UNIT – V

Natural Resources

CHAPTER

14 SOURCES OF ENERGY

Syllabus

➢ *Sources of energy : Different forms of energy, conventional and non-conventional sources of energy: Fossil fuels, solar energy; biogas; wind, water and tidal energy; Nuclear energy. Renewable versus non-renewable sources of Energy.*

Quick Review

➢ Any system from where energy can be trapped is called a source of energy. Source of energy is capable of providing adequate amount of energy. It should be convenient to use and easy to store and transport.

➢ **Law of conservation of energy :** Energy can neither be created nor be destroyed, but can be transformed from one form to another.

➢ **Qualities of a Good Source of Energy :**

(i) Which would do a large amount of work unit mass.
(ii) Cheap and easily available.
(iii) Easy to store and transport.
(iv) Safe to handle and use.
(v) Does not cause environmental pollution.

➢ **Fuel :** The material which are burnt to produce heat energy are known as fuels. E.g., wood, coal, LPG, kerosene.

➢ **Characteristics of a Good Fuel :**

(i) High calorific value (give more heat per unit mass).
(ii) Burn without giving out any smoke or harmful gases.
(iii) Proper ignition temperature.
(iv) Easy to handle, safe to transport.
(v) Convenient to store.
(vi) Burn smoothly.

Sources of Energy

S. No.	Conventional Sources of Energy	Non-conventional Sources of Energy
(a)	Fossil fuels (Coal, Petroleum)	Solar energy (e.g, solar cooker, solar cell panel)
(b)	Thermal power plant	Energy from the sea (tidal wave, OT energy)
(c)	Hydro power plants	Biomass-plant
(d)	Geothermal energy	Nuclear energy

Conventional Sources of Energy

➢ Sources of energy which are known to most of the people *e.g.*, fossil fuels, biomass etc.

I. Fossil Fuels :

➢ Fuels developed from the fossils *e.g.*, coal, petroleum.
➢ Take million of years to form.
➢ Available in very limited amount.
➢ These are non-renewable sources of energy.

- India has about 60% share in the world reserved coal, that may last 250 years more at the present rate of consumption.
- In power stations, one needs energy to run turbines. Large quantity of fossil fuels like coal are burnt to produce heat energy. This produces steam which is used to rotate turbines to produce electricity. The flow of energy is as listed below :

  Fossil fuels—Heat Energy—Mechanical Energy—Electrical Energy.
- The energy of water flowing through rivers or stored in dam is another potential source of energy. It is also indirect source of solar energy. It is the solar energy which recycles water in nature from oceans and the earth's surface through rain and snow. The energy of water flowing through rivers has been used for rotating the wheels of watermills which are still operating in remote hilly areas.
- The material contained in the bodies of plants and animals is called biomass. It act as a fuel. It includes waste from tree and grass crops, forestry agricultural and urban wastes. The excreta of living organisms and their bodies after death also contribute to the biomass.

I.

- The dead part of plants and trees and the waste materials of animals and man are called **Biomass.**

(1) Wood : It is a biomass and used as a fuel for a long time.

Disadvantages :

- Produces a lot of smoke on burning.
- Do not produce much heat.

(2) Charcoal : When wood is burnt in limited supply of air, then water and other volatile materials gets removed and charcoal is formed.

$$\text{Wood} \xrightarrow{\text{Limited Supply of } O_2} \text{Charcoal}$$

Charcoal is better fuel then wood because :

(i) It has higher calorific value than wood.

(ii) Does not produce smoke while burning.

(iii) It is a compact fuel, easy to handle and convenient to use.

(3) Cowdung : It is a biomass but it is not good to burn cowdung directly as fuel because :

- it produces lot of smoke.
- cowdung does not burn completely, produces lot of ash as residue.
- low calorific value.
- by making bio gas (or gobar gas) from cow dung, we get a smokeless fuel.

(4) Bio gas : It is produced in a biogas plant. Anaerobic micro organisms decomposes the complex compound of the cow dung + water slurry. It takes few day for the decomposition process and generate gases like methane, CO_2, hydrogen and hydrogen sulphide. Bio gas is stored in the gas tank above the digester from which they are drawn through pipes of use.

Alternate or Non-conventional Sources of Energy

- Day by day, our demand for energy is increasing, so there is a need for another sources of energy.

Reasons for alternate source of energy

(i) The fossil fuel reserves in the earth are limited which may get exhausted soon if we use them at the current rate.

(ii) To reduce the pressure on fossil fuels making them last for a much longer time.

(iii) To reduce the pollution level and to save the environment.

I. Solar Energy :

- Sun is the ultimate source of energy.
- Energy obtained from the sun is called solar energy.

$$\text{Solar constant} = 1.4\ \text{KJ/s/m}^2$$

- Outer edge of the earth receives solar energy equal to 1.4 KJ/s/m^2 or 1.4 KW/m^2 [1 KJ/s = 1 KW]
- **Electrical energy** is one of the widely used energies. It is generated by harnessing different sources of energy. In any conventional power plant, turbines of generators are rotated by using steam arrived by heating water from one source of energy.
- Indirectly or directly all forms of energy originate from the solar energy. Besides heat energy, ultraviolet, gamma rays and visible light also come from solar energy.
- **Solar cell** is a device which converts solar energy *i.e.*, light energy directly into electricity. They are made up of semi-conductors like–silicon, germanium and selenium.

- **Solar cell panel** comprises of a large number of solar cells and can provide much higher power for many uses.
- The blowing wind has energy which is called **wind energy**. Wind is associated with kinetic energy. Solar energy is responsible for the blowing of the wind. The three factors which help in blowing of wind are :
  (i) The uneven heating of equatorial region and polar region of earth by sun rays.
  (ii) Rotation of earth.
  (iii) Local conditions.
- **Ocean Thermal Energy (OTE) : There is always a temperature difference between water at the surface and at deeper level up to 20°C. This form of energy is called ocean thermal energy which can be converted into electricity.**
- Energy from oceans is also available in the form of sea-waves. Due to blowing of wind on the surface of ocean, very fast sea-waves move on its surface. It has lot of kinetic energy due to high speed.
- The rise of ocean water due to attraction of moon is called '**high tides**' whereas fall of ocean water is called '**low tides**'. The tidal waves rise and fall twice a day. Tidal energy can be harnessed by constructing a tidal barrage or tidal dam.
- The heat from inside the earth heats up the water below the surface. This hot water can be used under favourable conditions as a source of energy. This energy with hot water below the earth is called geothermal energy.
- **Atomic mass unit** is defined as $\frac{1}{12}$ th of the mass of carbon atom ${}^{12}_{6}C$. 1 amu = 1.66×10^{-27} kg.
- Unit for energy is associated with electrons accelerated through a potential of 1 volt.
  $1\ eV = 1.6 \times 10^{-19}$ joule, $1\ MeV = 1.6 \times 10^{-13}$ joule.
- According to Einstein, the mass and energy are inter-convertible. They are related by the relation $E = mc^2$, where c is the velocity of light. ($3 \times 10^8\ ms^{-1}$).
- When nuclear fission reaction takes place, it also releases neutrons which are capable of creating further fission. For continuous production of energy, fission should be continuous. The neutrons released are made to bombard other uranium nuclei to produce more fission. Such self-sustained reactions are called chain reactions.
- In order to make a chain reaction possible there should exist sufficient ${}^{235}U$ nuclei. The minimum mass of fissionable material required in order to make a chain reaction possible is called critical mass.

Know the Terms

- The fuels which are obtained from the remains of plants and animals are called fossil fuels, *e.g.*, coal, petroleum and natural gas.
- The material contained in the bodies of plants and animals is called biomass. It acts as a fuel.
- **Bagasse** is the residue of sugarcane after extracting (taking out) juice from them. It is used as fuel in industries.
- **Conventional or Non-Renewable Sources** : Energy sources which are used traditionally for many years and are to deplete over a period of time are called conventional or non-renewable sources. *e.g.*, coal, petroleum, natural gas etc.
- **Non-Conventional or Renewable Sources :** Energy sources which do not deplete and are scarcely used by the population are called non-conventional or renewable sources *e.g.*, Solar energy, wind energy etc.
- The amount of solar energy received per square meter per second on the surface of earth is called solar constant. It is approximately 1.4 (kJ/m^2s).
- **Wavelength :** Length of a wave or separation between two points in successive waves which are in same phase is called wavelength. It is expressed in meter.
- **Frequency :** The number of wave motions in one second is called frequency. It is expressed in Hertz (Hz).
- The light of wavelength which is greater than the wavelength of red are called Infra-red (IR) radiations. They are not visible to human eye but have the property to heat the bodies on its way. All hot bodies radiate infra-red radiations.
- **Semiconductors** are those substances which have very low electrical conductivity. They are between the good conductors and insulators. If certain impurities are added, their electrical conductivity is increased when sunlight falls on semi-conducting material, their conductance increases.
- An electric motor is a rotating device that converts electrical energy to mechanical energy.
- A generator is the machine that converts mechanical energy into electrical energy. It works on the basis of electromagnetic induction.
- The concentration of salts in water of different seas is different. The difference in concentration of salts in the water of two different seas is called '**salinity gradient**'.
- The projectile (say neutron) should have some minimum energy, in order to create fission. This minimum energy is called **threshold energy**.

