

Chapter 5.

Coal and petroleum.

Natural resources - which materials are obtained from nature, are called natural resources.

Natural resources can be broadly classified into two kinds: -

(i) Inexhaustible natural resources - which resources are present in unlimited quantity in nature and are not likely to be exhausted by human activities.

Examples - Sunlight, air.

(ii) Exhaustible natural resources: - The amount of resources in nature is limited and they can be exhausted by human activities is called exhaustible natural resources.

Example: forests, wildlife, minerals, coal, petroleum, natural gas etc.

Fossil fuels - The exhaustible natural resources which are formed from the dead remains of living organisms are called fossil fuels.

Coal - which is as hard as stone and is black in colour is called coal. It is one of the fuels used to cook food.

Coke - A tough, porous and black substance and pure form of carbon is called coke.

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

(2)

Coal tar — Coal tar is a black, thick liquid with an unpleasant smell. It is a mixture of ~~about 200 substances~~. It is used in ~~synthetic~~ dyes, drugs, explosives, perfumes, plastics, paints, photographic materials, roofing materials etc.

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

Petroleum — Thick, colour of oily liquid which has unpleasant smell. is called petroleum.

It is used in light automobiles such as motor cycles, scooters and cars. It is a mixture of various constituents — petroleum gas, petrol, diesel, kerosene, lubricating oil, paraffin wax, bitumen etc.

Natural gas — It is very important fossil fuel because it is easy to transport through pipes. This is used in the form of CNG and LPG.

Natural gas is also used as a starting material for the manufacture of a number of chemicals and fertilizers. In our country natural gas has been found in Tripura, Rajasthan, Maharashtra and in the Krishna Godavari Delta.

(3)

Refinery. — The process of separating the various constituents/ fractions of petroleum is known as refining. It is carried out in petroleum refinery.

Exercise —

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

Ans — Following are the advantages of using CNG and LPG as fuels —

- (i) CNG is used for power generation in transports.
- (ii) LPG is used as fuel in homes for cooking food.
- (iii) LPG and CNG both are easy to store and transport.
- (iv) They are non-polluting fuels.
- (v) They are used as non-polluting fuels to transport vehicles.
- (vi) These fuels have more energy per unit volume.
- (vii) These are easily available and have affordable cost.
- (viii) They have virtually no ash particles left after burning.

(2) Name the petroleum product used for surfacing of roads.

Ans — Bitumen is the petroleum product used for surfacing of roads.

(3) Describe how coal is formed from dead vegetation. What is this process called?

Ans — About 300 million years ago the earth had dense forests in low lying wetland areas. Due to natural processes like flooding, these

(4)

Forests got buried under the soil. As more soil deposited 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 coal, petroleum and natural gas.

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

(c) Least polluting fuel for vehicle is CNG.

(5) Tick true/false against the following statements.

(a) Fossil fuel can be made in the laboratory. (F)

(b) CNG is more polluting fuel than petrol. (F)

(c) Coke is almost pure form of carbon. (T)

(d) Coal tar is a mixture of various substances. (T)

(e) Kerosene is not a fossil fuel. (F)

(6) Explain why fossil fuels are exhaustible natural resources.

Ans - Fossil fuels are present in nature in limited quantity and are being exhausted abundantly by us. Therefore, fossil fuels are called exhaustible natural resources.

(5)

(7) Describe characteristics and uses of coke.

Ans - Coke is a tough porous black substance. It is almost pure form of carbon. It is

