SOURCES OF ENERGY

1. **What is a good source of energy ?**
   A good source of energy is one which
   (i) does maximum useful work per unit of its mass or volume.
   (ii) Is easy to store and carry and is easily available.
   (iii) Causes less pollution of the environment.
   (iv) Economical
2. **What are the qualities of an ideal fuel ?**
   (i) an ideal fuel is that gives us more heat per unit mass.
   (ii) Which does not pollute the environment by emitting harmful gases.
   (iii) It should be cheap and economical.
   (iv) Is easy to handle , safe to transport and convenient to store.

3. **Write two examples of fossil fuel. Why are they preferred to wood.**
   Coal and petroleum are two examples of fossil fuel.
   Fossil fuels have higher calorific value compared to wood so they are preferred.

4. **On what basis would you classify energy source as a renewable and non-renewable** ?
   We regard an energy source as renewable if it becomes available again and again after a short period of time. eg. Solar energy, wind energy and water energy are some of the energy sources that can be regarded as renewable.
   An energy source is regarded as non-renewable if, after use, it does not become available again after a long period of time. eg. Fossil fuels.

5. **What are the disadvantages of fossil fuels ?**
   (i) The fossil fuels are non-renewable sources of energy. Air pollution is caused by burning fossil fuels.
   (ii) The oxides of carbon, nitrogen and sulphur that are releases on burning fossil fuels are acidic oxides. These lead to acid rain which affects our water and soil resources.
   (iii) Carbon dioxide produced by burning these fuels produces green house effect.
6. **Why we are looking at alternate sources of energy ?**
   We are looking at alternate sources of energy because
   (i) the fossil fuel reserves in the earth are limited which may be get exhausted soon if continued to used at current rate.
   (ii) The use of alternate sources of energy will reduce pressure on fossil fuels making them last for a much longer time.
   (iii) The pollution being caused by the burning of fossil fuels can be avoided by using alternate sources of energy.

7. **Explain why a sheet of glass is used in solar heating devices ?**
   Glass sheet has a property that allows the infra-red rays of short wavelength from the sun to get in the device and does not allow the infra red rays of long wavelength to leave the solar heating device. Therefore, heat energy is trapped inside the heating device. Hence a green house effect is produced by the glass sheet.

8. Explain why a) a reflector is used in a solar cooker ?
b) the inner surface of the solar cooker is painted black ?

a) The reflector is used to increase the area over which the solar energy is collected so that more and more heat rays of the sun may enter the solar heating device thereby increasing the efficiency of the solar cooker.

b) Black colour is a very good absorber of heat energy but a poor reflector. So it is used to absorb the maximum heat from the sunlight.

9. a) State the principle of solar heating devices.
b) Describe the construction of a box type solar cooker
c) Mention two advantages and two limitations of solar cookers.

A solar cooker is a device which is used to cook food using solar energy.

Principle : heat absorbing property of black bodies.
The green house effect produced by the glass sheet.

- Construction : It consists of an insulated box, which is painted with black paint from inside, so that it absorbs maximum amount of heat radiations.
- A glass sheet which covers the box. Which allows solar rays to enter the box but does not allow the heat radiations to escape out of the box.
- A plane mirror hinged at the top of the box to reflect solar rays on to the box.
- The food to be cooked is placed in a metal container which is painted black.

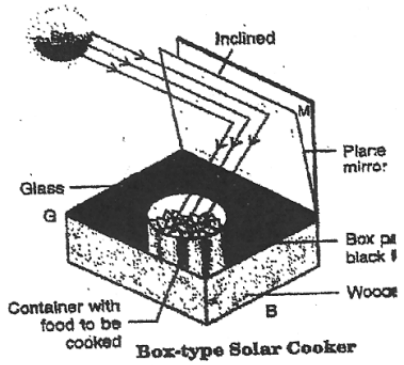
Solar cooker is kept in sunlight in such a way that the solar radiation is focused on to the box. The solar radiations pass through the glass sheet and gets absorbed by the black surface and the temperature slowly rises up and reaches 100°C to 140 °C.

Advantages :

(i) it is a renewable source of energy.
(ii) It does not cause any pollution.
(iii) It is economical.

