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Chapter – 14 Sources of Energy

Multiple Choice Questions

Q1. Which of the following is a non-renewable source of energy?

a) **Wood**
b) **Sun**
c) **Fossil fuels**
d) **Wind**

Answer: Option c)

Non-renewable sources of energy are exhaustible and cannot be replaced.

The fossil fuels are non-renewable sources of energy but wood, the sun and wind are renewable.

Q2. 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) **The earth atmosphere contains acids**

Answer: Option b)

Acid rain happens because of several human activities of polluting the atmosphere. The emission of carbon, sulphur and nitrogen from the industries, burning of fossil fuels etc. and also by the natural phenomena such as emission from volcanoes make the water vapour in the cloud more acidic thereby causing acid rain.

Q3. Fuel used in the thermal power plants is

a) **Water**
b) **Uranium**
c) **Biomass**
d) **Fossil fuels**

Answer: Option d)

The thermal power plant generates electric power from heat produced by burning fossil fuels, that is, coal and petroleum.

Everyday large amount of fossil fuels are burnt to heat up water to produce steam, which helps in running turbines to generate electricity.

Q4. 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**

Answer: Option a)

In a hydro power plant, water from the top of the dam fall through pipelines on blades of turbine at the bottom of the dam. The potential energy of water changes into kinetic energy which is transferred to the turbine.

The moving turbine rotates the armature of a generator to produce electricity, that is, turbine changes the kinetic energy into electricity. Hence, potential energy possessed by stored water is converted into electricity.

Q5. Which id the ultimate source of energy?

a) **Water**
b) **Sun**
c) **Uranium**
d) **Fossil fuels**

Answer: Option b)

The sun is ultimate source of energy is that, all forms of energy, directly or indirectly is diverted from sun, without sun food would not grow and thus, are unable to gain the energy to live.

Q6. 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**

Answer: Option c)

Solar energy cause least environmental pollution in the process of harnessing and utilisation.

Q7. 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**

Answer: Option b)

The water at surface of sea or ocean is heated by sun while the water in deeper sections is cold, as difference in temperature between these layers ranges from $10^oC\ to\ 30^oC$.

Q8. The major problem in harnessing under nuclear energy is how to

a) **Split nuclei**
b) **Sustain the reaction**
c) **Dispose of spent fuel safely**
d) **Convert nuclear energy into electrical energy**

Answer: Option c)

The major hazard of nuclear power generation is the storage and disposal of spent or used fuels. Improper nuclear-waste storage and disposal cause environmental contamination and risk of accidental leakage of nuclear radiation.

Q9. Which part of the solar cooker is responsible for greenhouse effect?

a) **Coating with black colour inside the box**
b) **Mirror**
c) **Glass sheet**
d) **Outer cover of the solar cooker**

Answer: Option c)

Glass sheet present in the solar cooker passes the radiation into the solar cooker and get absorbed and reflected back by coating is of longer wavelength and can't pass through the glass. So, glass sheet produces greenhouse effect in solar cooker.

Q10. The main constituent of biogas is:

a) **Methane**
b) **Carbon dioxide**
c) **Hydrogen**
d) **Hydrogen sulphide**

Answer: Option a)

The composition of biogas is;

Methane $(CH)_4$, 65-75% (combustible).

Carbon dioxide $(CO)_2$, 20-30% (non-combustible).

Hydrogen $(H)_2$, 5-10% (combustible)

Hydrogen sulphide H_2S, traces (combustible)

Nitrogen $(N)_2$, 2-6% (non-combustible)

Q11. 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**

Answer: Option c)

Wind energy farms can be located only in vast open areas located in favourable wind conditions as the minimum velocity for a windmill to function is 11 km/h to 16 km/h and is called as cut-in speed.

Q12. 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**

Answer: Option a)

The sun radiates an enormous amount of energy for nearly 5 billion years and will continue radiating for about 5 billion years more.