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

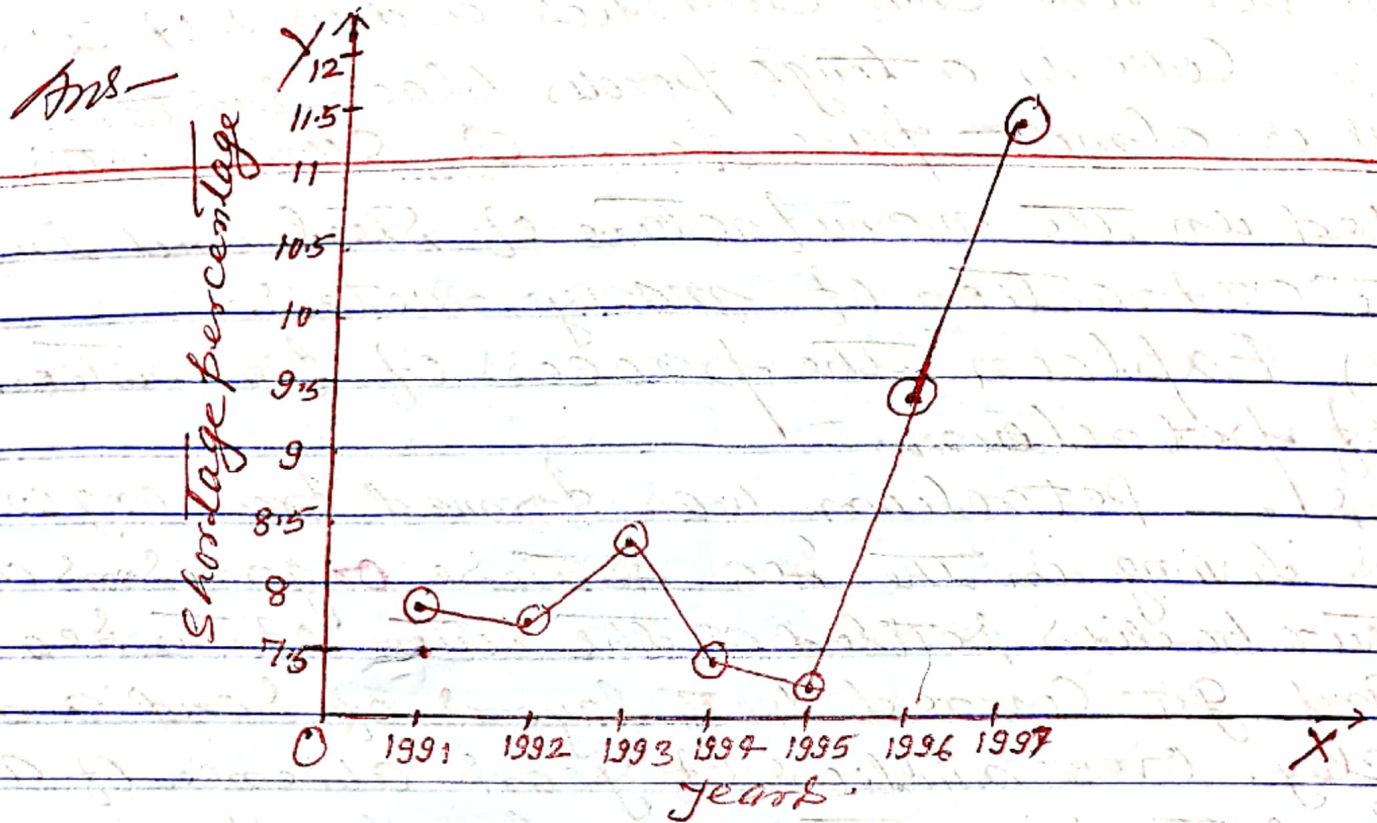
(8) Explain the process of formation of petroleum.

Ans - Petroleum 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 absence of air, high temperature and high pressure transformed the dead organisms into petroleum and natural gas.

(9) The following table shows the total power shortage in India from 1991-1997. Show the data in the form of graph. Plot shortage percentage for the years on the y-axis and the year on the x-axis.

S.NO	Year	Shortage (%)
1	1991	7.9
2	1992	7.8
3	1993	8.3
4	1994	7.4
5	1995	7.1
6	1996	9.2
7	1997	11.5

(6)



6. Combustion and flame.

Combustion - A chemical process in which a substance reacts with oxygen to give off heat is called combustion.

Combustible substance - The substance that undergoes combustion is said to be combustible substance. It is also called a fuel.

The fuel may be solid, liquid or gas.

Ignition temperature - The lowest temperature at which a substance catches fire is called its ignition temperature.

Flame - The visible part of fire is called flame.

Inflammable substance - The substance which has very low ignition temperature and can easily catch fire with a flame.

are called an inflammable substance.
Example - Petrol, Alcohol, LPG etc.

(7)

Rapid Combustion — The type of Combustion, in which gas burns rapidly and produces

heat and light, is called rapid combustion.

Spontaneous Combustion — The type of Combustion in which a material suddenly bursts into flames without the application of any apparent cause, is called Spontaneous Combustion.

