# Energy Flow and Practices for Conservation of Resources

## Exercise

**Question 1.**
Name two renewable and the two non-renewable sources of energy.

**Answer:**

- **Renewable sources :** Solar energy, wind energy, hydro-energy, geo-thermal energy and nuclear energy.
- **Non-renewable sources :** Coal, petroleum and natural gas.

**Question 2.**
Why should we conserve the non-renewable sources of energy?

**Answer:**
We should conserve the non-renewable sources of energy because if these sources once finished, cannot be regenerated over a reasonable period of time.

**Question 3.**
State the law of conservation of energy.

**Answer:**
Law of conservation of energy : According to law of conservation of energy— "energy is neither created nor destroyed in a system and sum total of energy remains same."

**Question 4.**
State the main difference between the renewable and non-renewable sources of energy.

**Answer:**
**Renewable sources :**

1. These are the sources from which energy can be obtained continuously over a long period of time.
2. They are non-conventional sources.
3. These are the natural sources which will never get exhausted.
4. These sources can be regenerated.
5. **Examples :** Solar energy, wind energy, hydro-energy, geo-thermal energy and nuclear energy.

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**Non-renewable sources :**

1. These are the sources from which energy can not be continuously obtained over a long period of time.
2. They are conventional sources.
3. These are natural sources which ould soon depletes.
4. These sources cannot be regenerated.
5. **Examples :** Coal, petroleum and natural gas.

**Question 5.**
Explain why is it no wise to regard wood as a renewable source of energy.

**Answer:**
Use of wood is renewable source, but is not advised to use, because saplings take a long time to become a tree.

**Question 6.**
Why are fossil fuels called non-renewable sources of energy?

**Answer:**
Fossil fuels (coal, petrol, diesel etc.) are exhaustible i.e. if these are once finished can not be regenerated over a reasonable period of time. That is why fossil fuels are called non-renewable sources of energy.

**Question 7.**
State two limitations of solar energy.

**Answer:**
**Limitations of solar energy :**

1. This energy can not be used at night.
2. This cannot be used where solar rays are less in power
3. Solar energy produces only d.c. electricity which cannot be used for household purposes.

**Question 8.**
State four traditional uses of solar energy.

**Answer:**
**Uses of solar energy :**

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1. Solar energy is used in solar cookers for cooking of food.
2. Solar energy is used by plants to make their food by photosynthesis.
3. Solar energy is used to produce electricity with the help of solar cells.
4. Solar energy is used for providing electricity to electronic calculators and wrist watches.

**Question 9.**
State three ways by which you can enhance the collection of solar energy.

**Answer:**
**Following are the three ways by which we can enhance the collection of solar energy:**

**(i) Use of black painted surface :** Black surfaces are good absorbers as well as good radiators of radiant heat. Thus the surfaces of the objects which are to collect radiant heat are painted black, so that their temperature rises rapidly. But after some time, an equilibrium state is reached when the solar energy absorbed by a blackened object is equal to radiant heat radiating out from its surface. To overcome this difficulty, some means should be provided to that the rate of radiant heat from its surface is reduced or stopped altogether.

**(ii) Use of insulated box with glass cover :** The objects painted black, should be placed in well insulated box provided with glass cover. The insulated box will prevent heat losses due to conduction, convection and radiation. The glass cover will allow the solar energy to pass through it as it is transparent to radiant heat of smaller wavelength. However, when the object with blackened surface gets hot within the box and radiates out radiant heat, the glass will not allow these radiations to pass through, as they are of longer wavelength. Thus, the heat radiations are trapped within the insulated box, thereby raising the temeperature of objects with blackened surface.

**(iii) Use of reflectors :** As mentioned earlier, the amount of solar energy per square metre per second is too small to do any useful work. Thus, if solar energy is directly allowed to enter a solar heating device, it does not raise its temperature sufficiently. However, if solar energy is collected from a sufficiently large area and then reflected into the small area of a solar heating device, its temperature rises sufficiently to do some useful work. It is here that reflectors are useful for solar heating devices.

