Multiple Choice Questions

1. Which of the following is a non-renewable source of energy?
(a) Wood
(b) Sun
(c) Fossil fuels
(d) Wind

Soln:

Answer is (b) Sun

2. Acid rain happens because
(a) sun leads to heating of upper layer of atmosphere
(b) burning of fossil fuels release oxides of carbon, nitrogen and sulphur in the atmosphere
(c) electrical charges are produced due to friction amongst clouds
(d) earth atmosphere contains acids

Soln:

Answer is (b) burning of fossil fuels release oxides of carbon, nitrogen and sulphur in the atmosphere

Explanation:

Acid rain happens when rain water mixes with oxides of Carbon, Nitrogen and Sulphur in the atmosphere.

3. Fuel used in thermal power plants is
(a) water
(b) uranium
(c) biomass
(d) fossil fuels

Soln:

Answer is (d) fossil fuels

Explanation:

Coal is the major fossil fuel used in thermal power plants. Along with coal natural gas and petroleum are also used.

4. In a hydro power plant
(a) Potential energy possessed by stored water is converted into electricity
(b) Kinetic energy possessed by stored water is converted into potential energy
(c) Electricity is extracted from water
(d) Water is converted into steam to produce electricity

Soln:

Answer is (a) Potential energy possessed by stored water is converted into electricity .

Explanation:

Water stored in dams possess potential energy. When it is released it possess potential energy which is used to turn the turbines. Turbines produces electricity.

5. Which is the ultimate source of energy?
(a) Water
(b) Sun
(c) Uranium
(d) Fossil fuels

Soln:

Answer is (b) Sun

Explanation:

Plants produce food by using solar energy. Fossil fuels are produced from dead plants. Hence Sunlight is the source of all energy either directly or indirectly.

6. Which one of the following forms of energy leads to least environmental pollution in the process of its harnessing and utilisation?
(a) Nuclear energy
(b) Thermal energy
(c) Solar energy
(d) Geothermal energy

Soln:

Answer is (c) Solar energy

Explanation:

In nuclear energy metals like uranium are used which releases harmful rays than can affect the living organisms. In Thermal energy coal is used which releases Sulphur and Carbon-di-oxide and causes air pollution. In the case of geothermal energy the energy is absorbed by the pressure by the heat from the core which can sometimes be extremely hot and dangerous.

7. Ocean thermal energy is due to
(a) energy stored by waves in the ocean
(b) temperature difference at different levels in the ocean
(c) pressure difference at different levels in the ocean
(d) tides arising out in the ocean

Soln:

Answer is (b) temperature difference at different levels in the ocean

Explanation:

Energy from surface is used to boil volatile liquid. Vapors from these are utilized to turn the turbine.

8. The major problem in harnessing nuclear energy is how to
(a) split nuclei?
(b) sustain the reaction?
(c) dispose off spent fuel safely?
(d) convert nuclear energy into electrical energy?

Soln:

Answer is (c) dispose off spent fuel safely?

Explanation:

Nuclear plants produces highly radioactive material. This if released to the environment they pose major threat to living organisms. Hence, disposing the spent fuel safely is a major problem in harnessing nuclear energy.

9. Which part of the solar cooker is responsible for green house effect?
(a) Coating with black colour inside the box
(b) Mirror
(c) Glass sheet
(d) Outer cover of the solar cooker

Soln:

Answer is (c) Glass sheet

Explanation:

Green house effect is due the trapping of heat by the atmosphere. Heat is produced is due to presence of green house gases like CO_2, SO_2. In Solar cooker same thing happens. Solar energy trapped is reflected by the glass sheet which make the food cook.

10. The main constituent of biogas is
(a) methane
(b) carbon dioxide
(c) hydrogen (d) hydrogen sulphide

Soln:

Answer is (a) methane

Explanation:

Methane gas is the main product of biogas. Around 70% of the gas produced is methane and remaining will be ammonia, carbon-di-oxide.

11. The power generated in a windmill
(a) is more in rainy season since damp air would mean more air mass hitting the blades
(b) depends on the height of the tower
(c) depends on wind velocity
(d) can be increased by planting tall trees close to the tower

Soln:

Answer is (c) depends on wind velocity

Explanation:

High wind velocity will turn the turbine with at higher speed. This will increase the production of electricity.