- There action in which a heavy nucleus splits into two or more smaller nucleus, with the evolution of large amount of energy when it is bombarded with slow moving neutron is called **nuclear fission**.
- A nuclear reaction in which the bombarding particle is obtained as one of the product, due to which the reaction once initiated proceeds on its own is called a **chain reaction**.
- In order to make a chain reaction possible there should exist sufficient ^{235}U nuclei. The minimum mass of fissionable material required in order to make a chain reaction possible is called **Critical mass**. The Critical mass of ^{235}U is approximately 1 kg.
- A reaction in which two or more lighter nuclei fuse to form a heavy nucleus and large amount of energy is given out is called nuclear **fusion reaction**.
- The phenomena of emission of α, β particles and γ rays by unstable heavier nuclei is called **radioactivity**.

TOPIC-1

Sources of Energy

Very Short Answer Type Questions (1 mark each)

R Q. 1. **Give two examples of fossil fuels.** [DDE 2017]

Ans. Coal, Petroleum. ½+½

U Q. 2. **What do you mean by fuel ?** [DDE 2017]

Ans. A substance that can be consumed to produce energy is called a fuel *E.g.*, coal, petroleum. 1

R Q. 3. **Write two characteristics of good fuel.** [DDE 2017]

Ans. Two characteristics of good fuel are :

(i) It is smokeless and leaves no residue

(ii) It has higher heat of combustion. ½+½

R Q. 4. **Write the full form of CNG.** [Board Term I, Set-54, 2011]

Ans. Compressed natural gas. 1

R Q. 5. **List two characteristics of a good source of energy.** [Board Term I, Set-48, 2012]

Ans. (i) Easily accessible and easy to store. ½

(ii) Economical and eco-friendly. ½

R Q. 6. **What are the two disadvantages of burning fossil fuels ?** [Board Term I, Set-55, 2011]

Ans. Disadvantages are air pollution and acid rain which affects soil and water. 1

R Q. 7. **Mention any two limitations of using fossil fuels.** [Board Term I, Set-60, 2011]

Ans. (i) Fossil fuels will not last longer.

(ii) They are non-renewable sources of energy. ½ + ½

R Q. 8. **What are the materials obtained from plants and animals, and used as fuels called ? Name any two biomass energy source.**

Ans. The materials obtained from plants and animals, used as fuels are called biomass. Coal, wood etc. are the sources of biomass energy. 1

A Q. 9. **How charcoal is different from wood ?** [DDE 2017]

Ans. When the same amount of charcoal and wood are burnt, charcoal produces almost twice the heat produced by wood. Charcoal produces much less smoke than wood. 1

R Q. 10. **What is nuclear energy ?** [DDE 2017]

Sol. The energy released during nuclear fission or fusion, especially when used to generate electricity is called nuclear energy. 1

R Q. 11. **Name one fuel used in nuclear reactor.** [Board Term I, Set-37, 2012]

Ans. Uranium–235. 1

R Q. 12. **Name the reaction responsible for the large energy production in the sun.** [Board Term I, Set (42), 2012]

Ans. Nuclear fusion 1

R Q. 13. **Write two disadvantages of Nuclear Energy.** [NCT - 2014]

Ans. (i) Used for production and proliferation of nuclear weapons.

(ii) Its generation is very expensive. ½ + ½

R Q. 14. **Name the two major components present in the left-over slurry of a biogas plant.** [Board Term I, Set-36, 2012]

Ans. Nitrogen and phosphorus. ½ + ½

R Q. 15. **Name an efficient fuel obtained from cowdung and other animal and plant wastes. Also mention its main constituents.** [Board Term I, Set-31, 2012]

Ans. Biogas, methane. ½ + ½

U Q. 16. **Write the sequence of events taking place in a biogas plant.** [Board Term I, Set-57, 2011]

Ans. Slurry fed into digester ⟶ decomposition of biomass ⟶ production of gases to be used as a fuel. **1**

R **Q. 17. Name two combustible components of biogas.**
[Board Term I, Set-44, 2012]

Ans. Methane and hydrogen are two combustible components of biogas. **1**

R **Q. 18. What are hot spots inside earth's crust ?**
[Board Term I, Set-5X7289R, 2014]

Ans. Hot spots are placed within the mantle where rocks melt to generate magma. **1**

U **Q. 19. Describe the areas where acid rains are most likely expected.**

Ans. Acid rains are most likely expected in industrial areas where there is emission of oxides of nitrogen and sulphur. **1**

A **Q. 20. Biogas is also known as gobar gas. Justify.**
[DDE 2017]

Ans. Biogas is made up of waste products mainly gobar (cowdung). So it is known as gobar gas. **1**

Short Answer Type Questions-I

(2 marks each)

U **Q. 1. What is a nuclear fusion reaction ? List any two advantages of nuclear fusion reactions.**
[Board Term I, Set-35, 2011] [DDE 2017]

Ans. A reaction in which two nuclei of lighter elements combine to form a heavy nucleus with a liberation of tremendous amount of energy. **1**

Two advantages :

(i) Large amount of energies produced from a very small amount of fuel. ½

(ii) Produces non-pollutant waste/does not produce gases which pollute the environment/cause green house effect. ½

R **Q. 2. List four gases generated in a biogas plant.**
[Board Term I, Set-12, 2011] [DDE 2017]

Ans. (i) Hydrogen **(ii)** Hydrogen sulphide ½ + ½
(iii) Methane **(iv)** Carbon dioxide. ½ + ½

U **Q. 3. Mention the main use of slurry left behind in the biogas of plant. State the characteristics of the slurry on which this use is based.**
[Board Term I Set-15, 2011]

Ans. Slurry is used as a manure. **1**
Slurry is rich in nitrogen and phosphorus. **1**

R **Q. 4. Give two advantages of using nuclear energy.**
[Board Term I, Set-29, 2011]

Ans. Two advantages of using nuclear energy are :

(i) Very small mass of Uranium yields tremendous energy.

(ii) The released energy can be used to produce steam and further generate electricity. **1 + 1**

U **Q. 5. State any three characteristics of a good source of energy. Name the gaseous fuel which has the highest calorific value.**
[NCERT] [Board Term I, Set-33, 2011]

Ans. Characteristics of Good Source of Energy :

(i) Large amount of work per unit volume/mass. **1½**

(ii) Easily available

(iii) Easy to transport.

Gaseous fuel of highest calorific value is hydrogen. ½

R **Q. 6. Name the major constituent of biogas. List three characteristics to prove it as an excellent fuel.**
[Board Term I, Set-13, 2011]

Ans. Methane is the major constituent of biogas. ½

Three characteristics to prove it as an excellent fuel :

(i) Smokeless

(ii) Leaves no residue

(iii) Higher heat of combustion. ½ + ½ + ½

U **Q. 7. List any four qualities of an ideal source of energy. [NCERT] [Board Term I, Set-17, 2011]**

Ans. Qualities of an Ideal Source of Energy :

(i) More heat per unit mass. ½

(ii) Less Pollution and smoke free. ½

(iii) Cheap and Economical. ½

(iv) Easily available and easily handled. ½

(v) Safe to transport. **(Any four)**

U **Q. 8. Why is charcoal considered to be a better fuel than wood ? [Board Term I, Set-21, 2011]**

Ans. Charcoal is better fuel than wood because :

(i) It is smokeless and leaves no residue.

(ii) It has a higher heat of combustion. **1 + 1**

R **Q. 9. List any two disadvantages of using fossil fuels.**
[DDE 2017] [Board Term I, Set-24, 2011]

Ans. (i) Burning of coal or petroleum products lead to air pollution.