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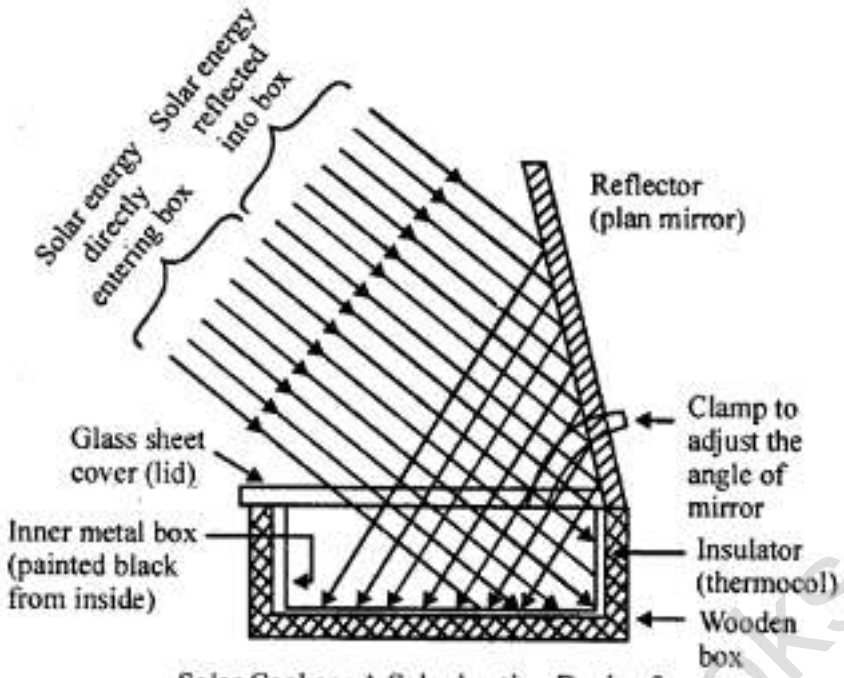

Solar Cooker : A Solar heating Device for collecting maximum Solar Energy

Figure shows the use of plane mirror as a reflector. In the diagram it is clearly shown that a part of solar energy enters directly into solar heating device and a part is reflected into it by the plane mirror. As the solar heating device receives more energy per unit time, its temperature rises quickly.

**Question 10.**
State two advantages of box type solar cooker.

**Answer:**
**Advantage of box type solar cooker :**

1. It is used for cooking food.
2. It costs nothing for cooking the food.
3. No loss of nutritions value of ood.
4. It causes no pollution.

**Question 11.**
What is the range of temperature which can be achieved in it?

**Answer:**
The temperature within solar cooker rises to about 140°C.

**Question 12.**

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**(a)** What are semiconductors? Name two semi conductors.
**(b)** What are doped semiconductors? Name two materials used for doping the semiconductors. What is the advantage of doping the semiconductors?

**Answer:**

**(a) Semiconductors :** Those materials whose conductivity is less than conductors but more than insulators are known as semiconductors.
Semiconductors are neither good conductors nor insulators of electricity. Germanium (Ge) and Silicon (Si) are the two semiconductors.

**(b) Doping :** The process of adding impurities to semi conductors is called doping. Materials used for doping are Boron and phosphorous.
**Advantages of doping the semiconductors :** Semi conductors are doped to increase the conductivity of the semiconductor.

**Question 13.**
Name a device which directly converts solar energy to electric energy.

**Answer:** Solar cell.

**Question 14.**
What is a solar panel? To what uses are the solar panels put?

**Answer:**
**Solar Panel :** The group of solar cells connected in specific pattern to produce desired potential difference and magnitude of current is called Solar Panel.

**Question 15.**
What is biogas? Which component of biogas is used as fuel? Describe a fixed dome type biogas plant with the help of a labelled diagram.

**Answer:**
**Biogas :** Biogas is a mixture of gases formed when slurry of animal dung and water is allowed to ferment in the absence of oxygen (or air). Biogas is a mixture of methane, carbon dioxide, hydrogen and traces of hydrogen sulphide along with water vapours. Its chief component methane is used as fuel.