12. Choose the correct statement
(a) Sun can be taken as an inexhaustible source of energy
(b) There is infinite storage of fossil fuel inside the earth
(c) Hydro and wind energy plants are non polluting sources of energy
(d) Waste from a nuclear power plant can be easily disposed off

Soln:

Answer is (a) Sun can be taken as an inexhaustible source of energy

Explanation:

Fossil fuel is an exhaustible source. Hydro and wind energy plants can have large environmental impacts by changing the environment and affecting land use, homes, and natural habitats in the dam area. Disposing off waste from a nuclear power plant is the major issue faced by nuclear plant.

13. In a hydroelectric power plant more electrical power can be generated if water falls from a greater height because
(a) its temperature increases
(b) larger amount of potential energy is converted into kinetic energy
(c) the electricity content of water increases with height
(d) more water molecules dissociate into ions

Soln:

Answer is (b) larger amount of potential energy is converted into kinetic energy

14. Choose the incorrect statement regarding wind power
(a) It is expected to harness wind power to minimum in open space
(b) The potential energy content of wind blowing at high altitudes is the source of wind power
(c) Wind hitting at the blades of a windmill causes them to rotate The rotation thus achieved can be utilised further
(d) One possible method of utilising the energy of rotational motion of the blades of a windmill is to run the turbine of an electric generator

Soln:

Answer is (b) The potential energy content of wind blowing at high altitudes is the source of wind power**.**

Explanation:

Wind power runs by kinetic energy of the wind. Hence statement b) is wrong.

15. Choose the incorrect statement
(a) We are encouraged to plant more trees so as to ensure clean environment and also provide bio-mass fuel
(b) Gobar-gas is produced when crops, vegetable wastes etc., decompose in the absence of oxygen
(c) The main ingredient of bio-gas is ethane and it gives a lot of smoke and also produces a lot of residual ash
(d) Bio-mass is a renewable source of energy

Soln:

Answer is (c) The main ingredient of bio-gas is ethane and it gives a lot of smoke and also produces a lot of residual ash

Explanation:

Main product of a biogas is methane. It burns with less smoke and did not produce residual ash.

Short Answer Questions

16. Why is there a need to harness non-conventional sources of energy? Give two main reasons.

Soln:

Following are the reason for the need to harness non-conventional sources of energy.

a) Conventional sources are exhaustible source of energy and they will get exhausted in the near future.
b) Non-conventional source of energy did not lead to environmental pollution.

17. Write two different ways of harnessing energy from ocean.

Soln:

1. Tidal energy
2. Ocean Thermal energy

18. What steps would you suggest to minimise environmental pollution caused by burning of fossil fuels?

Soln:

Steps to minimise environmental pollution caused by burning of fossil fuels are as follows.

1) Use con-conventional sources of energy such as hydrothermal and wind energy.
2) Afforestion should be adopted to control air pollution
3) Smokeless appliances should be used to reduce the pollution

19. What is the role of a plane mirror and a glass sheet in a solar cooker?

Soln:

Plane mirror reflect the sunlight thereby increasing the intensity of solar energy. Glass sheet prevents heat escape from solar cooker.

20. Mention three advantages of a solar cell?

Soln:

Advantages of a solar cell is as follows.

- Solar cells are the source of renewable energy
- Solar cells do not produce pollution
- Solar cells need minimum maintenance

21. What is biomass? What can be done to obtain bio-energy using biomass?

Soln:

Fuel obtained from organic material is called biomass. Following are the methods to obtain bio-energy using biomass.

a) Using firewood as a fuel
b) Preparing cowdung cake and use them as heating source
c) Gobar gas can be produced
d) Electricity can be produced by using gobar .

22. What are the limitations in obtaining energy from wind?

Soln:

Limitations in obtaining energy from wind.

- There will not be continuous and consistent production
- Area required to install wind power mill is large.
- Minimum speed of the wind should be 15 km/hour.

