Very Short Answer Type Questions

[1 mark]

Q. 1. What type of reactions occur inside the Sun which produces solar energy?

Ans. The nuclear fusion reactions taking place inside the Sun produce solar energy.

Q. 2. Which of the following are renewable and which are non-renewable sources of energy?

Coal, wind, tides, Sun, petrol, biomass, CNG, hydro energy.

Ans. Renewable sources: wind, tides, Sun, biomass, hydro energy

Non-renewable sources: coal, petrol, CNG

Q. 3. Which part of Sun's energy is responsible for drying clothes and exposure to which part could be a health hazard?

Ans. Infra-red (IR) radiations are responsible for drying clothes and ultraviolet (UV) radiations could be a health hazard.

Q. 4. What type of energy is possessed by wind?

Ans. Kinetic energy

Q. 5. Though a hot iron emits radiations, yet it is not visible in the dark, why?

Ans. Hot iron emits infrared rays. These rays are invisible to the eyes.

Q. 6. What is bagasse?

Ans. Bagasse is the remaining part of the sugarcane from which juice has been extracted.

Q. 7. Define anaerobic degradation.

Ans. The decomposition which takes place in the absence of oxygen by anaerobic bacteria is called anaerobic degradation.

Q. 8. Name the main constituent of biogas.

Ans. The main constituent of biogas is methane (75%).

Q. 9. What is the minimum wind velocity required for obtaining useful energy with a windmill?

Ans. Minimum velocity required for obtaining useful energy with a windmill is about 15 km/h.

Q. 10. Name two forms of energy in which solar energy manifests itself in oceans.

Ans. (i) Tidal energy, and (ii) Ocean thermal energy.

Q. 11. Name any two materials that are used for making solar cells.

Ans. (i) Silicon, and (ii) Gallium or selenium.

Q. 12. What is the range of wavelength of electromagnetic waves that constitute visible radiation?

Ans. The range of electromagnetic waves is about 4000 Å to 7000 Å, which constitute visible radiation.

Q. 13. What steps would you suggest to help minimise environmental pollution caused by burning of fossil fuels?

Ans. (i) Use of smokeless appliances (ii) Afforestation

Q. 14. State the two forms of energy in which energy is mainly utilised at our homes.

Ans. (i) Heat energy, and (ii) light energy.

Q. 15. What are the different types of nuclear reactions?

Ans. There are two types of nuclear reactions:

(i) Nuclear fission (ii) Nuclear fusion.

Q. 16. Why does acid rain happen?

Ans. Acid rain happens because of burning of fossil fuels which release oxides of carbon, nitrogen and sulphur in the atmosphere.

Q. 17. What energy transformation occur in a hydro power plant?

Ans. In a hydro power plant potential energy possessed by stored water is converted into electrical energy.

Q. 18. What is a chain reaction?

Ans. A reaction in which the particle which initiates (starts) the reaction is also produced during the reaction to carry on the reaction further and further is called a chain reaction.

Short Answer Type Questions – I

[2 marks]

Q. 1. What is the use of the black painted surface in solar heating devices?

Ans. Black colour is a very good absorber of heat but a very poor reflector. So, it is used to absorb the maximum amount of heat from the sunlight. It is used in solar heating devices to maximise the absorption of heat and to minimise heat loss due to reflection

Q. 2. Give an example of indirect harnessing of solar energy.

Ans. All green plants prepare carbohydrates from carbon dioxide and water in the presence of sunlight by the process of photosynthesis. All non-green plants and animals directly or indirectly consume food from the green plants (producers) and store this food in their bodies in the form of chemical energy. In other words, solar energy is transformed into chemical energy.

Q. 3. State the important uses of wind energy.

Ans. The wind energy is used:

(i) To generate electricity.
(ii) To grind the wheat in flour mills.
(iii) To run a pump to draw water from the ground.

Q. 4. Write two advantages of classifying energy sources as renewable and non- renewable.

Ans. (i) The classification helps us to decide which of the available energy sources need to be conserved to ensure their availability for future generations.

(ii) The classification helps us to look for alternative sources of energy like solar and wind energy. It has, therefore, accelerated the pace of development of technologies suitable for harnessing new sources of energy.