**Fixed dome type biogas plant :** It consists of follows parts :

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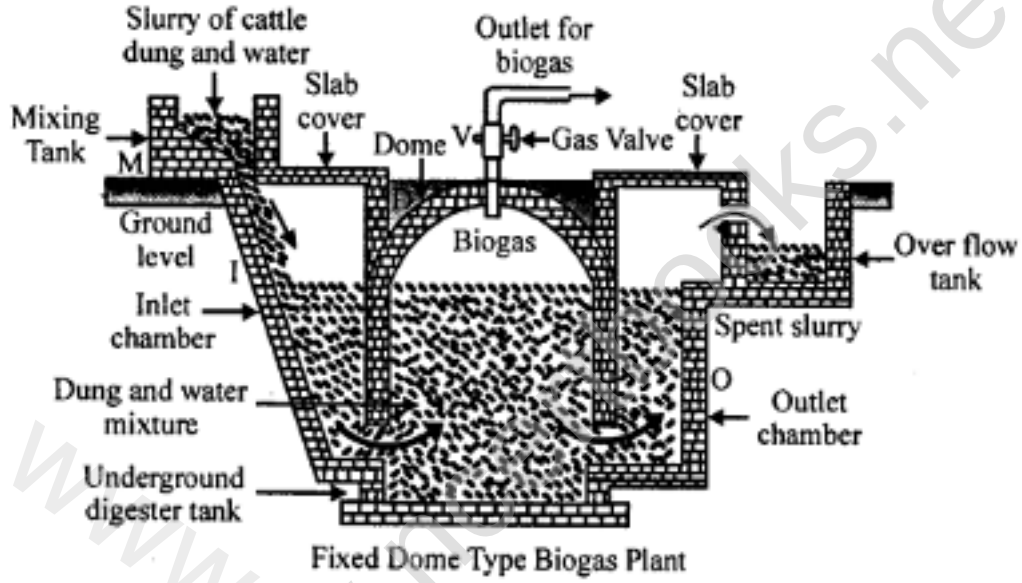
**Digester tank :** It is an underground tank. Its base and walls are made of bricks and cement. Its roof is made in the form of dome either with cement or bricks or with concrete. The dome collects the biogas. It is provided with an outlet for biogas. The outflow of the gas is controlled by gas valve.

**Slurry mixing tank :** On the left hand side of the digester is constructed a brick lined tank above the ground level. The bottom of this tank connects the digester through a brick-lined channel near the base.

The fresh slurry of animal dung and water in equal proportions is poured into the slurry mixing tank. This slurry slowly flows into the digester.



Fixed Dome Type Biogas Plant

**Spent slurry tank :** On the right hand side of the digester is constructed spent slurry tank, below the ground level. The base of this tank is in line with the lowest point of the dome of the digester. The base of this tank is connected to the base of the digester through a brick-lined channel.

**Working of fixed dome type biogas plant :** Everyday the slurry of animal dung and water in equal proportions is poured into the mixing tank. This slurry flows into the digester. In the digester anaerobic fermentation starts with the release of biogas. The biogas formed collects in the dome.
As more and more slurry flows into the digester everyday, the level of slurry rises up. It takes about 30 to 60 days for the slurry to fill the digester depending upon the temperature within the digester. During this time the biogas collects in the dome under pressure.

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When the pressure of biogas exceeds certain limit, the biogas forces the spent slurry into overlfow tank. The biogas is withdrawn from the dome through outlet pipe. Its flow is regulated by a gas valve. The spent slurry is periodically removed and is allowed to dry. It is then used as manure.
Once the biogas plant gets operative, it is a continuous process. Everyday fresh slurry is added in the mixing tank and spent slurry is removed from the overflow tank.

