper and deeper.
- Due to high pressure and temperature and the absence of air, the wood of the buried forest plants and trees slowly got converted into coal.
- The slow process by which the dead plants buried under the Earth have become coal is called carbonisation.
- Because coal was formed from the remains of the plants, it is called a fossil fuel.
- On heating, coal, which is mainly carbon, produces carbon dioxide gas and a lot of heat energy. $C + O_2 \rightarrow CO_2 + \text{Heat}$



Uses of Coal

- As a fuel in homes and industries.
- As a fuel in thermal power plants to generate electricity.
- Earlier, it was used in railway engines to produce steam to run the engine.

Products of Coal

The coal obtained is processed in the industry to obtain useful products such as coke, coal tar and coal gas.

Coke

- It is a tough, porous and black substance.
- It is an almost pure form of carbon.
- It is used in the manufacture of steel and in the extraction of metals.

Coal Tar

- It is a black liquid with an unpleasant smell.
- It is a mixture of approximately 200 substances.
- The products of coal are used to make synthetic fibres, drugs, plastics, synthetic dyes,

perfumes, paints, varnishes, pesticides, photographic materials and roofing materials.

- Bitumen, a petroleum product, is used in place of coal tar for metalling roads.

Coal Gas

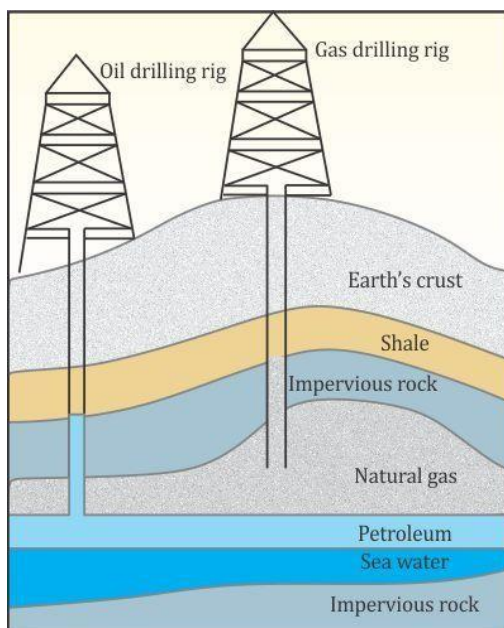
- Coal gas is obtained during the processing of coal to get coke.
- It is used as a fuel in many industries situated near coal processing plants.

Petroleum

- It is a dark-coloured, thick crude oil found deep below the ground in certain areas.
- Petroleum means rock oil (petra = rock, oleum = oil).
- Just like coal, petroleum is also a fossil fuel.

Formation of Petroleum

- Petroleum was formed from organisms living in the sea.
- As these organisms died, their bodies settled at the bottom of the sea and got covered with layers of sand and clay.
- Due to high pressure, heat, action of bacteria and the absence of air, the dead remains of the tiny plants and animals were slowly converted into petroleum.
- The petroleum thus formed got trapped between two layers of impervious rocks, forming an oil deposit.



Refining of Petroleum

- Petroleum is a mixture of various constituents such as petroleum gas, petrol, diesel, lubricating oil and paraffin wax.

- The process of separating the various constituents/fractions of petroleum is known as refining.
- Refining is carried out in a petroleum refinery.

Constituents of Petroleum and their Uses

Constituents of Petroleum	Uses
Liquid Petroleum Gas	Fuel for home and industry
Petrol	Motor and aviation fuel, solvent for dry cleaning
Kerosene	Fuel for stoves, lamps and jet aircraft
Diesel	Fuel for heavy motor vehicles, electric generators
Lubricating oil	Lubrication
Paraffin wax	Making ointments, candles, <i>Vaseline</i>
Bitumen	In paints and road surfacing

Natural Gas

- Natural gas mainly consists of methane with small quantities of ethane and propane.
- When natural gas is compressed by applying pressure, it is called compressed natural gas (CNG).
- It is a very important fossil fuel because it is easy to transport through pipes.
- It is a clean fuel.