Q13. 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**

Answer: Option b)

In a hydroelectric power plant, more electrical power can be generated if water falls from a greater height because the rise in water level, causes the increase in potential energy of water.

So, when water flows from higher position then large amount of kinetic energy is formed by the conversion of potential energy and kinetic energy in the form of moving water to produce more electrical power.

Q14. 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**

Answer: Option b)

To generate wind power, we require wind at a very high speed. Due to this motion it possess kinetic energy and are capable of doing mechanical work by virtue of its motion.

The energy by the wind is due to its high speed. When the blowing wind strikes the blades of a windmill it exerts a force on them due to which the blades of the windmill start rotating which is used to run the turbine of an electric generator.

Q15. 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**

Answer: Option c)

Encouraging to plant more trees we ensure clean and pollution free environment and it also provide bio-mass fuel. The main part of bio-gas is methane which burns without smoke, leaving no residue like ash. Bio-mass is living matter and is a renewable source of energy.

Short Answer Type Questions

Q16. Why is there a need to harness non-conventional source of energy? Give two main reasons.

Answer:

i) The energy demands are increasing rapidly because of population explosion and our efforts to improve the quality of life by adopting faster means of transportation, rapid industrialization and extensive use of energy-fed appliances.

ii) The sources of energy which are available are mainly fossil fuels which are non-renewable sources of energy and are limited. It will get exhausted after a time being. Therefore, we need to harness non-conventional sources of energy.

Q17. Write two different ways of harnessing energy from ocean.

Answer:

i) Tidal energy is derived from rising and failing oceans tides is called tidal energy. The tidal energy is harnessed by constructing a tidal barrage or tidal dam across opening to the sea.

ii) Ocean thermal energy is solar energy stored in the oceans in the form of heat. Temperature difference between the deep ocean water and upper level is used to produce ocean energy called thermal energy conversion.

Q18. What steps would you suggest to minimise environmental pollution caused by burning of fossil fuel?

Answer:

Following steps can be taken to minimise the environmental pollution caused by burning of fossil fuels:

i) Converting land into forest by planting trees.

ii) Using the smokeless appliances and using various techniques to reduce the escape of harmful gases.
iii) Using clean fuels like CNG, LPG etc.
iv) By using public transport instead of private vehicles.
v) By increasing the efficiency of combustion process.

Q19. What is the role of a plane mirror and a glass sheet in a solar cooker?

Answer:

The role of the plane mirror and a glass in a solar cooker:

i) Plane mirror: they are used as reflector in solar cooker to focus the maximum rays of the sun into the cooker to achieve a higher temperature.
ii) Glass sheet: the transparent glass sheet kept over the open end of the heating devices allows the infrared rays and visible rays to enter the device but does not allow the infrared radiations to move cut of the heating device due to increase in the wavelength of radiation inside the cooker and the temperature of heating device rises appreciably.

Q20. Mention three advantages of a solar cell.

Answer:

The three advantages of a solar cell are:

i) Solar cell is pollution-free during use.
ii) It is maintenance cost is very low and work quite satisfactory without the use of any focusing device. It is also ultimate source of energy.
iii) It is a set up in remote and unreachable settlements or thinly inhabited areas where a power transmission line is expensive and not commercially viable.

Q21. What is bio-mass? What can be done to obtain bio-energy using biomass?

Answer:

The waste material of living things and dead parts of plants and animals are called bio-mass that is, wood, crop, residue, bagasse cow-dung cake is used as fuels for domestic as well as industrial uses.

Bioenergy in the form of biogas can be produced from biomass by the decomposition in the absence of air. Biomass such as wood, cow-dung etc, are directly used as fuel.

Q22. What are the limitations in obtaining energy from wind?

Answer:

The limitations in obtaining energy from wind are follows:

i) It is established in those places where wind blows whole year.
ii) The minimum wind speed necessary for working of a wind generator is 15 km/h.
iii) The setting up of wind energy farm is very expensive.
iv) Wind energy farm requires quite large area of land 2 hectares land is needed for 1 MW generator.
v) The wind energy farms rainfall pattern.