Q. 5. Why is tidal energy not likely to be a potential source of energy?

Ans. The tidal energy is not likely to be a potential source of energy because:

(i) Only few sites are available around the world which are suitable for building field barrages, and

(ii) The rise and fall of sea water during high and low tides is not enough to generate electricity on a large scale.

Q. 6. Why is it not possible to make use of solar cells to meet all our energy needs? State at least two reasons to support your answer.

Ans. (i) In the solar cells, the energy is obtained only during the day, when the Sun shines.

(ii) In the solar cells, the solar panel convert solar energy into electricity, which is stored in storage battery. The storage battery give the direct current but all the appliances are working by the alternating current, so first of all direct current is converted into alternating current by any suitable appliance before it can be used to run various devices. So, it increases the cost of using solar panels as the source of energy.
So, the solar cell is not used to meet all our energy needs.

Q. 7. How is nuclear energy generated during nuclear fusion?

Ans. During fusion, two nuclei of Iight element combine to form a heavy nucleus with the release of tremendous amount of energy. There is some loss of mass during fusion process which is transformed into tremendous amount of energy.

Short Answer Type Questions – II

[3 marks]

Q. 1. Firewood is a conventional fuel. List any four reasons for replacing it with alternate sources of energy.

Ans. (i) Wood has low calorific value as compared to other sources of fuel.

(ii) It causes air pollution on burning.

(iii) Cutting down of trees causes depletion of forest leading to imbalance in nature.

(iv) Only 8-10% energy of burning firewood is utilised and the remaining is wasted.

Q. 2. State two advantages and two disadvantages of geothermal energy.

Ans. Advantages:

(i) The use of geothermal energy does not cause any pollution.

(ii) The use of geothermal energy is quite economical.

Disadvantages:

(i) It is not available everywhere.

(ii) Deep drilling in the Earth to obtain geothermal energy is very difficult.

Q. 3. What is biogas? Why is biogas considered an ideal fuel for domestic use?

Ans. Biogas is a combustible mixture of methane (about 75%), carbon dioxide, hydrogen and hydrogen sulphide gas. It is obtained by anaerobic decomposition of human and animal excreta and agricultural and urban waste materials.
Biogas is considered an ideal fuel for domestic use because of the following reasons:

(i) It has high calorific value.

(ii) It does not produce smoke.

Q. 4. Why is biogas a better fuel than animal dung cakes?

Ans. Biogas is a better fuel than animal dung cakes because:

(i) Burning of animal dung cake causes lot of pollution whereas biogas is a smokeless fuel.

(ii) The calorific value of animal dung cake is much lower than that of biogas.

(iii) Animal dung cakes leave residue after burning whereas biogas leaves no residue.

Q. 5. What causes the wind to blow?

Ans. The Sun rays fall on the equatorial region more intensively than on any other part of the Earth. Thus, the hot air of equatorial region, being lighter, rises upwards and cooler air from polar region starts blowing towards the equator to fill the space vacated by hot air.

This moving air is called wind. Therefore, Sun's energy causes winds on the Earth.

Q. 6. Give some uses and advantages of solar energy.

Ans. Uses:

(i) For cooking food in a solar cooker.

(ii) For heating water in solar geysers.

(iii) For generating electricity in space satellites, calculators, watches, etc., by solar cells.

(iv) For generating electricity on a large scale by a solar power plant.

(v) To melt metals in solar furnaces.

Advantages:

(i) It does not cause any pollution.

(ii) It is a renewable source of energy.

(iii) It is free of cost.

Q. 7. State the important uses of solar cells.

Ans. Solar cells are used

(i) for providing electricity in artificial satellites.

(ii) for lighting the street lights, traffic signals, running television sets and radio sets in remote areas.

(iii) for providing electricity in lighthouses.

(iv) for operating electronic watches and calculators.

Q. 8. Explain solar cell panel.

Ans. A solar cell is a device which converts solar energy directly into electricity. A group of solar cells is called a solar cell panel. It consists of a large number of solar cells joined together in a definite pattern. It provides a lot of electric energy required by artificial satellites, water pumps, street lighting, etc. For joining the various solar cells in a solar panel, silver wires are used because silver metal is the best conductor of electricity having a very low resistance and which also increases efficiency.