Explosion — A sudden reaction that takes place with the evolution of heat, light and sound. A large amount of gas formed in the reaction is liberated. Such a reaction is called explosion.

Fuel — Heat energy for domestic and industrial purposes are mainly wood, charcoal, petrol, kerosene etc.; these substances are called fuel.

Calorific value — The amount of heat energy produced on complete combustion of 1 kg. of a fuel is called its calorific value. The calorific value of a fuel is expressed in a unit is called kilojoule per kg (kJ/kg).

Incomplete Combustion — A Combustion in which a material does not burn due to insufficient supply of oxygen, is called incomplete Combustion.

Effect of increasing the increased concentration of carbon dioxide in the air

Global Warming — The rise in temperature of the atmosphere of the earth due to increased concentration of Carbon dioxide in the air is called global warming.

Acid rain — Oxide of Sulphur and nitrogen dissolve in rain water and form acids. Such rain is called acid rain.

Fire extinguisher — Device used to extinguish fire, is called fire extinguisher.

Ideal fuel — A fuel, which when burnt, produces a large amount of heat by burning in less quantity of it and produces least pollution to the environment is called an ideal fuel.

Fuel efficiency — A measure of how far a vehicle can travel per unit of fuel is called fuel efficiency.

Exercises —

1. List conditions under which combustion can take place.

Ans. Conditions under which combustion can take place are as follows —

(i) Air (Oxygen) (ii) The ignition temperature reach soon (iii) A source of inflammable substance.

(9)

(2) Fill in the blanks —

- (a) Burning of wood and coal cause pollution of air.
- (b) A liquid fuel, used in homes is LPG.
- (c) Fuel must be heated to its ignition temperature before it starts.
- (d) Fire produced by oil cannot be controlled by water.

(3) Explain how the use of CNG in automobiles has reduced pollution in our cities.

Ans The use of CNG in automobiles has reduced pollution in our cities because CNG does not produce any poisonous gas on burning. It has ~~no~~ virtually no ash particles left after burning.

(4) Compare LPG and wood as fuels.

Serial No	Properties	LPG	Wood
(i) Energy/ unit unit mass.		produces more energy	produces less energy.
(ii) Pollution		less pollution	more pollution
(iii) Residue		leave no residue.	leave ash as residue
(iv) Storage/Transport.		Easy to store and transport	Need more space to store.

(5) Give reasons.

(a) Water is not used to control fires involving electrical equipment.

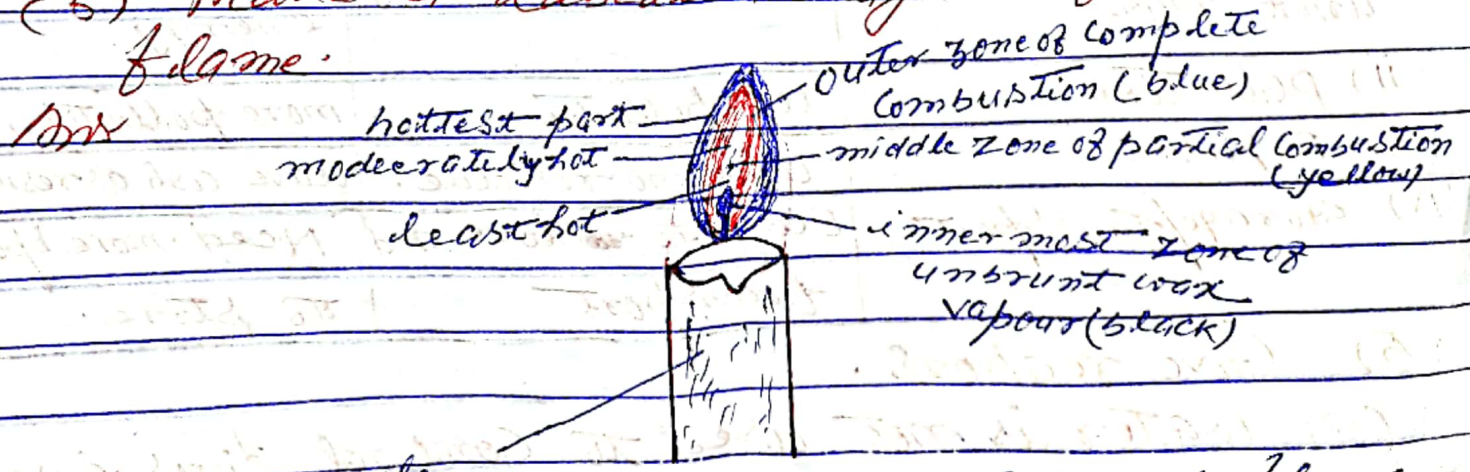
(9) Ans. — Water is not used to control fires involving electrical equipment because it may conduct electricity and harm those trying to douse the fire.

