SOURCES OF ENERGY

1. What is a good source of energy?

A good source of energy would be one which would (i) do a large amount of work per unit volume or mass (ii) does not pollute the atmosphere (iii) be easily available(iv) be easy to store and transport and (v) be economical.

2. What is a good fuel?

A good fuel is one which should have a high calorific value, should not leave much ash / residue behind after burning, should be cheap and easily available, should not give out smoke or harmful gases, should burn smoothly and should have proper ignition temperature.

3. What do you mean by conventional source of energy?

The traditional source of energy such as (i) wood and (ii) fossil fuels like coal, petroleum and natural gas which are familiar to most people are called conventional sources of energy.

4. Are fossil fuels renewable or non – renewable sources of energy?

Non – renewable sources of energy.

5. What are the disadvantages of fossil fuels?

(i) Air pollution is caused by burning fossil fuels.

(ii) The acidic oxides released from them leads to acid rain which affects soil and water resources.

(ii) Green house effect of gases like CO_2 released from fossil fuels (on burning).

6. Why are we looking at alternate sources of energy?

The growing demand for energy is largely met by the fossil fuels like coal and petroleum, which are non – renewable sources. So, in order to conserve them and avoid running out of them, we are looking for alternate sources of energy.

7. What are the disadvantages of dams?

1. Agricultural land and human habitation are to be sacrificed.

2. Large eco – systems are destroyed (When submerged under the water in dams).

3. The vegetation which is submerged rots and under anaerobic conditions and gives rise to large amount of methane, which is also a green – house gas.

8. What are the advantages of generating hydro – electricity?

It does not pollute the environment. Water is a renewable source of energy and the construction of dams on rivers helps in controlling floods and in irrigation.

9. What is biomass?

The dead parts of plants and trees and the waste material of animals are called biomass. It includes wood, crop residues and cow – dung. It is a renewable source of energy.

10. Name the constituents of biogas and which component of it is used as a fuel?

The constituents of biogas are CO_2, H_2, H_2S [hydrogen sulphide] and methane. The major component of biogas is methane (75%) which is used as a fuel.

11. Describe the working of a biogas plant with the help of a labelled diagram.

(i) Cow – dung and H_2O are mixed in equal proportions in the mixing tank and is called slurry.

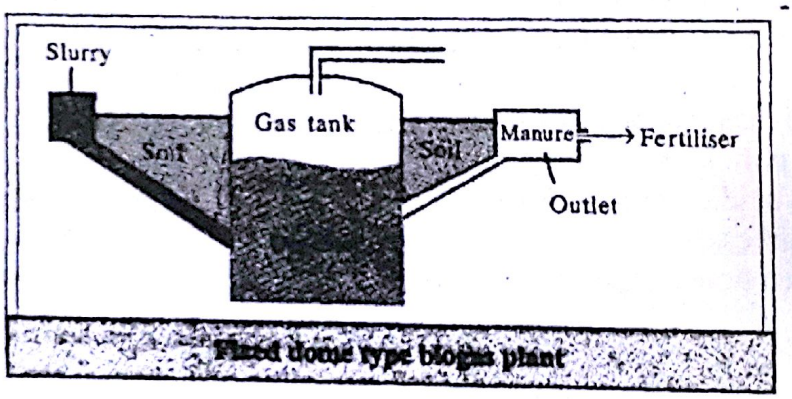
(ii) This slurry is fed into the digester tank which is a sealed chamber without oxygen.

(iii) An aerobic micro – organisms decompose the slurry (i.e) they breakdown the complex compounds of the slurry.

(iv) It takes few days to complete the decomposition process and release / generate gases like CO_2, H_2, H_2S and CH_4 called biogas.

(v) This biogas is stored in the tank above the digester form which it is drawn through pipes for use.

(vi) The slurry left behind is removed periodically and is used as a manure as it is rich in nitrogen and phosphorous.



12. Suggest a safe and efficient method for the disposal of biowastes and sewage material. How is this method advantages to us?

It is better and safe to prepare biogas from biowastes and sewage material and then the spent material (biowastes and sewage) can be used as a manure as it is rich in nutrient elements such as nitrogen and phosphorous. This method is advantages because we get fuel as well as the spent waste can be used as a manure.

13. Write an account on wind energy and wind mill.

* It is conventional source of energy.
* It was used to do mechanical work like drawing water from well.
* It is also used to generate electricity using wind mill.
* The rotatory motion of the wind mill is used to turn the turbine of the electric generator.
* The output of a single wind mill is quite small and cannot be used for commercial purposes.
* Therefore a number of mills are erected over a large area known as wind energy farm.

*The output of each wind mill is coupled together to get electricity on a commercial scale.

Advantages:

- Wind energy is an environmental friendly and efficient renewable source of energy.
- It requires no recurring expenses for the production of electricity.

Disadvantages:

- Wind energy farms can be established only at those places where wind blows for the greater part of the year.
- The wind speed should be more than 15 km/h
- To care of the energy needs when there is no wind, storage cells are needed.
- Wind energy farms require large area of land.
- The initial cost of establishment of the farm is very high.
- They need high level of maintenance.

14. Name some non –conventional sources of energy.

Solar energy, geothermal energy, nuclear energy and energy from the sea.

Answers to exercise questions

Qn.1. (b) Cloudy day.
Qn.2. (c) Nuclear energy.
Qn. 3. (a) Geo thermal energy.

Qn.4. Compare and contrast the fossil fuels and the sun as direct sources of energy.