**Question 16.**
Name an agent which decomposes animal dung into biogas.

**Answer:**
Anaerobic bacteria decomposes animal dung into biogas.

**Question 17.**
Write any two uses of biogas.

**Answer: Uses of biogas :**

1. It is used for cooking.
2. Its calorific value is very high.
3. It is an eco-friendly source of energy.

**Question 18.**

**(a)** Name the kind of energy possessed by the wind.
**(b)** State two advantages and two limitations of wind as a source of energy.

**Answer:**
**(a)** Kinetic energy is possessed by wind.
**(b) Advantages of wind energy :**

1. It does not cause any kind of pollution.
2. It is a renewable source.

**Limitations of wind energy :**

1. The wind farms can be establishes only at places when wind blows around the year steadily.
2. A large area of land is needed to establish a wind farm.

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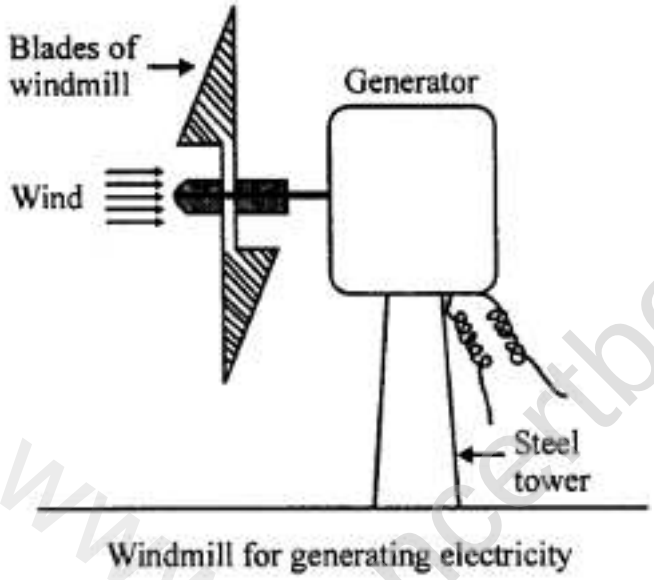
**Question 19.**
With the help of a diagram explain how wind energy is converted into electric energy.

**Answer:**
**Windmill :** It is a machine which converts kinetic energy of wind into electrical energy. A windmill consists of two or three blades like an electric fan which rotates about an axle mounted on a pole.
The shaft of the windmill is connected to the shaft of armature of a generator. When the fast moving wind rotates the blades of windmill, its shaft rotates the armature inside the generator. The rotating armature produces electric current. Thus, the kinetic energy of wind is converted into electric energy.



Windmill for generating electricity

**Question 20.**

**(a)** What do you understand by the term hydroelectric power?
**(b)** Explain the energy changes taking place in a hydroelectric dam?

**Answer:**
**(a) Hydroelectric power :** Hydroelectric power is the power derived from energy of falling water or fast running water. A hydroelectric power plant is an arrangement in which the kinetic energy of flowing water is transformed into electric energy and the electric energy so generated is called hydroelectric energy.
**(b) Energy changes taking place in a hydroelectric dam :**

1. As the water flows into reservoir from the catchment area, the kinetic energy of flowing water changes to potential energy.
2. As the water is released through control valve, the potential energy of water changes to kinetic energy.

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3. As the water flowing at a high speed strikes the blades of the turbine, its kinetic energy changes to rotational kinetic energy of the turbine.
4. As the turbine is coupled to the shaft of generator, the rotational kinetic energy of turbine changes to the rotational kinetic energy of armature.
5. As the coils of armature rotate in magnetic field, the rotational kinetic energy of armature changes to the electric energy in its coils.

**Question 21.**
State two advantages and two limitations of Hydel Power.

**Answer:**
**Advantages of Hydel Power :**

1. It does not produce any environmental pollution.
2. It is renewable source of energy.
3. Dam help us in irrigation and they control floods.

**Limitations of Hydel Power :**

1. The flowing water is not available every where.
2. The ecological balance in the downstream areas of rivers gets disturbed.