Uses

- CNG is used for power generation.
- It is used as a fuel for transport vehicles because it is less polluting.
- It is used directly for burning in homes and factories through a network of underground pipes.
- It is also used as a starting material for the manufacture of several chemicals and fertilisers.

Conservation of Natural Resources

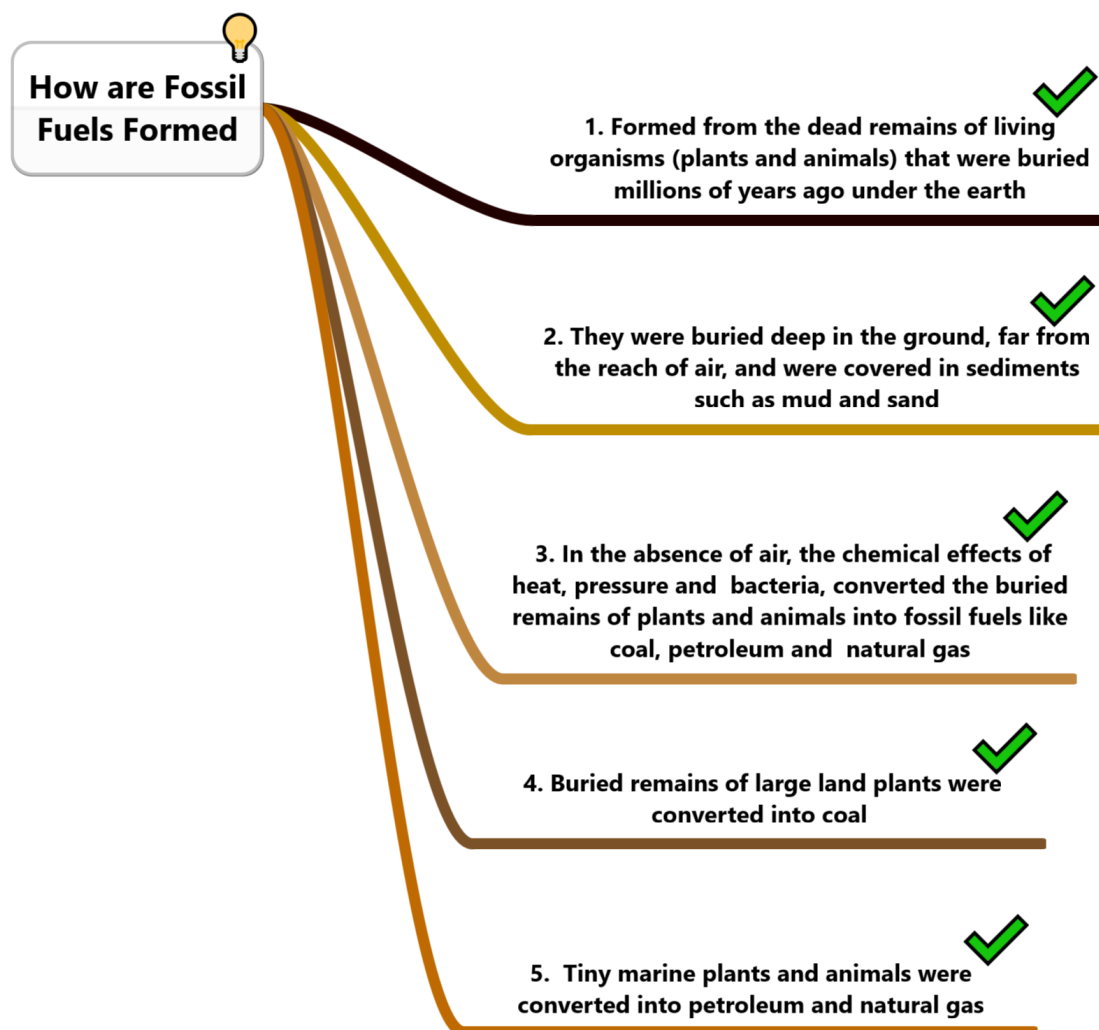
- The amount of coal, petroleum and natural gas present in the Earth is limited.
- The burning of fossil fuels is a major source of air pollution and is also linked to global warming.
- So, we should use fossil fuels only when necessary. This will result in a better environment, lesser risk of global warming and fossil fuel availability for a longer period of time.
- Tips from the Petroleum Conservation Research Association to save petrol/diesel:
 - a. Drive at constant and moderate speed as far as possible
 - b. Turn off the engine at traffic signals or at places where one has to wait