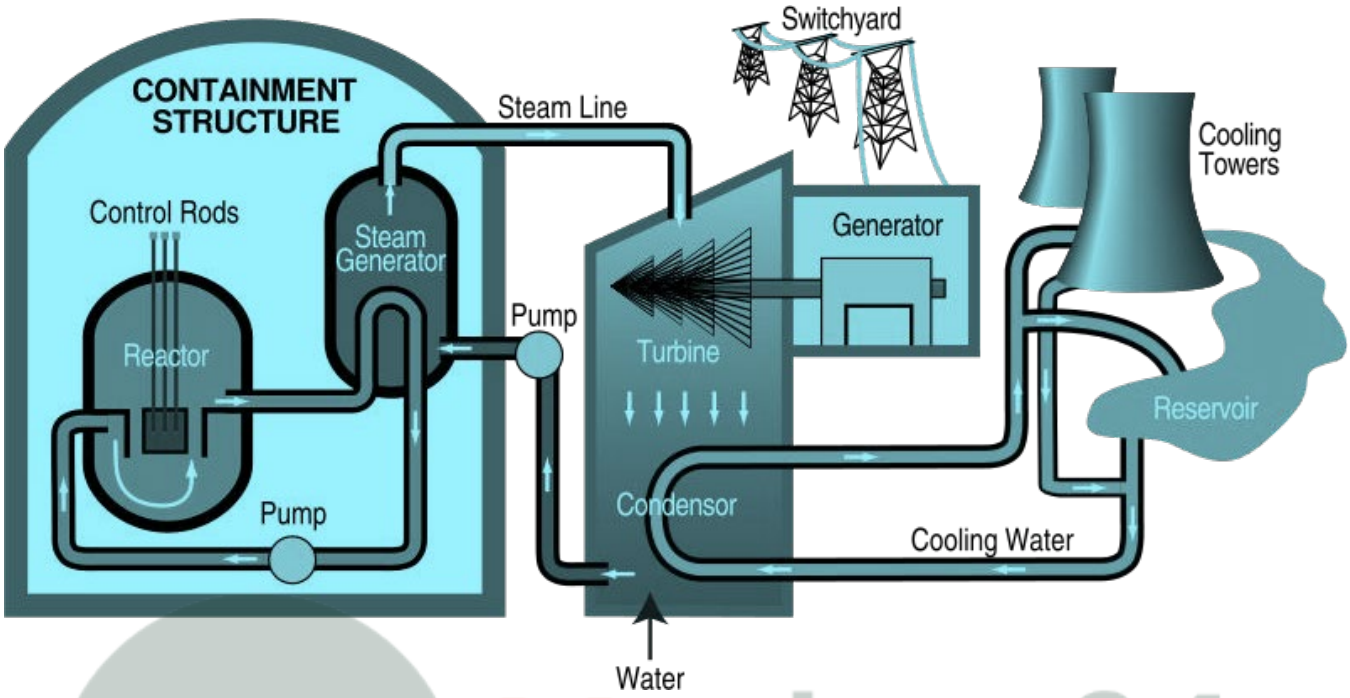
Long Answer Questions

23. Which is the process used to harness nuclear energy these days? Explain it briefly.

Soln:

Nuclear energy is harnessed in nuclear power plants. It has nuclear reactor, boiler and turbine.

- The nuclear reactor is the place where nuclear fission is carded out. Nuclear fission produces a huge amount of energy.
- Energy produced during nuclear fission is utilized to boil water, so that steam can be generated.
- Steam is utilized to turn the turbines to produce electricity.



24. How can solar energy be harnessed? Mention any two limitations in using solar energy. How are these limitations overcome?

Soln:

Solar Cookers and solar water heaters:

A black surface absorbs more heat as compared to a white or a reflecting surface under identical conditions. Solar cookers (Fig. 14.6) and solar water heaters use this property in their working. Some solar cookers achieve a higher temperature by using mirrors to focus the rays of the Sun. Solar cookers are covered with a glass plate. Solar energy trapped is reflected by the glass sheet which make the food cook.

Solar Cell

A typical cell develops a voltage of 0.5–1 V and can produce about 0.7 W of electricity when exposed to the Sun. A large number of solar cells are, combined in an arrangement called solar cell panel (Fig. 14.7) that can deliver enough electricity for practical use. The principal advantages associated with solar cells are that they have no moving parts, require little maintenance and work quite satisfactorily without the use of any focussing device. Another advantage is that they can be set up in remote and inaccessible hamlets or very sparsely inhabited areas in which laying of a power transmission line may be expensive and not commercially viable.

25. Make a list of conventional and non-conventional sources of energy. Give a brief description of harnessing one nonconventional source of energy.

Soln:

Conventional sources of energy are coal, petroleum, fire wood and tidal energy.