**Question 22.**
Give four reasons, why the use of cowdung in biogas preferred to burning of cowdung cakes.

**Answer:**
**Use of cow-dung in biogas is preferred to burning of cow-dung cakes because :**

1. Biogas does not produce any smoke and hence causes no pollution.
2. Biogas leaves behind no ash on burning.
3. Calorific value of biogas is very high as compared to cow-dung cakes.
4. Biogas can be used for driving engines of tube wells while cow-dung cakes can not be used for this purpose.

**Question 23.**
Why is charcoal considered better fuel than wood?

**Answer:**
Charcoal is considered a better fuel than wood because of the
**following reasons :**

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1. Calorific value of charcoal is higher than the calorific value of wood.
2. It produces no smoke.
3. It burns easily without any flame.

**Question 24.**
Name two forms of sea energy.

**Answer:**
**Two forms of sea energy are :**

1. Tidal energy
2. Wave energy

**Question 25.**
By which name heat energy in the interior of earth is known?

**Answer:**
Geothermal energy.

**Question 26.**
Name the major constituent of natural gas.

**Answer:**
Methane is the major constituent of natural gas.

**Question 27.**
Name the nuclear process that is responsible for

1. explosion of an atom bomb
2. release of energy by sun.

**Answer:**

1. Nuclear fission is responsible for explosion of atom bomb.
2. Nuclear fusion is responsible for release of energy by the sun.

**Question 28.**

1. Define nuclear fission
2. Nuclear fusion.

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**Answer:**

1. **Nuclear fission :** The process by which a heavy unstable nucleus (such as w-235) is broken into two medium-weight nuclei by the bombardment of a slow neutron, so as to liberate more neutrons and tremendous amount of energy is called nuclear fission.
2. **Nuclear fusion :** The process in which two or more light nuclei combine together to form a heavy nucleus along with the release of very large amount of energy is called nuclear fusion.

**Question 29.**
**Describe condition for**

1. nuclear fission
2. nuclear fusion.

**Answer:**

1. Bombardment of slow neutrons on heavy unstable nucleus (such as U-235).
2. A very high temperature of the order of millions of degree Calsius is required for nuclear fusion.

**Question 30.**
Explain the difference between nuclear fission and nuclear fusion.

**Answer:**
**Difference between nuclear fission and nuclear fusion are :**

**Nuclear fission :**

1. In a nuclear fission, a heavy nucleus splits up into lighter nuclei.
2. Harmful radiations are emitted in nuclear fission
3. It starts when slow neutrons bombards the heavy nucleus like ranium-235
4. It causes much pollution.
5. A large amount of energy is released in nuclear fission.
6. It can be controlled.

**Nuclera fusion :**

1. In a nuclear fusion, two or more light nuclei combine to form a heavy nucleus.
2. No harmful radiations are emitted in nuclear fusion.
3. It starts when light nuclei are heated at very high temperautre.

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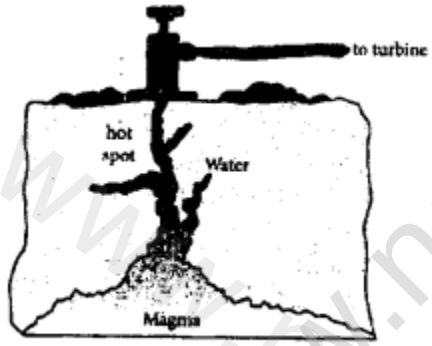
4. It causes no pollution.
5. Energy released in nuclear fusion is much more than nuclear fission.
6. It can not be controlled.

**Question 31.**
Explain how geothermal energy is used in generating electricity.

**Answer:**
**Geothermal energy :** The natural occurring thermal energy found within rock formations of the earth and the fluids hold within those formations is known as geothermal energy. The places under the surface of the earth, where the hot magma collects at fairly less depths, are called hot spots of the earth. The hot spots are the source of the geothermal energy which is used to generate electricity as follows :
**(i)** In some geological regions of the earth, the underground water comes in contact with hot spots and changes into steam. The steam so formed gets trapped between the underground rocks and gets compressed to very high pressure. This steam is extracted from the ground by sinking pipes from the surface of the earth. The steam coming up at high pressure is used in running turbines connected to the generator. This in turn produces electric energy.



