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NCERT Science Class 10 Chapter 15 Sources of Energy CBSE Board Sample Problems Long Answer (For CBSE, ICSE, IAS, NET, NRA 2022)

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Question

What are the limitations of extracting energy from?

- (i) The wind?
- (ii) Waves?
- (iii) Tides?

Solution

(i) The Wind:

- (a) It is not available at all times.
- (b) It requires a very large area of land.
- (c) It is not possible to have a windmill everywhere as to run it, the minimum wind speed of 15 km/hr is required (only possible in open areas like the seaside) .

(ii) Waves:

- (a) Wave energy would be a viable proposition only where waves are very strong.
- (b) It is costly to set up devices to trap wave energy.

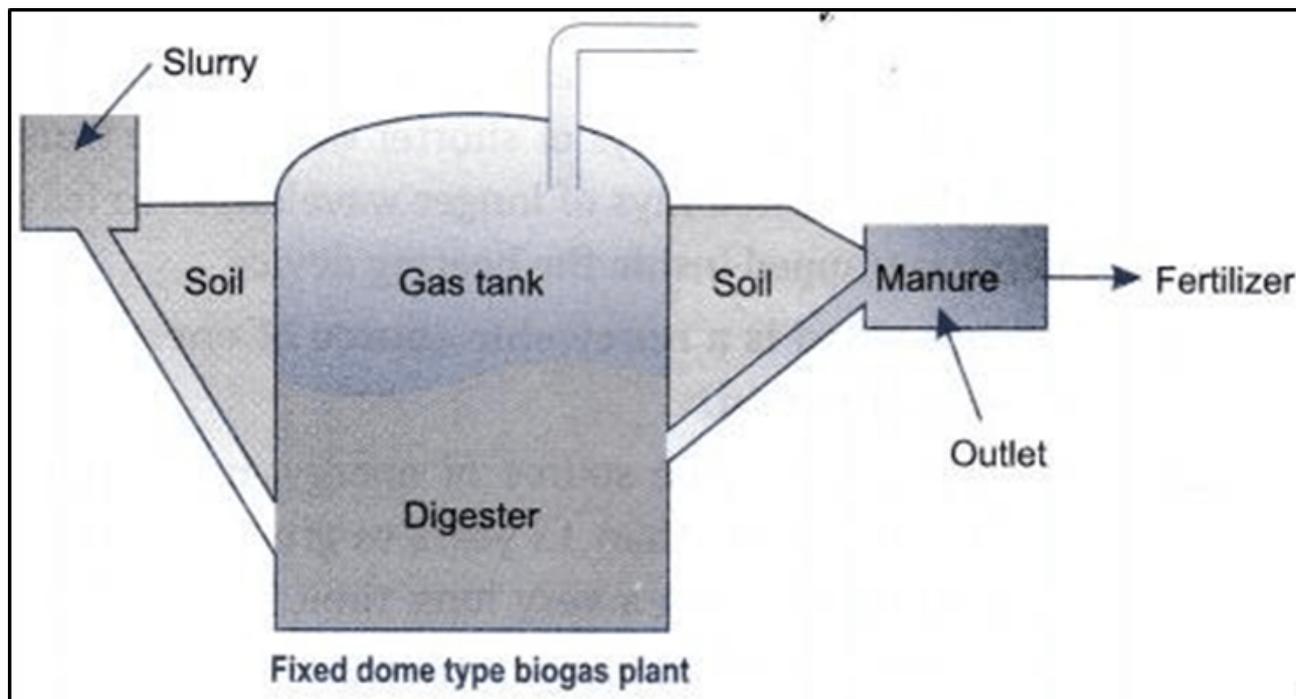
(iii) Tides:

- (a) Very few sea coasts in the world have suitable sites for the purpose of harnessing tidal energy.
- (b) The rise and fall of tides happen only twice in a day is not sufficient to generate electricity continuously.