Q. 9. Explain why only a small part of the solar energy that strikes the upper regions of atmosphere reaches the surface of the Earth.

Ans. When the solar energy falls on the top surface of the atmosphere then the following happens:

(i) Some solar energy is reflected back into the space by the atmosphere, and

(ii) The atmosphere also absorbs a lot of solar energy, for example, most of the ultraviolet rays are absorbed by the ozone layer.

So, the solar energy which reaches us through the Earth's atmosphere are mainly in the form of heat rays (infra red rays) and visible light, which is a small part of the solar energy.

Q. 10. Why is charcoal considered a better fuel than wood? What are the disadvantages of converting wood into charcoal?

Ans. Charcoal is considered a better fuel than wood because:

(i) It has high calorific value.

(ii) It does not produce any smoke.

Disadvantages:

(i) 1 kg of wood on destructive distillation produces only 0.25 kg of charcoal making it an expensive fuel.

(ii) For production of charcoal, more and more trees would have to be cut down which causes deforestation and disturbs the ecological balance of the Earth.

Q. 11. Explain how the energy of flowing water is related to solar energy.

Ans. When solar energy falls on the water surface then evaporation of water from water surfaces like ocean, river and other water bodies takes place to form clouds. The clouds are then taken to distant place by air currents, and ultimately water comes back to the surface in the form of rain and snow. During evaporation, a part of solar energy gets converted into potential energy of water molecules. The potential energy of water molecules gets converted into kinetic energy during rain and snowfall.
Thus, energy of water flowing in a river is considered to be an indirect form of solar energy.

Q. 12. Mention any two advantages and two disadvantages of producing hydroelectricity by building dams on rivers.

Ans. Advantages:

(i) The generation of electricity from water does not produce any environmental pollution.

(ii) Water energy is a renewable source of electric energy which will never get exhausted.

Disadvantages:

(i) A vast variety of flora and fauna (plants and animals) get affected.
(ii) Dams can be constructed only at a limited number of places.

Q. 13. What is the importance of hydro power plants in India? Describe how electric energy is generated in such plants.

Ans. Importance: Hydro power plants are of prime importance as about 25 per cent of our energy requirement in India is met by hydro power plants.

(i) A high rise dam is constructed at a suitable place on the river to obstruct the flow of water and thereby, collect water in larger reservoirs. Due to rise in water level the kinetic energy of flowing water is transformed into potential energy of stored water

(ii) The water from the high level in the dam is carried through sluice gates and pipes to the turbine of electric generator, which is fitted at the bottom of the dam. Due to flowing water, turbine is rotated at a fast rate and hydel electricity is produced.

(iii) A hydro power plant converts the potential energy of falling/stored water into electricity.

Q. 14. (i) Name the device used to convert

(a) solar energy into heat, and **(b) solar energy into electricity,**

(ii) Explain the principle of working of a windmill.

Ans. (i) (a) Solar energy into heat: Solar cooker.

(b) Solar energy into electricity: Solar cell.

(ii) The wind rotates the blades of the windmill. This, in turn, rotates the connecting rod (shaft) and the crank (u-bend) moves up and down. Since the pump rod is connected to the crank, the pump rod of the water pump also moves up and down and lifts the water from the well or flooded mine. Thus, the rotational movement of the blades of the windmill is used to drive a large number of machines.

Q. 15. Describe the steps involved in obtaining biogas and explain what is meant by anaerobic decomposition.

Ans. Following steps are involved in obtaining biogas:

(i) Mixing (slurry of cattle-dung and water)

(ii) Digesting (cattle-dung undergoing decomposition by anaerobic bacteria).

(iii) Formation of biogas (mixture of methane, CO_2, H_2 and H_2S).

(iv) Spent slurry (residue left after the formation of biogas).

The process by which the biomass changes into biogas in the absence of air due to an anaerobic microorganism is termed as an anaerobic decomposition.

Q. 16. Biogas is considered to be a boon to the farmers. Give reasons.

Ans. Biogas is considered to be a boon to the farmers because:

(i) Farmers can produce clean domestic fuel from the wastes like animal dung, dry leaves, dry plants, etc.