(ii) The oxides of C, N and S are released on burning fossil fuels as acidic oxides. It leads to acidic rain and affect water and soil. **1 + 1**

A **Q. 10. Fossil fuels are classified as non-renewable sources of energy. Why ?**

Ans. Fossil fuels like coal, petroleum, natural gas, etc., if exhausted, cannot be generated rapidly as they take millions of years to form again. **2**

A **Q. 11. Large scale use of nuclear energy becomes prohibitive due to some hazards. State any two major hazards associated with a nuclear power plant. [Board Term I, Set-37, 2011]**

Ans. Storage and disposal of spent or used fuels which decay into sub-atomic particles with harmful radiations. **1**

Nuclear waste storage and disposal result in environment contamination or accidental leakage of nuclear radiations. **1**

A **Q. 12. Wood takes a long time to grow, but even then it is considered a renewable source of energy. Comment.**

Ans. Although wood takes a long time, approximately 20 years, to grow, it is considered a renewable source of energy because the time taken is much smaller as compared to non-renewable sources of energy like– coal, petroleum, etc which take millions of years. 2

U **Q. 13. Why does a car parked in sunlight remains hot from inside even when there is no sunlight in the car ?**

Ans. The glass windows have the peculiar property to pass radiations which have wavelength near to the visible light or shorter wavelength. It does not allow infra-red radiations of higher wavelength. Since the sun sends infra-red radiations of lower wavelengths, these pass through the glass windows, and gets trapped inside the car in the form of heat. This heat or infra-red radiations can not pass out and thus gets trapped in the car for longer time, making it hot from inside. 2

Short Answer Type Questions-II

(3 marks each)

U **Q. 1. Differentiate between renewable and non-renewable sources of energy. Give two examples of each. [Board Term I, Set-WH1SGOB, 2014] [Board Term I, Set-WJ7QPA9, 2013]**

Ans.

S. No.	Renewable Energy	Non-Renewable Energy
(i)	Sources that can be regenerated.	Sources that will get depleted.
(ii)	These are inexhaustible sources.	These are exhaustible as they are limited.
(iii)	*eg.* energy from sun, wind.	*e.g.* coal, petroleum.

[CBSE Marking Scheme, 2014, 2013] 1 + 1 + 1

A **Q. 2. Explain the principle and working of a biogas plant. [Board Term I, Set-37, 2012]**

Ans. The waste of living organisms like cow dung, various plant materials like the residue after harvesting of crops, vegetable waste and sewage etc. form biomass.

During the decay of biomass, in the absence of oxygen, biogas is produced in the biogas plant. A slurry of cow dung and water is made in the mixing tank from where it is fed into the digester. In the digester tank, anaerobic micro-organisms decompose complex molecules of cowdung slurry and produce biogas. **[CBSE Marking Scheme, 2012] 3**

U **Q. 3. Name the process by which nuclear energy is generated and also name one substance used for it. Give two advantages and two hazards of nuclear energy. [Board Term I, Set-39, 2012]**

Ans. The process is nuclear fission. ½

Substances are uranium, plutonium, thorium. ½

Advantages :

(i) For a given amount of fuel, the amount of energy released is extraordinarily large. ½

(ii) Nuclear power plants can be set up at any place. ½

Hazards :

(i) Improper nuclear waste storage and disposal result in environmental contamination. ½

(ii) Further there is a risk of accidental leakage of nuclear radiation. ½

[CBSE Marking Scheme, 2012]

A **Q. 4. Out of the two elements A and B with mass number 2 and 235 respectively, which one is suitable for making :**

(i) a nuclear reactor

(ii) a hydrogen bomb.

Name the nuclear reaction involved in each case. Write one difference between the two types of nuclear reactions. [Board Term I, Set-44, 2012]

Ans. Nuclear reactor – Element B ½

Process – Nuclear Fission ½

Hydrogen bomb – Element A ½

Process – Nuclear Fusion ½

Nuclear Fission	Nuclear Fusion
A large nucleus breaks into two smaller nuclei and releases a large amount of energy.	Two smaller nuclei fuse or join together to form own nucleus and releases large amount of energy.

(CBSE Marking Scheme, 2012) 1

A **Q. 5. Draw a neat diagram of a biogas plant and label**

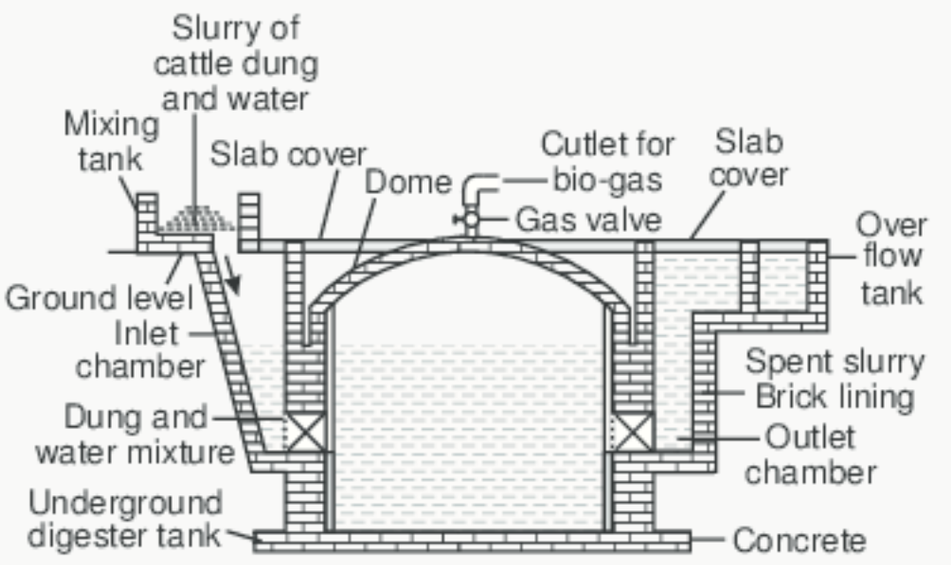
(i) inlet of slurry,

(ii) digester and

(iii) gas outlet.

[Board Term I, Set-49, 50, 42, 41, 2012]

Ans.



[CBSE Marking Scheme, 2012] 3

U **Q. 6. If energy can neither be created nor destroyed, explain with an example why we should worry about our energy resources ?**

[Board Term I, Set-L7ZSVLH, 2016]

Ans. Energy used is dissipated in less usable form.
The energy used is consumed and cannot be used again.
Example : Burning of candle → light + heat but products cannot produce chemical energy **(Or any other example) [CBSE Marking Scheme, 2016] 3**

Detailed Answer :

The law of conservation of energy states that energy can neither be created nor be destroyed. But, it can only be converted from one form to another. Despite this fact, the world is facing energy crisis. The reason behind it is that energy is converted into non-usable forms.

Fossil fuels like coal, petroleum etc. are the sources of energy which have accumulated in nature over a long time and cannot be replaced. We should worry about such sources because these sources of energy are getting depleted and sooner or late, will no longer be available to us.

U **Q. 7. Write two points of differences between renewable and non-renewable sources of energy. Give one example of each.**
[Board Term-I, Set-OQKPLGV, 2016]

Ans. Renewable - Supply can be renewed, Environment friendly.
Eg : wind, sun, water **(Any one)**
Non-Renewable - Supply is limited, cause environment pollution.
Eg : coal, petroleum **(Any one)**
[CBSE Marking Scheme, 2016] 3

Detailed Answer :

S. No.	Renewable source of energy	Non-renewable source of energy
(i)	Produced continuously in nature and are inexhaustible.	Takes long time for production and may get exhausted.
(ii)	These sources of energy do not cause any pollution.	These sources are the major cause of environmental pollution.
(iii)	Example - Wind, Sun, Water	Example - Coal, Petroleum

1+1+1

R **Q. 8. Make a list of three features due to which L.P.G is considered to be a good fuel ?**
[Board Term-I, Set-WDCXXOV, 2016]

Ans. (i) Releases large amount of energy on burning
(ii) easy to store
(iii) easy to transport
(iv) does not produce smoke
(v) environment friendly **(Any three)**
[CBSE Marking Scheme, 2016] 1×3

U **Q. 9. List two ways in which animal dung can be utilized as a fuel. Out of these two which one do you think is better ? Justify your answer.**
[Board Term I, Set-46, 2012]

Ans. Two ways :
(i) as cowdung cakes, **(ii)** as biogas. ½ + ½
Biogas is better than cowdung cakes because it has high heating capacity and are non-polluting as it burns without smoke and leaves no residue like ash. Slurry left in the biogas plant is a good manure for fields. 2
[CBSE Marking Scheme, 2012]