Long Answer Type Questions

Q23. Which is the process used to harness nuclear energy these days? Explain it briefly.

Answer:

Nuclear reactor is the process used to harness nuclear energy these days. Nuclear fission reaction takes place in the nuclear reactor. The reaction in which a heavy nucleus splits into two or more smaller nuclei with the evolution of large amount of energy, when it is bombarded with slow moving neutron is called nuclear fission.

The nucleus of a heavy atom when bombarded with neutrons, split apart into lighter nuclei and release of tremendous amount of energy. U-235 nucleus splits up broadly into two groups of nuclei

i) A heavy group of nuclei, with mass number in the range A=130 to A=149.
ii) A light group of nuclei with mass in the range A=85 to A=104.

The major hazards of nuclear reaction, power generation are as:

i) The improper nuclear-waste storage and disposal result into environmental contamination.
ii) There is a risk of accidental leakage of nuclear radiation causing huge loss.

iii) The high cost of setting up of a nuclear power plant with high risk of environmental pollution and limited obtainability.

Q24. How can solar energy be harnessed? Mention any two limitations in using solar energy. How are these limitations overcome?

Answer:

Solar energy is harnessed directly or indirectly which are as:

i) Direct utilisation: the direct utilisation of solar energy can be done either by collecting it as heat or by converting it to electricity.
ii) Indirect utilisation: it can be done by converting solar energy into chemical energy like bio-mass of plants etc.

The limitations of using solar energy are:

i) Energy reaching the surface is very much diffused so, direct utility is limited.
ii) It is not available uniformly at all the time and places.
iii) It is not available in night.
iv) It is not available on a cloudy night.

Q25. Make a list of conventional and non-conventional sources of energy. Give a brief description of harnessing one non-conventional source of energy.

Answer:

i) Conventional sources of energy are those which are used extensively and meet a major portion of our energy requirement. These are fossil fuels, hydro energy, biomass energy and wind energy.
ii) Non-conventional sources of energy are those which are not used as extensively as conventional and meet our energy requirement on a limited scale. These solar energy, ocean energy, geothermal energy and nuclear energy.

The harnessing of one conventional source of energy is:

Nuclear energy: Nuclear energy is produced by the release of heat from unstable elements such as uranium. The energy is harnessed by using the energy to heat water.

The radioactive water is then pumped through a heat exchange where the dirty water is used to heat clean water. The clean water is used to run turbines and other forms of engine.

Q26. Why is there a need for harnessing non-conventional sources of energy? How can energy by harnessed from the sea in different ways?

Answer:

There is need for harnessing non-conventional sources of energy because;

i) The demand for energy is increasing to meet the basic requirement of changed life-style, growing use of machines and industrialization, to improve living standards.
ii) The fossil fuels are non-renewable sources of energy and were formed over millions of years ago there are only limited reserves of fossil fuels.

The energy from the sea is harnessed in the different forms:

i) Tidal energy is harnessed by constructing a dam at a narrow opening to the sea. A turbine, at the opening of the dam converts tidal energy to electricity.
ii) Wave energy: devices are developed to trap waves near the seashore for rotation of turbine and generation of electricity.
iii) Ocean thermal energy: the water at the surface of the sea or ocean is heated by the sun while the water in depth parts is cold. This difference in temperature is help to obtain energy in ocean thermal energy conversion plants. These plants operate if the temperature difference between the surface water and water at depths up to 2 km is 293 K or more.

The warm surface water is used to boil a volatile liquid like ammonia and vapours are used to run the turbine of the generator. The cold water from the depths of the oceans is used to condense vapour.

Q27. What are the environmental consequences of using fossil fuel? Suggest the steps to minimise the pollution caused by various sources of energy including non-conventional sources of energy causes global warming?