- c. Ensure correct tyre pressure
- d. Ensure regular maintenance of vehicles

Fossil Fuels

- Fossil fuels are renewable fuels produced from the remains of long-dead living organisms buried beneath the earth.
- Coal, petroleum, and natural gas are examples of fossil fuels.
- They were created by the decomposition of prehistoric plant and animal remains (fossils) which were buried under the earth a long time ago.
- These are exhaustible natural resources.

How Fossil Fuels were Formed



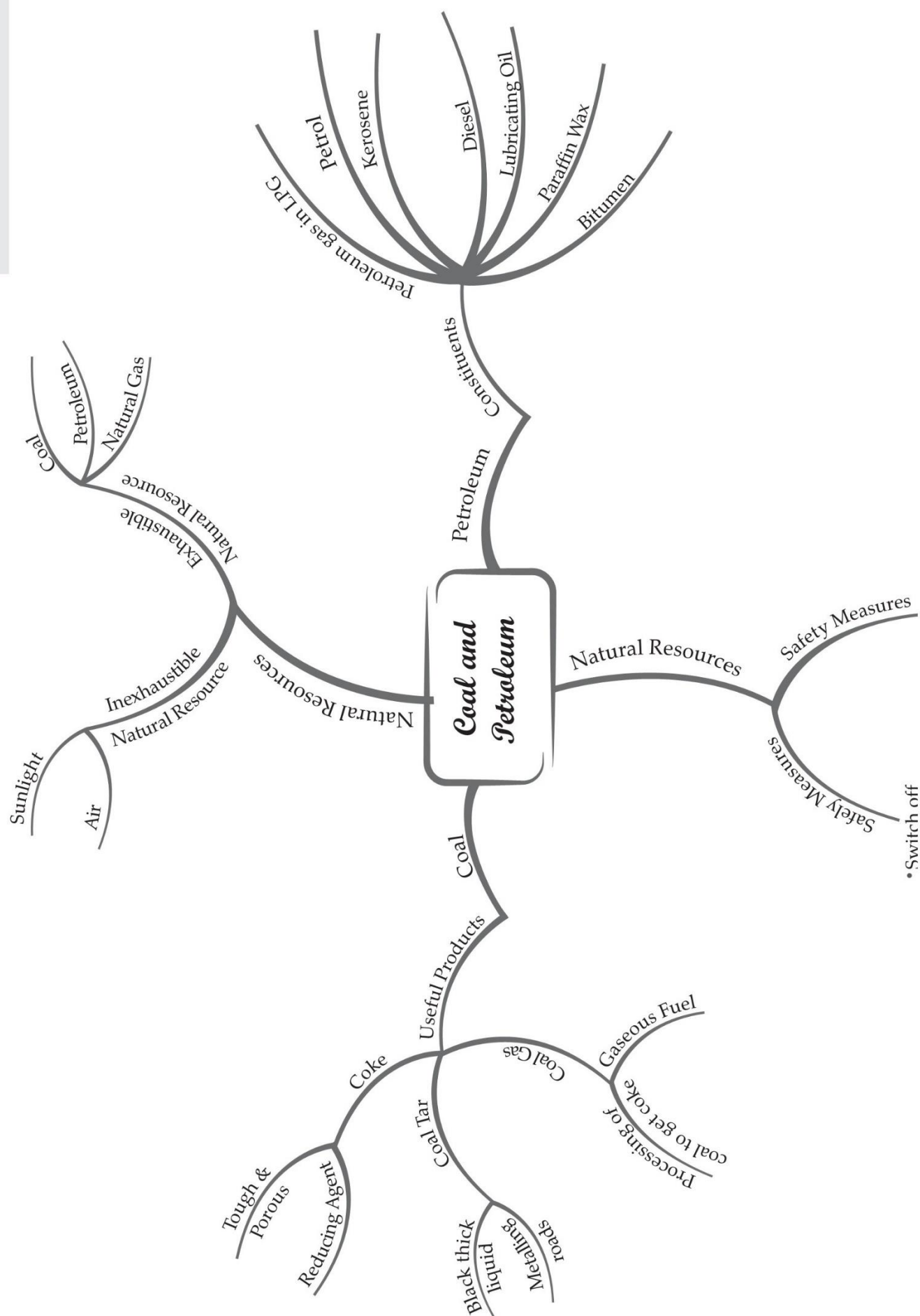
Conservation of Resources

Conservation is the sustainable use and protection of natural resources. The main aim of conservation is to maintain an adequate supply of these resources so that they are available in the future also.

- PCRA (Petroleum Conservation Research Association) is an agency which helps in the conservation and preservation of fossil fuels. This agency suggested some ways to save diesel or petrol.
- Avoid excessive braking.
- Turn off the engine when not in use.
- Vehicle should be checked and serviced regularly.

CHAPTER-3

MIND MAP : LEARNING MADE SIMPLE



Important Questions

Multiple Choice Questions-

Question 1. The most commonly used liquid fuel in our homes is:

- (a) kerosene
- (b) petrol
- (c) diesel
- (d) fuel oil

Question 2. The main elements present in petroleum are:

- (a) carbon and oxygen
- (b) carbon and nitrogen
- (c) carbon and hydrogen
- (d) hydrogen and oxygen

Question 3. The main gas present in LPG is:

- (a) methane
- (b) Propane
- (c) Butane
- (d) hexane

Question 4. CNG is:

- (a) combined natural gas
- (b) compressed natural gas
- (c) compressed nitrogen gas
- (d) clean natural gas.

Question 5. The place in India where natural gas is directly supplied through pipes (or) burning in homes and factories is:

- (a) Lucknow
- (b) surat
- (c) vadodara
- (d) munai

Question 6. "Black gold":

- (a) coal
- (b) coke
- (c) graphite
- (d) petrokum

Question 7. Hydrogen gas obtained from natural gas is used:

- (a) for fuelling rockets
- (b) for production of fertiliseirs
- (c) as fuel to be used at home
- (d) none of these

Question 8. Petrochemicals are obtained from

- (a) petroleum
- (b) natural gas
- (c) petroleum and natural gas
- (d) none of these

Question 9. Which of the following can be prepared in laboratory from dead organisms:

- (a) coal
- (b) petroleum
- (c) natural gas
- (d) none of these

Question 10. The estimated reserves of natural gas in india are:

- (a) 1 billion cubic metres
- (b) 10 billion cubic metres
- (c) over 100 billion cubic metres
- (d) 1 million cubic metres

Question 11. Which of the following ta not true about fossil fuels

- (a) it takes millions of years to form fossil fuels
- (b) the known reserves of fossil fuels will last for a long period of time
- (c) burning of fossil fuels causes air pollution
- (d) burning of fossil fuels causes global warming

Question 12. Natural gas is called clean fuel because:

- (a) it burns without producing any smoke
- (b) it burns completely
- (c) it does not leave behind any residue
- (d) all of these

Question 13. CNG is obtained when:

- (a) natural gas is subjected to low pressure
- (b) natural gas is subjected to high pressure
- (c) butane gas is subjected to high pressure
- (d) none of these

Question 14. The percentage of methane in natural gas is:

- (a) 100%
- (b) 90%
- (c) 95%
- (d) 80%

Question 15. Which of the following is a non-polluting fuel for transport vehicles.

- (a) petrol
- (b) diesel
- (c) CNG
- (d) none of these

Very Short :

1. Write the names of two natural substances.
2. Name two man-made substances.
3. Name two natural resources.
4. Write two exhaustible substances.
5. Why are air, water and soil called natural resources?
6. Name any two inexhaustible natural resources.
7. Why are Coal, Petroleum and Natural gas called fossil fuels?
8. Which gas is produced when coal burns in air?
9. Name the gas which is formed when coal is heated in the absence of air.