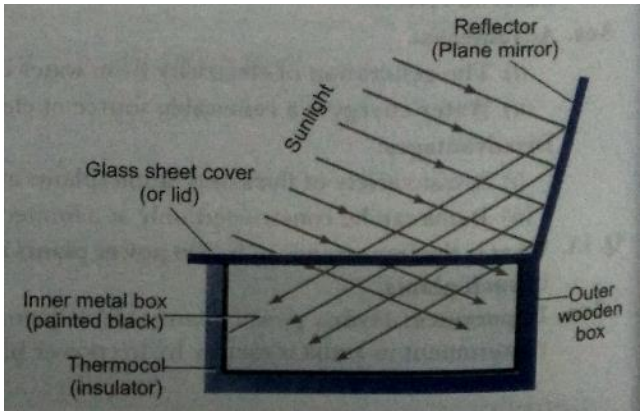
(ii) Spent slurry can be used in the fields as manure to increase the fertility of the soil.

(iii) Biogas can be used to generate electricity which can be utilised to run modern machines used in the fields to save time and energy.

Long Answer Type Questions

[5 marks]

Q. 1. Give the construction and working of a solar cooker.



Ans. A device that utilises solar energy for cooking purposes is called a solar cooker. The most commonly used form of solar cooker is known as box-type solar cooker. A box-type solar cooker is shown in the figure.

Construction of a box-type solar cooker: A box-type solar cooker consists of the following components:

(i) Box (B): This is an insulated metal or a wooden box. It is painted black from inside because black surface absorbs more heat. The box may be provided with four roll-wheels.

(ii) Glass cover (G): A cover made of two sheets of toughened glass held together in an aluminium frame is used as a cover of the box B.

(iii) Plane mirror reflector (R): A plane mirror reflector fixed in a frame is fixed to the box B with the help of hinges. The mirror reflector can be positioned at any desired angle to the box. The mirror is positioned so as to allow the reflected sunlight fall on the glass cover of the box.

(iv) Cooking containers (C): A set of containers made of aluminium and blackened from outside are kept in the box B. These containers are also painted black because black surface absorbs more heat.

Working: The food is cooked in a shallow vessel of the container. The box has a transparent covering of glass sheet over it. The solar cooker is placed in sunlight and reflector (plane mirror) is adjusted in such a way that a strong beam of sunlight enters the box through the glass sheet. The blackened metal surfaces in the wooden box absorb infra-red radiations from the beam of sunlight and heat produced raises the temperature of blackened metal surface to about 100^0C.

The food absorbs heat from the black surface and gets cooked. The thick glass sheet does not allow the heat produced to escape and thus, helps in raising the temperature in the box to a sufficiently high degree to cook the food.

Q. 2. (a) Distinguish between renewable and non-renewable sources of energy.

(b) Choose the renewable sources of energy from the following list.
Coal, biogas, Sun, natural gas

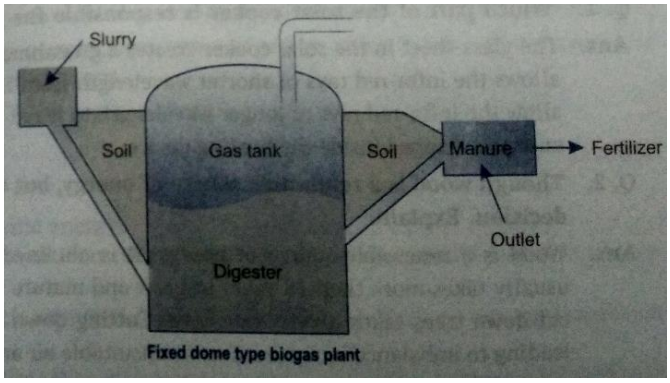
Ans. (a)

Renewable sources of energy	Non-renewable sources of energy
1. These sources of energy can be used again and again.	1. These sources of energy cannot be used again and again.
2. These type of sources are inexhaustible.	2. These type of sources are exhaustible and cannot be renewed.
3. It does not pollute atmosphere.	3. It causes atmospheric pollution.
4. *Example*: Solar energy wind energy, etc.	4. *Example*: Coal, petroleum, etc.

(b) Sun and biogas.

Q. 3. What is biogas? Describe the working of a biogas plant with the help of a labelled diagram.

Ans. 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.