Answer:

The environmental consequences are:

i) The air pollution caused by burning of coal and petroleum products.
ii) The oxides of carbon, nitrogen and sulphur are released as acidic oxides which cause acid rain affecting water and soil resources.
iii) The generation of greenhouse effect of gases like carbon dioxide leading to global warming.

The following are the steps to minimise the pollution caused by various sources of energy:

i) The pollution by burning the fossil fuel is reduced by increasing the efficiency of the combustion process and using various techniques to produce the smokeless appliances.
ii) The air pollution caused by burning of coal or petroleum products is reduced by afforestation.
iii) The planned use of energy minimises the pollution, that is, use of Liquid Petroleum Gas (LPG) and Compressed Natural Gas (CNG) as domestic fuel and in transportation.
iv) Proper and safe disposal of nuclear wastes.

Q28. Energy from various sources is considered to have been derived from the sun. Do you agree? Justify your answer.

Answer:

Yes, sun is the ultimate source of energy directly or indirectly, all the forms of energy are derived from solar energy, because,

i) Non-renewable sources of energy: fossil fuels like coal, petroleum and natural gas are formed due to burial of plants and creatures.
ii) Renewable sources of energy are indirectly derived from solar energy such as;

   a) Energy from flowing water: clouds are formed when water in lakes, rivers, seas, etc., evaporate due to solar energy bringing rainfall and snowfall. The rain and melting snow nourish rivers, streams etc and flowing water is used to get hydroelectricity.
   b) Wind energy is due to uneven heating of the earth's surface by the sun rays so a pressure difference is created and wind possess kinetic energy.
   c) Bio-energy: plants in the process of photosynthesis converts the solar energy into food which is consumed by animals. Thus, the animal wastes and remains of the plant form bio-mass which is a source of energy.
   d) Wave energy: the waves are generated by strong winds blowing across the sea.
   e) Ocean thermal energy is due to the temperature difference between the water at the surface and at depth in seas and oceans.

iii) Solar heating devices: they derive their energy directly from solar energy and convert it into other usable forms of energy, thus, energy from various sources is considered to have been derived from the sun.

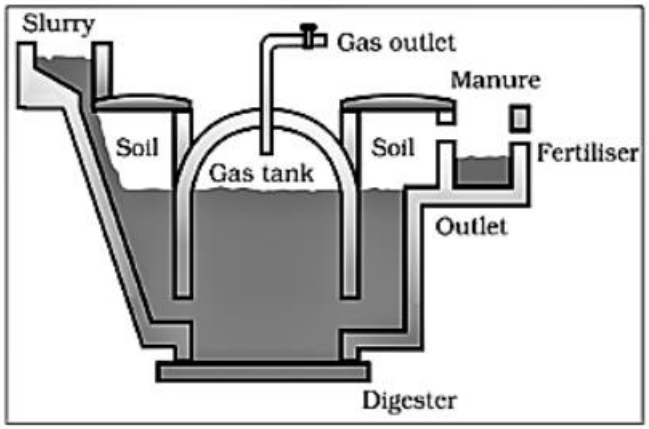
Q29. What is bio-mass? Explain the principle and working of a biogas plant using a labelled schematic diagram.

Answer:

Bio-mass is the organic fuel obtained from plants and animal wastes like wood, cow-dung, residue after harvesting the crop, vegetable waste and sewage, etc. These fuels, do not produce heat on burning and a lot of smoke is given out when they are burnt.

Principle –

The anaerobic micro-organisms decompose complex compounds of the cow-dung slurry in the absence of oxygen and generate gases like methane, carbon dioxide, hydrogen and hydrogen sulphide which burn without smoke and leaves no ash.



Schematic diagram of a bio-gas plant

Working:

The plant has a dome-like structure of bricks. A slurry of cow-dung and water is made in the mixing tank and fed into the digester which is a sealed chamber without oxygen. Anaerobic micro-organisms do not require oxygen decompose complex compounds of the cow-dung slurry and few days are required 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.