U **Q. 10. List any three parameters, which categorizes any source of energy as a good source of energy.**
[Board Term I, Set-IN14KGB, 2014]

Ans. **(i)** Does large amount of work per unit volume or mass.
(ii) Easy to store and transport.
(iii) It should be economical and easily accessible.
[CBSE Marking Scheme, 2014] 1 + 1 + 1

R **Q. 11. List any three qualities of an ideal source of energy. [Board Term I, Set-5X7289R, 2014]**

Ans. An ideal source of energy has following qualities :
(i) Production of large amount of heat/energy.
(ii) Easily accessible and easy to store within less space.
(iii) Less or no production of toxic by products. **1 + 1 + 1**

U **Q. 12. State any three advantages of using charcoal over wood ? [DDE-2014]**

Ans. **(i)** It produces large amount of heat energy.
(ii) It is smokeless and pollution free.
(iii) It is easy to store and transport. **1 + 1 + 1**

U **Q. 13. (a) List any two criteria for selecting a good fuel.**
(b) Explain how does burning of fossil fuels cause air and soil pollution. [Board Term I, Set-40, 2012]

Ans. (a) Criteria for selecting a good fuel :
(i) Would do a large amount of work per unit volume or mass.
(ii) be easily accessible. 1
(iii) be easy to store and transport. **(any one)** 1
(b) Burning of fuels releases gases like CO_2, SO_2, NO_2. These causes air pollution. With rain, these pollutants fall as acid rain and causes soil pollution. **[CBSE Marking Scheme, 2012] 1**

A **Q. 14. Biomass is the material contained in the bodies of plants and animals. It includes the waste from trees and grass crops forestry agricultural and urban wastes. The excreta of living organisms and their bodies after death also contributes biomass.**
(i) Comment on the statement "Biomass is a fuel". Justify the statement by giving two reasons.
(ii) What is Bagasse ?

Ans.(i) Reasons :
(a) It is a traditional source of energy which is used in domestic as well as industrial area.
(b) Usually firewood is burnt in traditional Chulhas. 2
(ii) Baggage is a residue of sugarcane after extracting juice from them. 1

Long Answer Type Questions (5 marks each)

A Q. 1. **Hydrogen compounds are abundantly available on earth, and it has high calorific value. But this is not used as a common fuel. Give any two reasons. What are the process that are being developed to use hydrogen as a common fuel ?**

Ans. Hydrogen is not used as a common fuel because :

(i) When hydrogen is lighted, it burns with an explosion.

(ii) It is very difficult to store and transport hydrogen.

Hydrogen as a fuel :

Fuel cells are being developed that can store energy produced by burning hydrogen. Development of some materials that can absorb hydrogen and then release it at a steady rate. 3 + 2

TOPIC-2

Alternative or Non-Conventional Sources of Energy

Very Short Answer Type Questions (1 mark each)

R Q. 1. **Name the main component of solar cell.**

[DDE 2017]

Ans. Solar cell is a device that is made up of semiconductor materials such as silicon, gallium arsenide and cadmium telluride. 1

R Q. 2. **Define a solar panel.**

[Board Term I, Set-15, 2012]

Ans. A panel which is made up of many solar cells is known as solar panel. 1

R Q. 3. **Name a device which can be used for cooking so as to save fuel.** **[DDE 2017]**

Ans. Solar cooker. 1

R Q. 4. **Name the component of a solar cooker that produces a green house effect inside it.**

[Board Term-I, Set-L7ZSVLH, 2016]

Ans. Glass plate/sheet that covers the box. 1

[CBSE Marking Scheme, 2016]

R Q. 5. **Name any one material used to make a solar cell and also mention the range of voltage produced by a typical cell.**

[Board Term-I, Set-OQKPLGV, 2016]

Ans. Silicon, Germanium. **(Any one) 1**

(Each solar cell produces a voltage of 0.5 volt.)

[CBSE Marking Scheme, 2016]

A Q. 6. **A black surface absorbs more heat radiations as compared to a white surface under identical conditions. List two solar devices which make use of this property in their design. [DDE-2014]**

Ans. Each solar cell produces a voltage of 0.5 volt. Solar cooker, Solar panel. ½ + ½

U Q. 7. **List two forms of energy in which solar energy manifests itself in oceans.**

[Board Term I, Set-47, 2012]

Ans. Tidal energy and Sea-wave energy. ½ + ½

R Q. 8. **Name any two elements that are used in fabricating solar cells.**

[Board Term I, Set-41, 2012]

Ans. Silicon / Gallium / Silver. **(Any two) 1**

U Q. 9. **List two indirect ways of using Solar energy.**

[Board Term I, Set-51, 2012]

Ans. (i) Wind energy **(ii)** Biomass energy ½ + ½

U Q. 10. **Why is a solar cooker painted black from outside ?**

[Board Term-I, NS9SX1D, 1ZHNPNO, 2016]

Ans. A black surface absorbs more heat as compared to white or a reflecting surface. 1

[CBSE Marking Scheme, 2016]

U Q. 11. **Mention the main purpose of using a plane mirror in solar cookers.**

[Board Term I, Set-44, 2012]

Ans. Mirror in a solar cooker acts as a reflector of sunlight into the box. It increases the concentration of heat rays in the box. 1

U Q. 12. **Mention the purpose of blackening the interior of a solar cooker.**

[Board Term I, Set-WJ7QPA9, 2013]

Ans. Black surface absorbs more heat than a white or prevents heat loss. 1

U Q. 13. **Why are black surfaces, and not the white surfaces, used for making solar cookers ?**

Ans. Black surfaces absorb more heat as compared to white surfaces. Therefore, for making solar cookers, black surfaces are used. 1

R Q. 14. **Which country is known as 'Country of Winds' ?**

[DDE 2017]

Ans. Denmark. 1

R **Q. 15. What is a wind energy farm ?**
[Board Term I, Set-IN14KGB, 2014]

Ans. A number of windmills erected over a large area. **1**

R **Q. 16. List two non-conventional sources of energy.**
[DDE-2014]

Ans. Solar energy and Wind energy. ½ + ½

R **Q. 17. List any two advantages of using wind energy.**
[Board term-I, Set-A85V2IL, 2015]

Ans. (i) Environment friendly.
(ii) Efficient source of renewable energy.
(iii) No recurring expenditure. **(Any two)** ½+½
[CBSE Marking Scheme 2015]

R **Q. 18. What should be the minimum wind speed to maintain the required speed of the turbine in a wind energy farm ?** **[DDE-2015]**

Ans. 15 km/h.

U **Q. 19. List any two limitations in harnessing wind energy.** **[Board Term I, Set-40, 2012]**

Ans. (i) Wind energy farms can be established only at those places where wind blows for the major part of the year.
(ii) Establishment of wind farms requires a large area of land. ½ + ½

A **Q. 20. Windmill works with the energy of the blowing wind. Then, how is the supply of electricity maintained in a windmill when there is no wind ?**

Ans. In a windmill, the electricity generated is stored in a battery. This battery provides electricity when there is no wind. **1**

R **Q. 21. Name two constituent of biogas, one should be chief constituent.**
[Board Term-I, Set-2ZGOVVV, 2015]

Ans. Methane — 75%
CO_2 **1**

R **Q. 22. Name the part of a biogas plant where reactions take place in the absence of oxygen.**
[Board Term-I, Set-WDCXXOV, 2016]

Ans. Digester. **[CBSE Marking Scheme, 2016] 1**

R **Q. 23. Mention two different ways of harnessing energy from ocean.** **[Board Term I, Set-18, 2012]**

Ans. Tidal wave, OTEC (Ocean Thermal Energy Conversion) ½ + ½

U **Q. 24. State the necessary conditions to operate an ocean thermal energy conversion plant.**
[Board Term I, Set-50, 2012]

Ans. The difference in temperature of water at the surface of ocean and at deeper levels (at depth upto 2 km) should be 20°C or more. **1**

R **Q. 25. Mention any one reason due to which most of the thermal power plants are set up near coal or oil fields.** **[DDE-2015]**

Ans. Because fuel is used to produce heat energy by burning.

U **Q. 26. State the transformation of energy taking place in a solar cell panel.**
[Board Term I, Set-52, 2012]

Ans. Solar energy ⟶ Electrical energy. **1**

U **Q. 27. Compare the energy produced during fission of a uranium atom with the energy produced due to combustion of a carbon atom from coal.**
[Board Term-I, Set-JYNE6XG-2015]

Ans. The fission of an atom of uranium produced 10 million times the energy produced by the combustion of an atom of carbon from coal. **1**

Short Answer Type Questions-I

(2 marks each)

U **Q. 1. What are Solar panels ? Write three uses of Solar panels.** **[DDE 2017]**

Ans. Solar panels are those devices which are used to absorb the sun's rays and convert them into electricity or heat.