Drawbacks

(iv) Solar cooker is adjusted from time to time so that it faces the sun.
(v) Solar cooker does not work at night and during cloudy days.



Box-type Solar Cooker

10. a) What is a solar cell ?
b) Name any two areas where solar cells are used as a source of energy.
c) state the limitations of solar energy available from solar cells ?

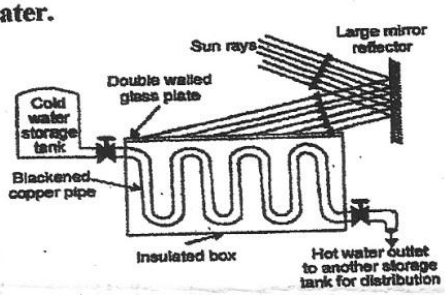
a) solar cell is a device usually made of silicon that helps to convert solar energy into electrical energy.

b) Solar cells are used as a source of energy
   (i) in all artificial satellites
   (ii) at TV relay stations and research centers located in areas where there is no usual supply of electrical energy.

Advantages : Has no moving parts and focusing device, requires little maintenance.

c) A typical solar cell can produce only a very small amount of approx. 0.7 W of energy from the energy of the sun.
The cost of fabricating a solar cell is expensive.

11. On what principle does a solar water heater operate. Draw a labeled schematic diagram for a solar water heater.



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Principle : heat absorbing property of black bodies.
The green house effect produced by the glass sheet.

A solar water heater consists of thick copper pipe in the form of a coil and its surface is painted black.. It is enclosed in a box made of an insulating material and covered with a plane glass sheet. When sunlight is focused on to the box, the copper pipe gets heated up resulting in the heating of the water circulated through it.

12. Explain the working of a windmill.

A windmill is basically like a large fan, fixed on a rigid support, that is kept at a good height above the ground. When wind blows, the blades of the fan are set into motion. Their motion can then be used to rotate some device (like a turbine) connected to them. This helps us to convert the energy of the wind into some other useful form of energy (like electrical energy).

13. Electricity generated with windmill is another form of solar energy. Explain.

When the sun shines a part of solar energy is absorbed by air, which in turn gets hot, becomes less dense and rise up, thereby causing a region of low pressure. To make up for this loss in pressure the air from surrounding regions starts blowing, thereby giving rise to wind, which has K.E. The kinetic energy of the wind then changes into mechanical energy of the blades of windmill, which in turn drives the dynamo to produce electricity.

14. a) What is a wind energy farm?
b) Why is it essential to locate wind energy farms in specific locations.
c) List two limitations of harnessing wind energy.

a) A large area where many windmills are erected to tap electrical energy from the wind energy is called wind energy farm.
b) It can be constructed in those regions where the wind blows for most part of the year. The minimum speed of the wind should be 15 km/hr.
c) (i) Needs very large area for constructing wind energy farms.
(ii) Needs higher level of maintenance.

15. How is Geo thermal energy used to generate electricity.
State the advantages and limitations of harnessing geothermal energy.

The molten rocks formed in the deeper regions of earth's crust are pushed upward and trapped in certain regions called 'hot spots'. When underground water comes in contact with the hot spot, steam is generated. The steam trapped in rocks is routed through a pipe to a turbine and used to generate electricity.
Advantage : An environmental friendly source of energy and cost effective.
Limitations : There are few commercially viable sites where such energy can be exploited.

16. Electricity generated at hydroelectric power station is considered to be another form of solar energy. Explain.

When the sun shines, the heat energy supplied by it evaporates the water and changes into the kinetic energy. As the water vapour rises up, the kinetic energy changes into potential energy. When the condensation takes place and ultimately, it rains, a part of the potential energy changes into kinetic energy of the falling rain water. When this rain water is stored in the dams, it is in the form of potential energy. When the stored water drives the turbine of the dynamo, the potential energy first changes into kinetic energy then mechanical energy and finally electrical energy. Thus, electrical energy so generated is another form of solar energy.

17. Mention any two advantages and disadvantages of producing hydroelectricity by building dams on rivers.
Advantages: To generate electricity.
Helps in irrigation and in controlling floods.
Disadvantages : large land area gets submerged causing environmental and social problems
destroys natural habitats of plants and animals.