(b) LPG is better domestic fuel than wood. Ans — LPG is a good fuel as compared to wood as it readily available and it is cheap. It burns easily in air at a moderate rate and it produces large amount of heat. It does not leave behind any undesirable substances.

(c) Paper by itself catches fire easily whereas a piece of paper wrapped around an aluminium pipe does not.

Ans — Paper by itself catches fire easily whereas a piece of paper wrapped around an aluminium pipe does not because the ignition temperature of paper is low as compare to the paper wrapped around an aluminium pipe.

(5) make a labelled diagram of a candle flame.



Different zone of candle flame.

(11)

(7) Name the unit in which the calorific value of a fuel is expressed.

Ans- The calorific value of a fuel is expressed in kilojoule per kg (kJ/kg).

(8) Explain how CO_2 is able to control fires.

Ans- CO_2 , being heavier than oxygen, covers the fire like a blanket. Since the contact between the fuel and oxygen is cut off, the fire is controlled. The added advantage of CO_2 is that in most cases it does not harm the electrical equipment.

(9) It is difficult to burn a heap of green leaves but dry leaves catch fire easily. Explain.

Ans- Green leaves contain lot of water. So, when we try to burn green leaves, water contained in the leaves cools the leaves, so that its temperature is brought below its ignition temperature. This prevents the burning of green leaves.

Dry leaves do not contain any water.

So when burning process starts, its temperature is raised drastically above its ignition temperature and the leaves catch fire easily.

(10) Which zone of a flame does a goldsmith use for melting gold and silver and why?

Ans- Goldsmith uses the outer most zone of the flame for melting gold and silver because it is the hottest zone of the flame.

(11) In an experiment 4.5 kg of a fuel was completely burnt. The heat produced was

measured to be 180,000 kJ. Calculate the calorific value of the fuel.

Ans - Calorific value of fuel = $\frac{\text{Total heat produced}}{\text{Total mass burnt}}$

$$= \frac{180000}{4.5} = \frac{180000 \times 2}{9} = 40,000 \text{ kJ/kg.}$$

(12) Can the process of rusting be called combustion? Discuss.

Ans - No, as rusting is very slow process as compared to combustion and the heat evolved in combustion is much more than rusting. Rusting can take place at room temperature but combustion need an ignition temperature.

(13) Abida and Ramesh were doing an experiment in which water was to be heated in a beaker. Abida kept the beaker near the wick in the yellow part of the candle flame. Ramesh kept the beaker in the outermost part of the flame. Whose water will get heated in a shorter time?

Ans - Ramesh's water will get heated in a shorter time because the outermost part of the flame is the hottest part.

(13)

Force and pressure.

Force — A push or pull on an object is called a force. It is denoted by F . and its

SI unit is Newton (N).

push — If a force applying on a body to keep it away from its position is called push.

pull — If a force applying on a body a distance apart from a person to bring it nearby the person is called pull.

Magnitude of a force — The strength of the force is called the magnitude of a force.

Direction of force — The direction in which body moves on applying a force is called the direction of a force.

Muscular force — The force resulting due to the action of muscles is said to be muscular force.

Contact force — Since muscular force can be applied only when it is in contact with an object is called contact force.

Force of friction — The force acting between two surfaces in contact which opposes the motion of one body over the other is called the force of friction.

Non Contact force — The force which acts when the two objects does not come in physical contact is called a non contact force. eg. — magnetic force, Electrical force

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magnetic force - The force exerted by a magnet on a magnetic substance is called a magnetic force.

Electrostatic force - The force exerted by a charged body is called electrostatic force.

Force of gravity - The force of gravitation exerted by the earth on a smaller object near its surface is called force of gravity.

Force of gravitation - Every object in the universe, whether small or large, exerts a force on every other object which is known as force of gravitation.