Uses of Solar Panels :
(i) Solar panels are used in wide range electronics equipment.
(ii) Radio, TV relay stations in remote locations use solar cell panels.
(iii) The solar cells panels are mounted on specially designed inclined roof tops so that more solar energy is incident over it. ½+½+½+½

R **Q. 2. (i) What is solar cell panel ?**
(ii) Name any two elements that are used for making solar cell panels. **[Board Term I, Set-17, 2011]**

Ans. (i) A combined arrangement of a large number of solar cells that can deliver sufficient electricity for practical use is known as solar cell panel. **1**
(ii) Silver, Silicon. ½ + ½

U **Q. 3. List any four reasons why we need to look for alternate sources of energy.** **[DDE 2017]**
[Board Term I, Set-16, 2011]

Ans. Four reasons we need to look for alternate sources of energy are :
(i) Pollution due to fossil fuels. ½
(ii) Exhausting fuel reserves. ½
(iii) Increasing need. ½
(iv) Replenishment is not easy. ½

U **Q. 4. (a) Hydrogen is used as a rocket fuel. Why ?**
(b) List two limitations of using solar cookers.
[Board Term I, Set-34 2011]

Ans. (a) Hydrogen is comparatively a cleaner fuel than any other gaseous fuel, as on its burning only water is produced which does not pollute the environment. **1**
(b) (i) Cannot be used in night/cloudy days.
(ii) Direction of reflector has to be changed from time to time. ½ + ½

U Q. 5. **What kind of mirror concave, convex or plane would be best suited for use in a solar cooker ? Why ?** **[NCERT Exemplar]**

Ans. Concave mirror is best suited for use in a solar cooker. This is because it is a converging mirror and converges large amount of light of sun into the solar cooker. 2

U Q. 6. **Write two limitations of using wind energy.** **[DDE 2017]**

Ans. (i) No electricity is produced when the wind is not blowing.

(ii) Cost of setting up a wind farm is high. **1+1**

A Q. 7. **How has the traditional use of wind and water energy been modified for our convenience ?** **[NCERT Exemplar]**

Ans. The windmills which have been traditionally used are converted to wind energy farms, which contain a large number of windmills to increase our energy output. Hydropower plants are now associated with dams to produce electricity. **1 + 1**

R Q. 8. **Name any two energy sources that you would consider to be renewable. Give reasons for your choice.** **[NCERT Exemplar]**

Ans. Hydel power, as water is replenished by water cycle. Wind power, as wind keeps blowing due to uneven heating of earth by the sun. 2

U Q. 9. **List two reasons which limit the usage of solar cells for harnessing energy for domestic use.** **[Board Term I, Set-25, 2011]**

Ans. (i) Availability of the special grade silicon for making solar cells is limited.

(ii) The process of manufacture is expensive, silver used for interconnections of the cells in the panel further adds to the cost. **1 + 1**

R Q. 10. **Write name of four nuclear power reactors located in India.** **[DDE 2017]**

Ans. (i) Tarapur Atomic Power station — Maharashtra

(ii) Kakrapar Atomic Power station — Gujarat.

(iii) Kaiga Nuclear Power Plant — Karnataka.

(iv) Kudankulam Nuclear Power Point — Tamil Nadu

½+½+½+½

U Q. 11. **Write two uses or advantages of geothermal energy.** **[DDE 2017]**

Ans. (i) It is economical to use.

(ii) It does not cause any pollution. **1+1**

R Q. 12. **Expand OTEC. On what principle is it based ?** **[NCERT Exemplar]**

Ans. OTEC means Ocean Thermal Energy Conversion. It is based on the temperature gradient between upper and lower layers of the ocean. **1 + 1**

U Q. 13. **Write two advantages and two limitations of dams for the production of hydroelectricity.** **[DDE 2017]**

Ans. Advantages :

(i) Electricity can be produced at a constant rate.

(ii) The lakes are that formed behind the dam can be used for water sports and leisure.

Disadvantages :

(i) Dams are extremely expensive to build and must be built to a very high standard.

(ii) Building a large dam alters the natural water table level. ½+½+½+½

Short Answer Type Questions-II

(3 marks each)

R Q. 1. **What is Solar cell panel ? Name two materials used for making solar cell. Write two limitations of solar cells.** **[NCT - 2014]**

Ans. Solar cell panel comprises of a large number of solar cells and can provide a much higher power for many uses.

Two materials used for making solar cell are Gallium and Silicon.

Limitations of Solar cells—

(i) It is not available in night and on a cloudy day.

(ii) Energy reaching the surface is very much diffused, so direct utility is limited. **1 + 1 + 1**

R Q. 2. **What is a solar cell ? Why and how is a solar cell application and panel prepared ? List two limitations of these panels.** **[Board Term I, Set-43, 2012]**

Ans. Solar cell is a device that converts solar energy into electricity. Since the output of a single solar cell is quite small, a large number of solar cells are combined using silver for the interconnection.

This arrangement of solar cell is called solar panel that can deliver enough electricity for practical use. 1

Uses :

(i) Artificial satellites.

(ii) Traffic lights, calculators

(iii) Radio and wireless transmission

(iv) At TV relay station. **(Any two) 1**

Limitations :

(i) Highly expensive

(ii) Fabrication is a complex process

(iii) Low efficiency. **(Any two) 1**

[CBSE Marking Scheme, 2012]

U Q. 3. **Explain the term geothermal energy'. How can it be exploited ? Though it is economical yet it is not harnessed in most of the countries. Why ?** **[Board Term-I, Set-1ZHNPNO, 2016]**

Ans. Geothermal energy is heat energy trapped in hot regions called hot spots when molten rocks are pushed upwards.

When underground water comes in contact with hot spots steam is generated. Steam trapped in rocks is routed through a pipe to a turbine to generate electricity.

Very few commercially viable sites are available where such energy can be exploited.

[CBSE Marking Scheme, 2016] 3

Detailed Answer :

The heat from interior of the earth can be utilised as a source of energy under certain favourable conditions that are created by natural processes. This is known as geothermal energy.

Molten rocks formed in the deeper hot regions of Earth's crust are pushed upward and trapped in certain regions due to geological changes. These spots are called hot spots. Underground water when comes in contact of hotspots, it gets converted into steam due to heat of molten rocks (magma) and remains trapped between the rocks, at high pressure. This steam can be used to run turbines connected to electric generators. **1 + 2**

U **Q. 4. Explain geothermal energy. How can it be harnessed to produce electrical energy ?**

[Board Term I, Set-15, 2012]

Ans. Due to geological changes, molten rocks formed in the deeper hot region of earth's crust are pushed upward and trapped in certain region- hotspots are formed. **1**

When underground water comes in contact with hotspots, steam is generated. **1**

The steam routed through pipe to a turbine and produce electricity. **1**

[CBSE Marking Scheme, 2012]

U **Q. 5. Explain ocean-thermal energy and how can it be harnessed. Mention any two limitations in obtaining the energy from the oceans ?**

[Board Term I, Set-37 2012]

Ans. The difference in temperature between warm surface water heated by the sun and colder water found at ocean depth is a source of energy called Ocean thermal energy. The difference in temperature is exploited in OTE conversion plants.

The warm surface water is used to boil a volatile liquid like ammonia. The vapours are used to run the turbine of a generator. **2**

Limitations :

(i) Efficient commercial exploitation is difficult. ½

(ii) Expensive set up. ½

[CBSE Marking Scheme, 2012]

R **Q. 6. What is geothermal energy ? How can it be used commercially ? List in tabular form three distinguishing features between a thermal power plant and a geothermal power plant.**

[Board Term I, Set-43 2012]

Ans. The underground water comes in contact with 'hotspots' present in the earth's crust and steam is generated. This energy possessed by the hot water below the earth is called Geothermal energy. **1**

It can be used to produce electricity. ½

S. No.	Thermal Power Plant	Geothermal Power Plant
(i)	Uses coal as fuel.	Uses underground hot water.
(ii)	Causes pollution.	Does not cause pollution
(iii)	The fuel used is very expensive.	The fuel is free of cost.

½ × 3 = 1½

[CBSE Marking Scheme, 2012]

R **Q. 7. List three advantages of using solar cells.**

[NCERT Exemplar] [DDE-2014]

Ans. (i) Solar cells provide electricity in artificial satellites and space probes.