18 . Describe the two ways of getting useful energy from water of ocean.

(i) Tidal energy – This energy is generated by rising and falling water in tides.
(ii) Ocean thermal energy – this energy is possessed by the difference in temperatu between warm surface water heated by sun and colder water found at ocean dep

19. What are the limitations of the energy that can be obtained from the oceans ?

(i) Tidal energy is not likely to be a potential source of energy in future because ther are very few sites around the world which are suitable for building tidal dams.
(ii) Wave energy would be a viable proposition only where waves are very strong.
(iii) The energy potential from the sea is quite large, but efficient commercial exploits is difficult.

20. Why are fossil fuels classified as non renewable sources of energy. What steps should be taken to conserve them.

It takes millions of years in the formation of fossil fuel. As these fuels cannot be regenerated in reasonable time, therefore, they are called non renewable sources of energy.

Following steps are taken to conserve the fossil fuels

(i) Using these fuels judiciously.
(ii) Using alternate sources of energy such as wind energy, hydro - energy, solar energy etc.

21. Define nuclear fission.

Nuclear fission is the process in which a heavy nucleus (Uranium) is split into lighter nuclei when hit by a thermal neutron with a release of large amount of energy.

22. What is a nuclear reactor ?

Reactor in which nuclear fission reaction is carried out in a controlled manner, so that energ is released at a steady rate are known as nuclear reactor. Nuclear reactors are used for generating electrical energy from nuclear energy.

23. State the major hazard of nuclear power generation from a nuclear reactor.

(i) major hazard is the storage and disposal of spent or used fuels.
(ii) Improper nuclear waste storage and disposal result in environmental contamination.
(iii) Risk of accidental leakage of nuclear radiation
(iv) High installation cost of the nuclear power plant.

24. What are advantages of nuclear energy ?

(i) it produces a huge amount of energy from a very small amount of nuclear fuel.
(ii) It is used for generating electricity

25. Why charcoal is considered a better fuel than wood ? What are the disadvantages Of converting wood into charcoal ?

Charcoal is considered as better fuel than wood because :

(i) it has high calorific value
(ii) it does not produce any smoke.

One kg of wood on destructive distillation only produce 0.25 kg of charcoal, it is its main disadvantage as charcoal proves to be an expensive fuel.

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26. Compare and contrast biomass and hydroelectricity as sources of energy.

(i) bio-mass is a renewable source of energy only if we plant trees in a planned manner which is not in the case of hydro electricity.

(ii) Biomass provides pollution free energy only when converted into biogas whereas hydroelectricity is totally pollution free source of energy.

27. a) What is biogas. How is it produced ?

b) with the help of a labeled diagram explain the production of bio-gas.

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

- The biogas plant has a dome-like structure built with bricks.
- A slurry of cowdung with 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 to decompose breaks down the complex compounds of the slurry.
- It takes few days for the decomposition to take place completely and generate gases.
- The slurry left behind acts as an excellent manure.
- The biogas is stored in the gas tank above the digester from which they are drawn through pipes for use. (Diagram Refer text book)

28. What are the advantages of preferring bio-gas compared to other fuels?

(i) Biogas is an excellent fuel as it contains 75 % of methane.

(ii) It burns without smoke and leaves no residue

(iii) It is used for lighting.

29. Hydrogen has been used as a rocket fuel. Would you consider it a cleaner fuel than CNG ? Why or why not ?

Hydrogen is a cleaner fuel than CNG (Compressed Natural Gas) because the burning of hydrogen produces only water, which is completely harmless. The burning of CNG produces carbon dioxide and water. This Carbon dioxide produce green house effect in the atmosphere a lead to excessive heating of the environment in the long run.

30. What are the environmental consequences for the increasing demand for energy. What steps would you suggest to reduce energy consumption ?

(i) Burning of fossil fuels to meet increasing demand for energy causes air-pollution.

(ii) Construction of dams on rivers to generate hydroelectricity destroys large eco-syste

In order to reduce energy consumption.

(i) Fossil fuels should be used with care and caution.

(ii) Fuel saving devices should be used.

(iii) Efficiency of the energy source should be maintained by getting them regularly servic

(iii) We should be economical in energy consumption as energy saved is energy produc