Non-conventional sources are Solar energy, nuclear energy, Biogas, Tidal energy, Ocean thermal energy, wave energy etc.

Methods to harness Non-conventional sources of energy.

Solar Energy can be harnessed by using solar cookers, solar water heaters, solar cells and solar panels.

Nuclear power can be converted to electric energy with the help of nuclear reactors.

The water at the surface of the sea or ocean is heated by the Sun while the water in deeper sections is relatively cold. This difference in temperature is exploited to obtain energy in ocean-thermal-energy conversion plants.

The kinetic energy possessed by huge waves near the seashore can be trapped in a similar manner to generate electricity. The waves are generated by strong winds blowing across the sea. Wave energy would be a viable proposition only where waves are very strong.

26. Why is there a need for harnessing non-conventional sources of energy? How can energy be harnessed from the sea in different ways?

Soln:

Following are the reason for the need to harness non-conventional sources of energy.

a) Conventional sources are exhaustible source of energy and they will get exhausted in the near future.
b) Non-conventional source of energy did not lead to environmental pollution.

Energy can be harnessed from the sea in following ways

Tidal energy:

Tidal energy 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. As you can guess, the locations where such dams can be built are limited.

Wave energy

The kinetic energy possessed by huge waves near the seashore can be trapped in a similar manner to generate electricity. The waves are generated by strong winds blowing across the sea. Wave energy would be a viable proposition only where waves are very strong.

Ocean Thermal Energy

The water at the surface of the sea or ocean is heated by the Sun while the water in deeper sections is relatively cold. This difference in temperature is exploited to obtain energy in ocean-thermal-energy conversion plants.

27. 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.

Soln:

Following are the consequences of using fossil fuels.

- Global warming will result due to increase in the level of Carbon-di-oxide,
- Sulphur oxides causes acid rain
- Burning of fossil fuels will result in accumulation of smog in big cities which will result in decreased visibility
- Air pollution leads to health hazrds to humans and animals.

Steps to minimise the pollution caused by various sources of energy including non-conventional sources of energy.

- Use of public transport
- Use of vehicles like electric bikes and bi-cycle that can reduce air pollution
- Adopting 3R's policy- reduce, reuse and recycyle.
- Afforestation

28. Energy from various sources is considered to have been derived from the sun. Do you agree? Justify your answer.

Soln:

Energy from various sources is considered to have been derived from the sun. Following points can justify the statement.

Energy from fossils fuels are indirectly harnessed from sunlight because. Plants trap sunlight to produce food which ultimately makes biomass. Biomass gets converted to fossil fuels.

- Biomass will be helping in obtaining wood and gobar gas.
- Water on the earth gets circulated because of kinetic energy possessed by sun.

- Waves and ocean are formed due to heating of water. Hence sun is indirectly responsible for harnessing Tidal, Wave and Geothermal energy.

29. What is biomass? Explain the principle and working of a biogas plant using a labelled schematic diagram.

Soln:

Sources of fuel obtaining from organic material is call as biomass.

Cow-dung, various plant materials like the residue after harvesting the crops, vegetable waste and sewage are decomposed in the absence of oxygen to give bio-gas.

The 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 compounds of the cow-dung slurry. It takes a few days for the decomposition process to be complete and generate gases like methane, carbon dioxide, hydrogen and hydrogen sulphide. The bio-gas is stored in the gas tank above the digester from which they are drawn through pipes for use.

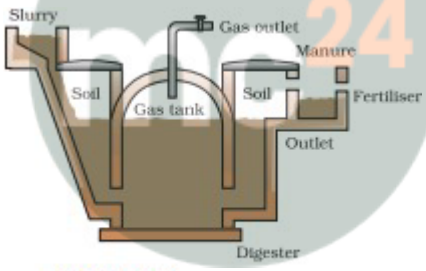


Figure 14.4
Schematic diagram of a bio-gas plant

Bio-gas is an excellent fuel as it contains up to 75% methane. It burns without smoke, leaves no residue like ash in wood, charcoal and coal burning. Its heating capacity is high. Bio-gas is also used for lighting. The slurry left behind is removed periodically and used as excellent manure, rich in nitrogen and phosphorous. The large-scale utilisation of bio-waste and sewage material provides a safe and efficient method of waste-disposal besides supplying energy and manure.