(ii) Used for street lighting, for traffic signals, for operating water pumps etc.

(iii) Used to operate electronic watches and calculators.

1 + 1 + 1

U **Q. 8. (a) Why are solar heating devices painted black ?**

(b) Name two such devices and state two limitations of these. **[Board Term I, Set-31, 2012]**

Ans. (a) Black bodies are good absorbers of heat, so temperature rises quickly. **1**

(b) Two devices–Solar cooker, Solar water heater. ½ + ½

Two limitations :

(i) Cannot be used at night. ½

(ii) Heating process is very slow. ½

[CBSE Marking Scheme, 2012]

R **Q. 9. (i) Name the device used to convert :**

(a) Solar energy into heat.

(b) Solar energy into electricity.

(ii) Mention two limitations of solar energy.

[Board Term I, Set-36, 2012]

Ans. (i) (a) Solar cooker **(b)** Solar cell. ½ + ½

(ii) Two Limitations :

(a) Solar heating devices are useful only at certain times during the day. **1**

(b) High cost and low efficiency of solar cell panels. **1**

[CBSE Marking Scheme, 2012]

U **Q. 10. Mention why is it not possible to make use of solar cells to meet all our energy needs. State three reasons to support your answer.**

[Board Term I, Set (39) 2012]

Ans. (i) Availability of special grades silicon used for making solar cells is limited. **1**

(ii) Silver is used for the inter-connection of the cells in the panel which adds to its cost. **1**

(iii) Low efficiency of solar cells is another reason. 1

[CBSE Marking Scheme, 2012]

A **Q. 11. Draw a well labelled diagram of a solar cooker. Identify two components in its structure that helps in maximizing heat absorption in it.**

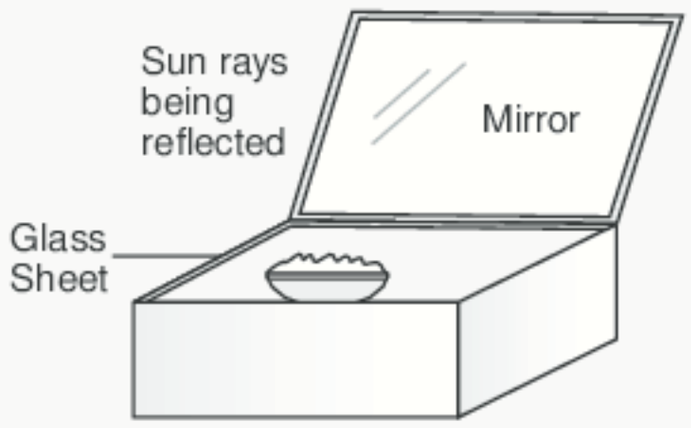
[Board Term I, 2012]

Ans. Plane mirror, glass sheet, painted black inside the cooker. **(Any two) 1**

Plane mirror–maximise the amount of light entering the solar cooker.

Glass sheet–traps infra-red radiations and produces green house effect.

Painted black–absorbs radiation. 1



A Solar Cooker :

(i) Its black surface absorbs more heat

(ii) Focused mirror.

[CBSE Marking Scheme, 2012] 1

U **Q. 12. List three advantages of harnessing wind energy.** [Board Term I, NS9SX1D, 2016]

Ans. The advantages of harnessing wind energy are :

(i) It is an environment-friendly and efficient source of renewable energy.

(ii) It requires no recurring expenses for the production of electricity.

(iii) It does not cause any pollution. 1 + 1 + 1

[CBSE Marking Scheme, 2016]

U **Q. 13. Mention any three factors on which the selection of a good source of energy depends.**

[DDE-2015]

Ans. (i) Pollution free and Eco-friendly

(ii) Easily accessible, easy to store and transport

(iii) Economical. 1+1+1

U **Q. 14. Write three reasons for the opposition of the construction of Tehri dam on the river Ganga.**

[NCT - 2014]

Ans. (i) Spurred concern about the environmental consequences of locating such a large dam in the fragile ecosystem of himalayan foothills.

(ii) It is located in the central himalayan seismic gap, a zone of earthquake.

(iii) Dam break would submerge numerous iron fillings downstream. 1 + 1 + 1

U **Q. 15. List three factors responsible for the wind. State three limitations in harnessing wind energy.**

[Board Term I, Set-57 2012]

Ans. Three factors :

(i) Uneven heating of the earth's surface. ½

(ii) Rotation of the earth. ½

(iii) Local conditions – such as change in pressure. ½

Three limitations :

(i) Can be used where wind blows for a greater part of the year. ½

(ii) Wind speed should be higher than 15 km/h. ½

(iii) Establishment is expensive and requires large area. ½

[CBSE Marking Scheme, 2012]

U **Q. 16. State the energy transformation taking place at hydropower plants. List two advantages of setting up hydropower plants.**

[Board Term I, Set-56, 2012]

Ans. Mechanical / potential energy ⟶ Electrical energy 1

Advantages :

(i) It does not cause pollution.

(ii) Uses renewable source of energy.

(iii) Continuous supply of water for irrigation.

(Any two) 2

[CBSE Marking Scheme, 2012]

U **Q. 17. Describe how a hydropower plant produces electricity. Write any two advantages of hydroelectric energy.**

[Board Term I, Set-40, 2012]

Ans. High rise dams are constructed on the river to obstruct the flow of water and thereby collect water in large reservoirs, the water level rises and in this process the kinetic energy of flowing water gets transformed into potential energy. The water from the high level in the dam is carried through pipes to the turbines, at the bottom of the dams and converted to electricity. 2

Two advantages of hydro energy :

(i) Reservoir can be refilled every time it rains so it is renewable source of energy. ½

(ii) Does not cause pollution. ½

[CBSE Marking Scheme, 2012]

A **Q. 18. Explain generation of electricity in a thermal power plant. [Board Term I, Set-2ZGOVV, 2015]**

Ans. Large amount of fossil fuels are burnt everyday in power stations to heat up water to produce steam which further runs the turbine to generate electricity. Many thermal plants are set up near coal or oil fields. In these plants fuel is burnt to produce heat energy which is converted into electrical energy. 3

U **Q. 19. Mention the transformation of energy that takes place in a thermal power plant. Briefly.**

[Board Term I, Set-JYNE6XG, 2015]

Ans. Large amount of fossil fuels are burnt everyday in power stations to heat up water to produce steam which further runs the turbine to generate electricity. Many thermal power plant is used

since fuel is burnt to produce heat energy which is converted into electrical energy. 3

A **Q. 20. Describe how hydro-energy can be converted into electrical energy. Write any two limitations of hydro energy. [Board Term I, Set (60) 2012]**

Ans. Conversion of hydro energy to electrical energy : Refer Q. 18 'SATQ-II'.

Limitations of hydro energy are :

(i) Dams are very expensive to build.

(ii) It is not the biggest source of energy on earth.

[CBSE Marking Scheme, 2012] 1

A **Q. 21. You would have seen at the roofs of the minister's house, hospital, hotels etc., solar panel for electricity and solar heater for hot water are placed. Now a days most of the people are preferring these methods.**

What kind of source of energy is used here ?

How it will affect our environment ?

Ans. Renewable source of energy. Saving of electrical energy, money. Non-polluting. **1**

Associated Value : The learners will appreciate the practice of adopting renewable sources of energy like CNG, biofuel, solar energy by the people. 2

A **Q. 22. Conserving energy has become the need of the society & nature, be it in the transport house hold or industries. Energy conservation has been recognized as a national issue for long time.**

As a responsible citizen of India, what steps would you take to conserve energy ?

Ans. Use of renewable sources of energy–Population control, Planting trees (afforestation)

(Any other point according to the student) 2

Associated Value : The learners will be encouraged to play their role as a responsible citizen in the conservation of energy resources. **1**

Long Answer Type Question (5 marks)

A **Q. 1. It is said that a difference of 20°C in temperature of water at two levels can be exploited to generate electricity. Name the power plant that can be used for this purpose. Describe the process and give its main advantage.**

Ans. It is correct that a difference of 20°C in temperature of water at two levels can be exploited to generate electricity. For this purpose, Ocean Thermal Energy Conversion (OTEC) power plants are used. To use this plant, a difference of 20°C or more between the temperature of surface waters and water at depths of 1000 meters is required. In one of Ocean Thermal Energy Conversion system, the warm surface water is used to boil low boiling liquid like ammonia, or a chlorofluorocarbon. The vapours of the liquid are then sent to move the turbines of generator. The cold water from the depths is used to cool the vapour escaped from the turbines and converted into liquid to be used again. 5

High Order Thinking Skills (HOTS) Questions

Q. 1. Biogas is considered to be a boon to the farmers. Give reason. [Board Term I, Set-26, 2011]

Ans. (a) Farmers can produce clean fuel from biowastes.