Question

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

Solution



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- 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.
- 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 microorganisms that do not require oxygen decompose or break down complex compounds of the cow-dung slurry.
- It takes a few days for the decomposition process to be complete and generate gases. The biogas is stored in the gas tank above the digester from which they are drawn through pipes for use.

Question

What are the environmental consequences of the increasing demand for energy? What steps would you suggest for reducing energy consumption?

Solution

- Industrialization demands for more energy and to fulfill these demands fossil fuels are used as they are readily available.
- Due to their harsh usage, it has an impact on the environment. Too much exploitation of fossil fuels has led to greenhouse effect resulting in global warming.
- But there are few possibilities of reducing this by reducing the usage of fossil fuels and opting for alternate sources of energy.

- Reducing the unnecessary usage of electricity and water.
- Opting for public transportation and reducing using own vehicles.
- These are few small steps that can be implemented for reducing the energy consumption.

Question

What do you mean by wind energy and wind turbine? Discuss the limitations of wind energy.

Solution

- In areas where the ground is heated faster, the air rises as temperatures go up. The majority of wind power is transferred into energy by the use of turbine blades.
- Wind energy is the energy harnessed from wind. The kinetic energy of wind is converted into mechanical energy.
- If this energy is used directly by a machine (such as grinding stone or a water pump) , it is called a windmill.
- If the mechanical energy is first converted into electricity, then the machine is called a wind turbine.

Limitations of Wind energy

a) No electricity when there is any wind

- The limitation of wind power is that no electricity is produced when the wind is not blowing. Thus, it cannot be used as a dependable source of base load power.
- Utilities and merchant generators will not invest huge sums of money into a technology that does not work when the wind is not blowing.
- It can be used only at those places where wind blows for the greater part of the year.

b) Wind Turbines Killing Migrating Birds

- The process of turning wind into electricity is causing the death of many predatory birds whose annual migration route includes the pass. Past attempts to reduce bird kills have included painting the tips of turbine blades to try to make them more visible to birds and installing screens around generators.
- Still, these measures have failed to substantially lower the number of bird deaths.
- Wind speed should be higher than 15 km/h to rotate the turbine at the required speed. This is the minimum threshold speed for wind, so that the windmills can be effective for energy production.
- Need of a backup facility when there is no wind, as no one can control the amount and speed of wind.
- Requires large area for setting up wind energy farms. (i.e.. 1 MW requires about 2 hectares of land)
- Tower and blades require a high level of maintenance. The blades are constantly exposed to vagaries of nature like rain, sun, storm, that is why they need to be maintained for proper functioning.

Question

(i) Mention three major hazards of nuclear power generation.

(ii) Name the type of nuclear reaction by which the sun produces its energy.

(iii) Which type of nuclear process is currently used in nuclear electricity generator?

Solution

(i) Major hazards are:

- (a) There is risk of accidental leakage of nuclear radiation.
- (b) There is a risk of damage to the environment.
- (c) The storage and disposal of spent or used fuels is very difficult and risky,
- (ii) Thermo nuclear fusion reaction.
- (iii) Nuclear fission reaction.

Question

(i) Distinguish between conventional and non-conventional sources of energy, giving one example each.

- (ii) Why is it difficult to use hydrogen as source of energy?

Solution

(i) Difference between conventional (e. g. coal, petroleum) and non-conventional (e. g. solar and wind energy) sources of energy are

Conventional Sources	Non-conventional Sources
Conventional sources of energy are non-renewable sources of energy.	Non-conventional sources of energy are renewable sources of energy.
They have been in use since a long time. For example, firewood and coal have been in use since a long time. Most of these energy sources cause pollution when used.	These sources have recently developed and are still developing. For example, the technology of producing electricity from solar panels has recently developed. They do not cause any pollution.
They are common and widely used sources (e. g. thermal power) .	They are comparatively new sources of energy and hence are not widely used. For example, solar panels and wind mills are not widely used.
<i>Difference between Conventional (E. G. Coal, Petroleum) and Non-Conventional</i>	

- (ii) It is difficult to use hydrogen as a source of energy because it is highly inflammable and it is very expensive.