10. What is the purest form of carbon?
11. What is the main use of coke?
12. How many substances are found in coal tar?
13. Name the substance obtained from the coal tar and used to repel moths and insects.
14. Which substance is used for road surfacing these days?
15. Where was the first oil well drilled?

Short Questions :

1. What is Inexhaustible Natural Resource?
2. Define Exhaustible resources with few examples.
3. How was Coal formed?
4. How was Petroleum formed?
5. What do you mean by refining and petroleum refinery?
6. What do you understand by Petrochemical products. What are their uses?
7. Name few places where Natural Gas has been found in India.
8. Why should we use some resources like coal and petroleum in limit?
9. What are the advices of PCRA to save petrol/diesel while driving?
10. What are the harmful effects of using fossil fuels?

Long Questions :

Question 1. Explain about the varieties of coal.

Question 2. The burning of fossil fuels causes air pollution. Explain.

Question 3. Write a short note on petroleum.

Question 4. How is the energy useful to us? Explain.

Question 5. Describe coal and its various products along with their uses.

ANSWER

MCQ:

Answer

(a) kerosene

Kerosene is commonly used liquid fuel in our homes.

Answer

(c) carbon and hydrogen

The main elements present in petroleum are carbon and hydrogen.

Answer

(c) Butane

The main gas present in LPG is Butane.

Answer

(b) compressed natural gas

CNG is Compressed Natural Gas.

Answer

(c) vadodara

The place in India where natural gas is directly supplied through pipes for burning in homes and factories is Vadodara

Answer

(d) petrokum

Petroleum is 'Black gold'.

Answer

(b) for production of fertilisers

Hydrogen gas obtained from natural gas is used for production of fertilisers.

Answer

(c) petroleum and natural gas

Petrochemicals are obtained from petroleum and natural gas.

Answer

d) none of these

Coal, petroleum and natural gas cannot be prepared in laboratory from dead

Answer

(c) over 100 billion cubic metres

The estimated reserves of natural gas in India are over 100 billion cubic metres.

Answer

(b) the known reserves of fossil fuels will last for a long period of time

Fossil fuels will last only for a short period of time.

Answer

(d) all of these

Natural gas is called clean fuel because it burns without producing any smoke, it burns completely, it does not leave behind any residue.

Answer

(b) natural gas is subjected to high pressure

CNG is obtained when natural gas is subjected to high pressure.

Answer

(c) 95%

The percentage of methane in natural gas is 95%.

Answer

(c) CNG

CNG is a non-polluting fuel for transport vehicles

Very Short :

1. **Answer:** (i) Air (ii) Water

2. **Answer:** (i) Car (ii) Bus

3. **Answer:** (i) Air (ii) Water

4. **Answer:** (i) Coal (ii) Natural gas

5. **Answer:** Air, water and soil are provided by nature so they are called natural resources.

6. **Answer:** (i) Air (ii) Sunlight

7. **Answer:** Coal, Petroleum and Natural gas are formed by fossils, so they are called fossil fuels.

8. **Answer:** Carbon dioxide.

9. **Answer:** Coal gas.

10. **Answer:** Coke.

11. **Answer:** It is used in the extraction of metals.

12. **Answer:** About 200 substances.

13. **Answer:** Naphthalene balls.

14. **Answer:** These days bitumen is used for road surfacing in place of coal tar.

15. **Answer:** The first oil well was drilled at Pennsylvania, USA, in 1859.

Short Answer :

1. **Answer:** The resources which are present in unlimited quantity in nature and are not likely to be exhausted by human activities are known as Inexhaustible Resources. For **Example:** Sunlight, air.

2. **Answer:** All resources which are found in a limited quantity in nature are known as Exhaustible resources. They can be exhausted by human activities. Example of these

resources is Forests, Minerals, Coal, Petroleum, Natural Gas etc.