Fixed dome type biogas plant

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

Q. 4. 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.

Ans. Fossil fuels have the following environmental effects:

(*i*) Air pollution: Burning of fossil fuels release oxides and sulphides in the air and many other harmful gases like carbon monoxide, sulphur dioxide, etc. These cause various

health problems and also lead to acid rain which further affects water and soil resources.

(ii) Greenhouse effect: On burning fossil fuels, a large amount of carbon dioxide is released into the atmosphere. This is a greenhouse gas and does not allow the sun rays reflected from the earth surface to escape into the atmosphere. Thus, increasing the temperature of the atmosphere. This is called greenhouse effect and results in global warming.

Following steps can be taken to minimize pollution:

(i) Use of smokeless appliances.
(ii) Use of refined technology to increase the efficiency of combustion process and to reduce escape of harmful gases into the atmosphere.
(iii) Judicious use of energy.

Q. 5. Differentiate between box-type solar cooker and spherical reflector type solar cooker.

Ans.

Box-type solar cooker	Spherical reflector type solar cooker
1. Plane mirror is used as a reflector.	1. Concave or parabolic reflector is used.
2. It does not concentrate solar energy at a point.	2. It concentrates the solar energy at a point called focus.
3. Comparatively low temperature is produced in it.	3. Very high temperature is produced.
4. It is used to cook the food materials which require slow heating.	4. It can cook food materials which require strong
5. Baking and frying is not possible in it.	5. Baking and frying can be done in it.

HOTS (Higher Order Thinking Skills)

Q.1. Which part of the solar cooker is responsible for greenhouse effect?

Ans. The glass sheet in the solar cooker creates a greenhouse effect. Glass sheet has a property that allows the infra-red rays of shorter wavelength from the Sun to get in the device but does not allow the infra-red rays of longer wavelength to leave the solar heating device. Therefore, heat energy is trapped inside the heating device.

Q.2. Though wood is a renewable source of energy, but the use of wood as a fuel is not a wise decision. Explain.

Ans. Wood is a renewable source of energy. It is obtained by cutting trees. A new plant sapling usually takes more than 15 years to grow and mature into a tree. Therefore, replenishment of cut down trees takes a very long time. Cutting down of trees causes depletion of the forests leading to imbalance in nature. Due to unsuitable air and the above reasons, usage of wood as a source of energy is not a wise decision.

Q.3. Wavelength of radiation incident on a surface is 850 nm. Will the surface become visible when exposed to this radiation? Explain.

Ans. As we know, the range of wavelength of visible radiation is from 400 nm to 700 nm. The radiation having wavelength greater than 700 nm is termed as infra – red radiations which only produces warmth, so the wavelength of radiation 850 nm cannot be visible.

Value Based Questions

Q. 1. In a school, there are seventy teachers and most of them have their personal vehicles. There are many teachers who come from the same place but everyone prefers coming by their personal vehicle. On the other hand, the students of the school either come by buses or by carpooling.

Answer the following questions based on the situation given above.
(i) Whose practice of commuting to school is nature friendly? Justify your answer.
(ii) What values are being promoted by teachers and students?
(iii) In what other ways can we become nature friendly?

Ans. (i) The students' way of commuting is nature friendly because they are saving fossil fuels, which are non-renewable sources of energy, by this practice and also reducing pollution.

(ii) The teachers are promoting negligence towards environment, careless Spending of resources. The students are promoting environmental concern, sharing, helpfulness.

(iii) By switching off the lights and fans when not in use, turning off the engine of vehicles at red lights.

Q. 2, In a village people burn wood and cow dung as fuel for basic necessity. In another nearby village, people have a bio-gas plant in which bio waste is used to prepare bio gas which is supplied to all the houses of the village.

Answer the following questions based on the situation given above.
(i) If we compare the situation of both villages, which practice is the best and why?
(ii) What values are promoted by each village?
(iii) Suggest some other ways that can be employed for saving resources?

Ans. (i) The practice of the second village is the best because they are employing a less polluting and less expensive way of fuel generation.

(ii) The first village is promoting no concern for the environment, ignorance and no technological development. The second village is promoting environmental concern, judicious use of resources and sharing.

(iii) Renewable sources of energy like CNG (Compressed Natural Gas) can be used in vehicles, solar energy can be used in place of electricity.