Fossil fuel as source of energy	Sun as a source of energy
*Non – renewable source of energy	*Renewable source of energy
*Causes lot of pollution on burning.	*Causes no pollution.
*These provide energy in concentrated form.	* Provides energy in scattered (diffused) form
*Available and can be used all the time. (during day and night)	*Available only during day time when the sun shines.

Qn. 5. Compare and contrast biomass and hydro electricity as sources of energy.

Biomass as a source of energy	Hydro electricity as source of energy
* Renewable source of energy	* Renewable source of energy.
* Causes air pollution on burning.	*Causes no air pollution.
*Gives heat energy that can be used for cooking and heating only.	*Gives electrical energy that can run all types of electrical appliances.

*Can be obtained without using any special device, but can be obtained by the action of anaerobic bacteria on domestic sewage in the absence of air (oxygen)

*Can be produced only by establishing hydro power plants. Only in limited number of places, usually in hilly areas or by constructing dams at the foot hill.

Qn.7 On what basis would you classify energy sources as
a. Renewable and non – renewable?
b. Exhaustible and in exhaustible?

a. **Renewable source** — **Non – renewable source**

*Sources of energy which are being Produced continuously in nature And are inexhaustible are renewable sources of energy.

*Sources of energy which have accumulate in nature over a very very long time and cannot be quickly replaced when exhausted are non - renewable sources of energy.

*These are also called non– conventional sources of energy or alternate sources of energy

*These are also called conventional sources of energy.

*eg:-Solar energy, wind energy, Tidal energy, water energy, Geothermal energy, biomass Energy, hydrogen etc are renewable Sources of energy.

*Fossil fuels like coal, petroleum, natural gas, nuclear fuels like uranium etc…are all non - renewable sources of energy.

b. **Exhaustible and inexhaustible energy sources.**

Exhaustible sources of energy are those non – renewable sources of energy that get exhausted one day. Therefore they are conventional sources of energy except nuclear fuels. Eg:- Fossil fuels like coal, petroleum and natural gas.

Inexhaustible sources of energy are those renewable sources of energy that can be used again and again endlessly and will never get exhausted. These are all non – conventional sources of energy. Eg:- wood, sun, water, geothermal energies etc..

Qn.8 What are the qualities of an ideal source of energy?

The following are the characteristics of qualities of an ideal source of energy-
An ideal source of energy is the one which would do a large amount of work per unit mass (or per unit volume), which is cheap and easily available, which is easy to store and transport, which is safe to handle and use and which does not cause environmental pollution.

ALTERNATIVE OR NON – CONVENTIONAL SOURCES OF ENERGY

Solar energy :-

* It is the energy obtained from the sun.
* Only a small part of solar energy reaches the outer layer of the earth's atmosphere.

Solar energy devices:-

Eg:- Solar cooker, solar cell and solar water heater.

Solar cell:-

- It is a device which converts solar energy into electricity.
- It is made of silicon.
- Each cell develops a voltage of 0.5 to 1 volt and produce about 0.7 w of electricity.
- A large no. of cells are combined in an arrangement called solar cell panel that can deliver enough electricity.

Advantages:-

1. No moving parts, require little maintenance and work satisfactorily.
2. No need of focussing device.
3. Can be used in remote and inaccessible or sparsely populated areas.
4. Causes no pollution to the atmosphere and surroundings.

Disadvantages:-

- Special grade silicon for making solar cell is not available in plenty.
- The process of manufacture is very expensive.
- Silver used for interconnection of the cells adds to the cost.
- High cost and low efficiency.

Other uses of solar cells:-

- Used in artificial satellites and space probes wireless transmission systems.
- Radio, T.V relay stations in remote locations use solar panels.
- Calculators, traffic signals and toys use solar cells.

Energy from the sea:-

The three forms of energy which could be harnessed from the sea are tidal energy, wave energy and oceanic thermal energy.

Tidal energy:-

- Due to the gravitational pull of mainly the moon, the level water in the sea rises and falls. This phenomenon is called high and low tides.
- The difference in the sea – levels gives us tidal energy and is harnessed by constructing a dam across a narrow opening to the sea.
- A turbine fixed at the opening of the dam converts tidal energy to electricity.

Wave energy and Oceanic thermal energy (Refer book)

Geothermal energy:-

- Geothermal energy is the heat energy from hot rocks present inside the earth.
- The extremely hot rocks present below the surface of earth heat the underground water and turn it into steam.
- This high power steam which is trapped in the rocks is taken out by drilling and putting a tube into it.
- This steam at high power is used to turn the turbine of a generator to produce electricity.

Advantages:-

- It is economical.
- It causes no pollution (environment friendly)

Disadvantages:-

- It is not available everywhere.
- Deep drilling in the earth to obtain geothermal energy is very difficult and expensive.

Nuclear energy:-

When a nucleus of a heavy atom (eg.Ur, Pt or Th) is bombarded with a low energy neutron, it is splitted (nucleus) into lighter nuclei. During this process a tremendous amount of energy is released and is called nuclear energy and the process is called nuclear fission.

Electric power is generated using a nuclear reactor.

Nuclear reactor releases nuclear energy using nuclear fission chain reaction at a controlled rate.

Disadvantages :-

- The high cost of installation of a nuclear power plant.
- Risk of accidental leakage of nuclear radiation.
- High risk of environmental contamination due to improper nuclear waste storage and disposal.

Advantage:-

- It produces a large amount of energy (heat) from a very small amount of nuclear fuel.
- It does not produce CO_2 which contributes to green house effect or SO_2 which causes acid rain.