3. **Answer:** About 300 years ago the earth had dense forests in low lying wetland areas. Due to natural processes, like flooding these forests got buried under the soil. They got sunk deeper and deeper and temperature gets increasing day by day, under high pressure and high temperature dead plants slowly got converted to coal.
4. **Answer:** Petroleum was formed from organisms living in the sea. As these organisms died, their bodies settled at the bottom of the sea and got covered with layers of sand and clay. Over Millions of years in absence of air and under high temperature and high pressure the dead organisms get transformed into Petroleum and natural Gas.
5. **Answer:** The process of separating various components or fraction of petroleum is called refining. This process is carried out in petroleum refinery.
6. **Answer:** Petroleum and natural gas provide many useful substances. These are termed as 'Petrochemicals'. These are used in manufacturing of detergents, fibres, polythene and other man made plastics
7. **Answer:** In our country Natural Gas has been found in Tripura, Rajasthan, and Maharashtra and in the Krishna Godavari Delta.
8. **Answer:** As we know Coal and petroleum are fossil fuels. The dead organisms takes millions of years to get converted into these fuels, On the other hand the known reserves of these will last almost a few hundred years. A part from this since these products are not environmental friendly as burning of these fuels is a major cause of air pollution and their use is also linked to global warming therefore we should use these resources only when it is actually required.
9. **Answer:**
 - I. Drive at a constant and moderate speed as far as possible
 - II. Switch off the engine at traffic lights or at a place where you have to wait
 - III. Ensure correct type pressure
 - IV. Ensure regular maintenance of the vehicle.
10. **Answer:** Harmful effects of burning fossil fuels are as following:
 - (i) Burning of fossil fuels cause air pollution.
 - (ii) They also cause global warming because they produce greenhouse gas like carbon dioxide on burning.

Long Answer:

1. Answer:

Depending upon the amount of carbon content, coal may be of four types:

Peat: This is the most inferior and softest form of coal. Its carbon content is very low. It has a large amount of moisture and is not much suitable to be used as fuel.

Lignite: Lignite is comparatively harder than peat, but still is very soft. Its carbon content is more than that of peat.

Bituminous: Its carbon content is higher, as it is free from moisture and other impurities.

Anthracite: This is the highest grade coal. This is also known as hard coal. It has maximum amount of carbon. It produces a very little smoke.

2. Answer:

The burning of fossil fuels causes a lot of air pollution.

The burning of coal produces gases like carbon dioxide, carbon monoxide, sulphur dioxide, etc., which can lead to undesirable changes in climate due to increase greenhouse effect.

The major air pollutants produced by the burning of petrol in automobiles are carbon monoxide, sulphur dioxide, unburnt hydrocarbons, etc. These pollutants are harmful for human beings and living organisms which causes breathing problems and skin diseases.

3. Answer:

Petroleum is the liquid form of fuel. It is also known as crude oil and found trapped between the layers of impervious rocks under the ground. It is a natural resource, which formed by the dead plants and animals in the sea. It is a dark coloured viscous liquid and like all other oils, it is lighter than water. It is a mixture of different hydrocarbons. It undergoes fractional distillation to yield petrol, kerosene, diesel and other chemicals used in manufacture of plastics.

4. Answer:

We need energy in almost every field of our life. Without energy our life is impossible.

Some of the uses of energy are:

- We need energy of fuels to generate electricity and to run vehicles.
- We need energy to run our electrical appliances like refrigerator, TV, radio, computer, etc.
- We need energy at construction sites to construct houses, buildings, etc.
- We need energy to cook our food and other domestic use.
- We need energy (petrochemicals) for manufacturing fibres, plastics, paints, cosmetics, etc.
- All the factories, industries, agricultural devices depend on power supply to run the machines.

5. Answer: Coal is a hard and black coloured non-metal which is used to cook food, in the past it was also used to run railway engines, apart from this it is also used to produce electricity in thermal power plant; it is also used as fuel in various industries.

Following are the products of coal:

- I. **Coke:** Coke is a product of coal; it is tough, porous, and black in colour and almost pure

form of carbon. It is used in making steels and in extraction of many metals

- II. **Coal tar:** coal tar is the product of coal which is the mixture of various substances. Products obtained from coal tar is used for manufacturing a variety of products like dyes, drugs, perfumes, explosives, paints, photographic materials, roofing materials etc.
- III. **Coal gas:** Coal gas is obtained during the processing of Coal to get coke. It is used as a fuel in many industries situated near the coal processing plants.