Weak force - Force of gravitation is a weak force, as we do not feel it as it decreases rapidly with distance between the objects.

Pressure - The force acting on a unit area of a surface is called pressure.

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}} \quad p = \frac{F}{A}$$

Its SI unit is Pascal or N/m^2

Atmosphere - The envelop of air around us is known as the atmosphere.

Atmospheric pressure - The pressure exerted by air in the atmosphere is known as atmospheric pressure.

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Exercises -

(1) Give two examples each of situations in

which you push or pull to change the state of motion of objects.

Ans - Two examples of push force are as follows -

(i) A heavy box at rest is pushed to move it from one room to another.

(b) A player pushed a football using his foot.

Two examples of pull force are as follows -

(i) Rope is pulled to draw water from a well.

(ii) The cow is pulled by a man for tie the nail.

(2) Give two examples of situations in which applied force causes a change in the shape of an object.

Ans - (i) If an inflated balloon is taken and pressed from two sides with hand, its shape changed. The shape is disturbed of a balloon.

(ii) If a ball of dough is rolled to make a chapati, its shape is changed.

(3) Fill in the blanks in the following statements

(a) To draw water from a well we have to pull at the rope.

(b) A charged body attracts an uncharged body towards it.

(c) To move a loaded trolley we have to pull it.

(d) The north pole of a magnet repulses the north pole of another magnet.

(4) An Archer stretches her bow while taking aim at the target. She then releases the

arrow, which begins to move towards the target. Based on this information, fill up the gaps in the following statements using the following terms: muscular, contact, non contact, gravity, friction, shape, attraction.

- (a) To stretch the bow, the archer applies a force that causes a change in its shape.
- (b) The force applied by the archer to stretch the bow is an example of muscular force.
- (c) The type of force responsible for a change in the state of motion of the arrow is an example of contact force.
- (d) While the arrow moves towards its target, the force acting on it are due to gravity and that due to friction of air.

(5) In the following situations identify the agent ~~exerting~~ exerting the force and the object on which it acts. State the effect of the force in each case.

- (a) Squeezing a piece of lemon between the fingers to extract its juice.
- (b) Taking out paste from a tooth paste tube.
- (c) A load suspended from a spring while its other end is on a hook fixed to a wall.
- (d) An athlete making a high jump to clear the bar at a certain height.

Serial No -	Agent	Object	Effect
a	Fingers	Lemon	Juice is extracted by force.
b	Fingers	Tooth paste tube	Tooth paste coming out by force.
c	Load	Spring	Expansion of spring.
d	Athlete	Athlete's body	Athlete jump over the bar.

(6) A blacksmith hammers a hot piece of iron while making a tool. How does the force due to hammering affect the piece of iron?
 Ans - The force due to hammering change the shape of the piece of iron.

(7) A wall after it has been rubbed with a piece of synthetic cloth. It was found that the balloon sticks to the wall. What force might be responsible for the attraction between the balloon and the wall?
 Ans - The force which is responsible for the attraction between the balloon and the wall is electrostatic force. When we rub the balloon by a synthetic cloth, it gets charged. When it is taken near the wall, it will get attracted towards the uncharged wall because the electrostatic force which is the force exerted by a charged body on another uncharged body.

(8) Name the forces acting on a plastic bucket containing water held above ground level in your hand. Discuss why the forces acting on the bucket do not bring a change in its state of motion.

Ans- The force acting on a bucket are - gravitational force and muscular force.

Gravitational force is acting on the bucket downwards and muscular force is acting on the bucket upward direction.

These two forces are balancing each other. Therefore, the ~~bucket does not~~ forces acting on the bucket do not bring change in its state of motion.

(9) A rocket has been fired upwards to launch a satellite in its orbit. Name the two forces acting on the rocket immediately after leaving the launching pad.

Ans- The two forces are acting on the rocket immediately after leaving the launching pad are ~~for~~ one force of gravity of the earth acting downwards and other the frictional force produced by air particles.

(10) When we press the bulb of a dropper with its nozzle kept in water, air in the dropper is seen to escape in the form of

bubbles. Once we release the pressure on the bulb, water gets filled in the dropper. The rise of water in the dropper is due to

(a) pressure of water (b) Gravity of the earth.

(c) Shape of rubber bulb

(d) Atmospheric pressure.

Ans - (d) Atmospheric pressure.

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