(b) Spent slurry is used as a manure and can be used to generate electricity. **1½ + 1½**

Q. 2. The cost of production of electricity in a thermal power station located in Bihar/Jharkhand/Orissa is less than in Gujarat/Maharashtra. Do you agree ? Justify your answer. 3

Ans. It is because, coal is available in Bihar/Jharkhand/Orissa locally, whereas it has to be transported for any thermal power plant in Gujarat/Maharashtra. 3

Q. 3. How is the supply of electricity maintained in a windmill when there is no wind ? In a solar panel when there is no sun ? 3

Ans. In both the cases, the electricity generated is stored in a battery. This battery provides electricity when there is no wind in the case of a windmill and no sun in the case of a solar panel. 3

Q. 4. It is advised to plant more trees along roadsides. Why ? 3

Ans. By planting more trees along roadsides we reduce pollution. When we burn fossil fuels, lots of harmful gases like carbon dioxide, carbon monoxide, etc. are produced by them. These are absorbed by plants and converted into useful gases like oxygen. 3

Q. 5. Which is a better fuel : biogas or animal dung-cakes ? Give reasons in support of your answer. 3

Ans. Biogas is a better fuel than animal dung-cakes. This is because of the following reasons :

(i) Biogas burns without smoke, whereas the burning of animal dung-cakes produces a lot of smoke.

(ii) Animal dung-cakes leave residue like ash, whereas biogas leaves no residue.

(iii) The calorific value of biogas is much higher than that of animal dung-cakes. **1 + 1 + 1**

Q. 6. Energy can neither be created nor be destroyed. In the context of this statement explain, why do we talk about energy crisis ? 3

[Board Term I, Set-3R6WRQL, 2013]

Ans. (i) Energy can be converted from one form to another.

(ii) Energy in the usable form is dissipated to the surroundings in less usable form.

(iii) Non-renewable source of energy is consumed and cannot be used again.

[CBSE Marking Scheme, 2013] 1 + 1 + 1

Q. 7. It has been observed that the construction of big dams have certain problems associated with them. List three problems. [Board Term I, Set (46) 2012] 3

Ans. (i) Large areas of agriculture and human habitation are to be sacrificed as they get submerged.

(ii) Large ecosystems are destroyed when submerged under the water in dams.

(iii) The vegetation which is submerged rots under anaerobic conditions and give rise to large amount of methane which is also a green house gas.

[CBSE Marking Scheme, 2012] 1 + 1 + 1

Value Based Questions

Q. 1. An NGO is opposing the construction of a dam on a river flowing through a number of villages and forest for the 'purpose' of generating electricity while the Government was insisting that it would bring a number of benefits for the villagers once the project gets completed.

(a) Describe the value exhibited by NGO.

(b) Explain any two concerns of NGO due to which it is opposing construction of dam. 3

[Board Term I 2014, Set-IN14KGB, Board Term I, OQKPLGV, 2016]

Ans. (a) The NGO has concern for villagers and environment.

Major Concerns of NGO :

(b) (i) Construction of dam would lead to submersion of human habitation causing their displacement.

(ii) Agriculture land would be submerged.

(iii) Ecosystem would be disturbed.

(iv) Rotting of submerged vegetation would produce greenhouse gases. **(Any two)** 1+2

[CBSE Marking Scheme, 2016]

Q. 2. A science teacher asked his students of standard X to collect information about various energy sources and find how each one affects the environment. The teacher also motivated them to debate the merits and demerits of each source and select the best source of energy on that basis.

Answer the following question :

(i) Mention two sources of energy based on their effect on environment which the students might have selected as the best.

(ii) Which of the two energy sources renewable or non-renewable would have more demerits as compared to the other and why ?

(iii) Explain how the science teacher took this issue in today's reference. 3

[Board Term-I, WDCXXOV, 2016]

Ans. (i) Wind energy, solar energy, bio gas use. **(Or any other)**

(ii) Non-renewable because they produce pollution.

(iii) To make students aware about global issues like global warming/pollution. 3

[CBSE Marking Scheme, 2016]

Q. 3. Nikhil and Neha went to a remote village in Kerala to meet their grandmother. They ware surprised to see a biogas plant in Mr. Nair's house in the neighbourhood. There were plenty of livestocks and the household used cooking gas from the plant. Also their farm had rich vegetation. They contacted sarpanch of the village and convinced him to set up a biogas plant for village community.

(i) Mention the values displayed by Mr. Nair, Nikhil and Neha.

(ii) Explain the possible arguments given by Nikhil and Neha to the Sarpanch to convince him to set up community biogas plant. 3

[Board Term I, L7ZSVLH, 2016]

Ans. (i) Mr. Nair's readiness to adopt improvised technology for efficient use of fuel. Nikhil and Neha had concern for the whole village community and wanted that all should be benefitted by this technology and the environment be pollution free.

(ii) Nikhil and Neha explained to them that by setting up community biogas plant, the plant and animal waste would be disposed of in better manner. They would get manure and better fuel too. 3

[CBSE Marking Scheme, 2016]

Q. 4. Traffic jams, outside the school gate was a common sight since most of the students came on their own cars. This became a topic for discussion on every P.T.A meeting. On one such P.T.A. meeting, the principal pointed out the examples of four of their teachers who were car pooling for the past several years. She asked the parents also to adopt this method to sort out the problem.

(a) List two values shown by the teachers mentioned by the Principal.

(b) Explain two advantages that will occur if more parents emulated the example of these teachers.

[Board Term I, Set-1ZHNPNO, 2016] 3

Ans. (a)(i) They share a common concern for the need to conserve fossil fuels which are non-renewable.

(ii) They value cooperation and co-ordination for a common cause of energy conservation.

(b) If parents would adopt car pooling then the number of cars on street would reduce. This would save a lot of petrol or diesel which is a fossil fuel. Apart from saving money, there would be less pollution in air because burning fossil fuel causes air pollution. **[CBSE Marking Scheme, 2016]** 3

Q. 5. Groundwater in many areas in India is not fit for drinking because there are many toxic wastes consisting of poisonous metals leading to serious contamination which can be fatal. Government admitted that iron, arsenic and fluoride levels were found higher than their permissible limits. States like Rajasthan, Karnataka and Gujarat seemed to be worst affected. The government has also estimated that salinity has risen beyond tolerance level in many districts.

(i) What are the life skills focussed in this passage ?

(ii) As a student what initiative will you take in your area concerning "Drinking water is Valuable." Give any three suggestion. 2

Ans. (i) Life skills focussed :

Self awareness, Problem solving, Critical thinking . ½

(ii) Three suggestions :

(a) Do not waste water by presenting dramas. ½

(b) Conserve rain water by showing experiments. ½

(c) Not to dispose plastic and bottles in rivers, avoid garbage disposal in rivers. ½

Q. 6. In a school, there are seventy teachers and most of them come by their personal vehicle, whereas there are many teachers who come from the same place.

Is this practice of commuting to school helping nature ? Justify it ? 3

Ans. No, excessive use of fossil fuel pollutes the environment, and fossil fuels are non-renewable source of energy.

Can use car pool. 2

Associated Value : The learners will appreciate and adopt the idea of travelling in MRTs (Metro) and favour car pool so that they can also play a role in promoting eco-friendly life style. 1

Q. 7. Preeti in her summer vacations went to a village with her mother. She saw that many women in the village were busy preparing cakes from cowdung. She also saw that they were using these cowdung cakes as a fuel in Chulhas for cooking food. Preeti was surprised to see this and asked her mother about the cakes.

(i) Name other source of fuel which is prepared from cowdung.

(ii) Name the gases which are present in this fuel.

(iii) What values did this fuel indicate ? 3

Ans. (i) Biogas. 1

(ii) Methane, Carbon dioxide. 1

(iii) Values : 1

(a) It has high calorific value.

(b) It burns without smoke.

(c) It does not leave any residue.

Q. 8. Nuclear fusion of deuterium is said to power the sun. The energy that radiates out in all the directions is received to some extent by various planets and other celestial bodies. It is estimated that the earth receives only 0.0000000045792% of the total solar energy. Besides heat energy, ultraviolet, gamma rays and visible light also comes from solar energy.

