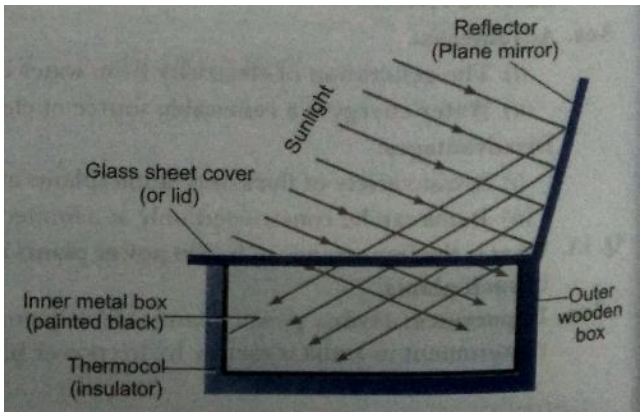
Long Answer Type Questions

[5 marks]

Q. 1. Give the construction and working of a solar cooker.



Ans. A device that utilises solar energy for cooking purposes is called a solar cooker. The most commonly used form of solar cooker is known as box-type solar cooker. A box-type solar cooker is shown in the figure.

Construction of a box-type solar cooker: A box-type solar cooker consists of the following components:

(*i*) Box (B): This is an insulated metal or a wooden box. It is painted black from inside because black surface absorbs more heat. The box may be provided with four roll-wheels.

(*ii*) Glass cover (G): A cover made of two sheets of toughened glass held together in an aluminium frame is used as a cover of the box B.

(*iii*) Plane mirror reflector (R): A plane mirror reflector fixed in a frame is fixed to the box B with the help of hinges. The mirror reflector can be positioned at any desired angle to the box. The mirror is positioned so as to allow the reflected sunlight fall on the glass cover of the box.

(*iv*) Cooking containers (C): A set of containers made of aluminium and blackened from outside are kept in the box B. These containers are also painted black because black surface absorbs more heat.

Working: The food is cooked in a shallow vessel of the container. The box has a transparent covering of glass sheet over it. The solar cooker is placed in sunlight and reflector (plane mirror) is adjusted in such a way that a strong beam of sunlight enters the box through the glass sheet. The blackened metal surfaces in the wooden box absorb infra-red radiations from the beam of sunlight and heat produced raises the temperature of blackened metal surface to about 100^0C.

The food absorbs heat from the black surface and gets cooked. The thick glass sheet does not allow the heat produced to escape and thus, helps in raising the temperature in the box to a sufficiently high degree to cook the food.

Q. 2. (a) Distinguish between renewable and non-renewable sources of energy.

(b) Choose the renewable sources of energy from the following list.
Coal, biogas, Sun, natural gas

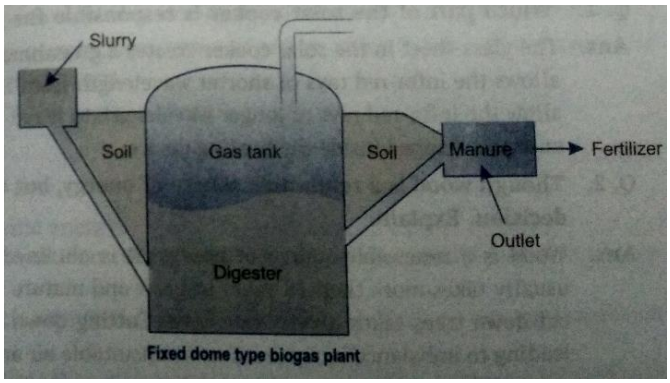
Ans. (a)

Renewable sources of energy	Non-renewable sources of energy
1. These sources of energy can be used again and again.	1. These sources of energy cannot be used again and again.
2. These type of sources are inexhaustible.	2. These type of sources are exhaustible and cannot be renewed.
3. It does not pollute atmosphere.	3. It causes atmospheric pollution.
4. $Example$: Solar energy wind energy, etc.	4. $Example$: Coal, petroleum, etc.

(b) Sun and biogas.

Q. 3. What is biogas? Describe the working of a biogas plant with the help of a labelled diagram.

Ans. Biogas is a mixture of methane, carbon dioxide, hydrogen and hydrogen sulphide. The major constituent of biogas is methane. Biogas is produced by the anaerobic degradation of animal wastes like cow-dung or plant wastes in the presence of water.



Fixed dome type biogas plant

The biogas plant has a dome-like structure built with bricks. A slurry of cow-dung and water is made in the mixing tank from where it is fed into the digester. The digester is a sealed chamber in which there is no oxygen. Anaerobic micro-organisms that do not require oxygen decompose or break down complex compound of the cow-dung slurry. It takes days for the decomposition process to be complete and generate gases. The biogas stored in the gas tank above the digester from which they are drawn through pipes for use.

Q. 4. What are the environmental consequences of using fossil fuels? Suggest the steps to minimise the pollution caused by various sources of energy including non-conventional sources of energy.

Ans. Fossil fuels have the following environmental effects:

(*i*) Air pollution: Burning of fossil fuels release oxides and sulphides in the air and many other harmful gases like carbon monoxide, sulphur dioxide, etc. These cause various

health problems and also lead to acid rain which further affects water and soil resources.

(ii) Greenhouse effect: On burning fossil fuels, a large amount of carbon dioxide is released into the atmosphere. This is a greenhouse gas and does not allow the sun rays reflected from the earth surface to escape into the atmosphere. Thus, increasing the temperature of the atmosphere. This is called greenhouse effect and results in global warming.

Following steps can be taken to minimize pollution:

(i) Use of smokeless appliances.
(ii) Use of refined technology to increase the efficiency of combustion process and to reduce escape of harmful gases into the atmosphere.
(iii) Judicious use of energy.

Q. 5. Differentiate between box-type solar cooker and spherical reflector type solar cooker.

Ans.

Box-type solar cooker	Spherical reflector type solar cooker
1. Plane mirror is used as a reflector.	1. Concave or parabolic reflector is used.
2. It does not concentrate solar energy at a point.	2. It concentrates the solar energy at a point called focus.
3. Comparatively low temperature is produced in it.	3. Very high temperature is produced.
4. It is used to cook the food materials which require slow heating.	4. It can cook food materials which require strong
5. Baking and frying is not possible in it.	5. Baking and frying can be done in it.