Geothermal energy

**(ii)** In some place, the steam formed under the surface of the earth does not get trapped. Instead it forces its way up through the cracks in the rocks along with hot water and rushes out from the surface of the earth to form natural geysers. The heat energy brought up by the natural geysers is used to generate electricity as stated above.
**(iii)** In some geological regions of the earth, there may be hot spots, but the underground water does not come in contact with them. In such regions, two holes are made in the Earth's crust. Through one hole is pumped in cold water. The cold water on coming in contact with hot spot changes to super heated steam, which emerges out from the other hole. The steam is then made to run a turbine coupled with generator to produce electricity.

**Question 32.**
What are hot spots? How can you extract energy from a hot spot, if it does not come in contact with underground water?

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**Answer:**
**Hot spots :** The places under the surface of earth, where hot magma collects at fairly less depths, are called hot spots of the earth.
If hot spot does not come in contact with underground water then two holes are made in the earth's crust. Through one hole is pumped in cold water. The cold water on coming in contact with the hot spot changes to super heated steam, which emerges out from the other hole. The steam is then made to run a turbine coupled with generator to produce electricity.

**Question 33.**
Explain, why nuclear fusion is not being used to meet day to day energy needs.

**Answer:**
Nuclear fusion is not being used to meet day to day energy needs because extremely high temperature and pressure is required to initiate the nuclear fusion. Such an extremely high temperature and pressure can not be achieved in daily life in a controlled way.

**Question 34.**
What is nuclear waste? What are hazard of nuclear waste to living beings? How is nuclear waste disposed off?

**Answer:**
**Nuclear waste :** Nuclear waste is the material that nuclear fuel becomes after it is used in a reactor.
**Hazards of nuclear waste :**
**(i)** Nuclear waste can cause environmental contamination which can affect the health of millions of people.
**(ii)** Nuclear waste is the source of radiations which can lead to the following disorders:

**(a)** Radiations can cause genetic disorders.
**(b)** These can cause leukemia.
**(c)** These can destroy the immunity and hence may lead to death.
**(d)** Long exposure to radiations can cause cancer, blindness etc.

**Question 35.**
What are environmental consequences of using fossil fuels?

**Answer:**
**Environmental consequences of using fossil fuels are :**

1. Burning of fossil fuel causes air pollution.

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2. Burning of fossil fuel can cause acid rain which corrode the buildings, monuments and reduces the fertility of the soil.
3. Smog is caused by burning of fossil fuels which block the sun's radiations and hence hamper the process of photosynthesis.
4. Burning of fossil fuels release green house gases, which in turn be the source of global warming.

**Question 36.**
Energy from various sources is considered to have been derived from the Sun. Do you agree? Justify your answer by giving two examples.

**Answer:**
Yes, sun is the ultimate source of energy directly or indirectly, all the forms of energy derived from solar energy.
**(i) Non-renewable sources of energy :** Fossil fuels like coal, petroleum and natural gas are formed due to burial of large plants and ancient creatures whose ultimate source of energy is sun.
**(ii) Renewable sources of energy :** They are indirectly derived from solar energy such as :

**(a) Energy from flowing water :** In lakes, rivers, seas etc., evaporates due to solar energy. They bring rainfall and snow fall.
**(b) Wind energy :** Wind energy arises due to uneven heating of the earth's surface by the sun rays at two different adjoining places. Due to this, wind possesses kinetic energy.
**(c) Bio energy :** Plants in the process of photosynthesis convert the solar energy into food (chemical energy). This food is consumed by animals.
**(d) Wave energy :** The waves are generated by strong winds (due to solar energy) blowing across the sea.
**(e) Ocean thermal energy :** Sun is responsible for the temperature difference between the water at the surface and water at depth in seas and oceans.

**(iii) Solar devices :** They derive their energy directly from solar energy and convert it into other usable forms of energy.

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