(i) "Solar energy is the prime source of all energy sources." Justify the statement by giving reasons.

(ii) Write down the importance of solar energy to humans ? 3

Ans. (i) Indirectly or directly all forms of energy originate from the solar energy. Plants prepare their food by the solar energy. The solar energy forms clouds by evaporating water from lakes, rivers, oceans which come down to the surface in the form of rain and snow. The energy from flowing water is hydroelectricity. 1

(ii) Importance of Solar Energy :

(a) Drying clothes

(b) To obtain salt from sea water

(c) To get rid of moisture content in food grains. 2

Q. 9. During the natural disaster (Tsunami) at Japan, the nuclear reactors were damaged, due to which hazardous radiation affected the large area.

(i) What was the reason for this damage ?

(ii) How it affected the people and environment ?

(iii) Do you think that nuclear energy is good for nature ? 3

Ans. (i) Heat evolved during nuclear fission.

(ii) (a) Damage to property & life

(b) Genetic disorder

(c) Infertile soil 2

(iii) No, it is not good for environment as it may cause pollution. 1

Associated Value : The learners will be more educated and careful towards safety measures against nuclear hazards.

Q. 10. It is difficult to imagine spending an entire day without using energy. We use energy to light our cities and homes, to power machinery in factories, cook our food etc. But we only have limited amount of non-renewable energy sources on Earth. Therefore, it is important to conserve our current energy sources so that our natural resources will be available for future.

(i) What are renewable resources ?

(ii) Comment on the statement, "Save energy and conserve the natural resources." As a student what simple habits you can inculcate in daily life to justify the statement. 3

Ans. (i) Renewable resources are those that will either never run out or are renewed through relatively rapid natural cycles. 1

(ii) Some habits to switch in daily life are :

(a) Switch-off lights when not needed at homes. ½

(b) Use compact fluorescent lamps. ½
(c) Use solar cookers, solar cells. ½
(d) Use energy efficient electrical appliances. ½

Q. 11. Arun lives in an eco-friendly house. All rooms in his house are cross ventilated and well lit with sun's light. He has installed solar panels on roof top and also used solar devices like solar cooker, solar water heater etc. Although he has spent some more money initially on these installations, yet he is happy now.

(i) State the reason behind Arun's happiness.

(ii) Which element is used in fabricating solar cells ?

(iii) What inspirations should we take from Arun ?

[Board Term I, Set-WH1SGOB, 2014] 3

Ans. (i) His monthly electricity bill is very less in comparison to his neighbours. He is contributing to the environment.

(ii) Silicon **(Or any other element).**

(iii) He is an environment friendly citizen and is concerned about the environment. **1 + 1 + 1**

[CBSE Marking Scheme, 2014]

Q. 12. Amit lives in Delhi and is much concerned about the increasing electricity bill of his house. He took some steps to save electricity and succeeded in doing so.

(i) Mention any two steps that Amit might have taken to save electricity.

(ii) Amit fulfilled his duty towards the environment by saving electricity. How ?

(iii) Which alternative source of energy would you suggest Amit to use ? 3

[Board Term I, Set-5X7289R, 2014]

Ans. (i) To save electricity, Amit must have used LED lights and solar panels.

(ii) He should install Solar panels on roof tops and also use solar devices like solar cooker, solar water heater etc.

(iii) Amit should use solar energy. **1 + 1 + 1**

Q. 13. Aditya suggestion to his family to install a solar water heater at their residence. But some of the family members were in a favour of installing an electric geyser.

(i) Who according to you is taking a correct decision ? Mention the value exhibited by Aditya.

(ii) Also give reasons (at least 2) for your answer.

[Board Term I, Set 3R6WRQL, 2013] 3

Ans. (i) Aditya is taking a correct decision. It shows his awareness about energy conservation.

(ii) Solar heater runs on renewable source of energy. 2
It saves electrical energy produced by burning fossil fuels, thus it helps in reducing global warming. 1

Q. 14. On returning home Neha noticed that her 6 year old brother Naresh, was watching TV in the afternoon with all the lights and fans 'on'. She noticed that the windows were closed and curtains were drawn, which made the room dark, so, Naresh had put on the lights. She calmly opened the windows, drew the curtains aside, which illuminated and aerated the room. Then she made Naresh put 'off the lights and made him understand the reason behind her action.

(a) List two values exhibited by Neha.

(b) Explain how she tried to give values to her brother.

[Board Term I, Set-WJ7QPA9, 2013] 3

Ans. (a) (i) Her concern for conservation of energy and her attitude.

(ii) She knows that she should make youngsters too aware of the need to conserve energy and reduce environmental pollution. 2

(b) She explains to her brother that in the production of thermoelectricity, coal is burnt, which is non-renewable source. Secondly, its burning causes air, water and soil pollution. 1

Q. 15. State any two impacts on the environment caused due to 'increase in demand for energy. Suggest any two steps to reduce energy consumption.' 3

[DDE-2015, Board Term I, Set-A85V2IL, 2015]

Ans. (i) Non-renewable sources getting exhausted.

(ii) Increase in pollution.

Suggestions :

(i) Use more of renewable sources of energy

(ii) Stop wasteful expenditure of energy. **1½+1½**

[CBSE Marking Scheme, 2015]

Q. 16. Aditi made a solar cooker in science competition she also got a prize in the competition. She wanted to help her mother in cooking at home with this solar cooker. She made her mother aware of the limitations of the solar cooker.

(i) What is the main limitation of using a solar cooker?

(ii) Would you suggest Aditi to install solar cooker at her home ? Give reason for your answer.

(iii) Which values of Aditi impress you ? [DDE 2015]

Ans.

(i) It cannot be used in night and cloudy days.

(ii) Yes, Because it is pollution free, economical as nothing is to be paid for using solar energy, easy to handle and nutrients in the food do not get destroyed.

(iii) Values : Environmental care, helpfulness. **1+ 1 + 1**

Q. 17. Solar cooker takes more time as compared to the LPG to boil potato or rice, yet Kunal uses solar cooker for such type of cooking :

(i) Why does Kunal use solar cooker instead of LPG ? Give reason for your answer.

(ii) Name the phenomenon which is responsible for obtaining high temperature in solar cooker ?

(iii) What is motivation behind solar cooker ? 3

[Board Term I, Set-JYNE6XG, 2015]

Ans. (i) Because it cooks food without paying by using solar energy.

(ii) Greenhouse effect.

(iii) Pollution free, economical, easy to handle. **1+1+1**

Q. 18. Kapil was feeling proud after the installation of solar water heater on his root top. He knows

that he has contributed towards the conservation of environment. Now answer the following questions:

(i) Write one advantage and one limitation of using a solar water heater.

(ii) How has Kapil contributed towards the conservation of environment ?

(iii) State the values that prompted Kapil's action. 3

[Board Term I, Set-2ZGOVVV, 2015]

Ans.

(i) **Advantage :** It is economical to use solar water heater because nothing is to be paid for using solar energy.

Limitation : It cannot be used at night and during cloudy weather.

(ii) Kapil's contribution towards conservation of environment is nature friendly because he is saving fossil fuels, which is non-renewable sources of energy. By this practice he is also reducing pollution.

(iii) Environmental concern, avoidance of wastage of energy. **1 + 1 + 1**

Q. 19. Ranbir lives in a village and uses wood as a fuel. He studied in this school that charcoal is a better fuel than wood. He decided to use charcoal instead of wood.

(i) How can Ranbir obtain charcoal from wood ?

(ii) Why is charcoal considered as better fuel than wood ? Give two reasons.

(iii) State the values that prompted this action of Ranbir. [Board Term-I, 2015]

Ans. (i) Charcoal can be produced by cutting trees, 1 kg of wood on destructive distillation produces only 0.25 kg of charcoal.

(ii) **(a)** Charcoal has high calorific value.

(b) Charcoal does not produce any smoke.

(iii) No regard for environment, disregard for health.

1 + 1 + 1

Q. 20. A school organized a study tour for its students to observe how do people in village use energy resources for their living. They observed that in one of the villages, people use wood and cow dung as a fuel while in the nearby village they saw modern technology was used by the villagers for better sanitation and management of their bio-waste and sewage materials by establishing bio-gas plant.

(a) If you compare situation of both the villages, which practice would you prefer to be the best and why ?

(b) What are the advantages of this practice ?

(c) State the associated values which you would get from this excursion tour.

Ans. (a) Second villagers because they utilises the bio-waste for established biogas plant.

(b) Biogas is cheap and does not cause pollution.

(c) Knowledge and Awareness. **1+1+1**

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