Class – 10 Science

Notes

Chapter-14 Sources of Energy

Acids: Indicators, General characteristics, Properties of acids, Chemical nature of acids.

Sources of Energy: A source of energy is that which is capable of providing enough useful energy at a steady rate over a long period of time.

A Good source of energy should be :

- Safe and convenient to use, For example; energy nuclear can be used only by highly trained engineers with the help of nuclear power plants. It cannot be used for our household purpose.
- Easy to transport, For example; coal, petrol, diesel, LPG etc. have to be transported from the places of their production to the consumers.
- Easy to store, For example; huge storage tanks are required to store petrol, diesel, LPG etc.

Characteristics of a good fuel

- High calorific value.
- Less smoke.
- Less residue after burning.
- Easy availability.
- Inexpensive.
- Easy to store and transport.

Classification of Sources of energy
The sources of energy can be classified as follows :

1. Renewable sources of energy.
2. Non-Renewable sources of energy.

1. Renewable sources of energy: Renewable sources of energy are those which are inexhaustible, i.e., which can be replaced as we use them and can be used to produce energy again and again.
These are available in an unlimited amount in nature and develop within a relatively short period of time.
Example of Renewable Sources of Energy :

- Solar energy.
- Wind energy.
- Water energy (hydro-energy).
- Geothermal energy.
- Ocean energy.
- Biomass energy (firewood, animal dung and biodegradable waste from cities and crop residues constitute biomass).

Advantages of Renewable Sources of Energy

- These sources will last as long as the Earth receives light from the sun.
- These sources are freely available in nature.
- These sources do not cause any pollution.

2. Non-Renewable Source of Energy: Non-renewable sources of energy are those which are exhaustible and cannot be replaced once they have been used. These sources have been accumulated in nature over a very long period of millions of years.
Examples of Non-renewable Sources of Energy :

- Coal.
- Oil.
- Natural gas.
  All these fuels are called fossil fuels.

Disadvantages of Non-renewable Sources of Energy

- Due to their extensive use, these sources are fast depleting.
- It is difficult to discover and exploit new deposits of these sources.
- These sources are a major cause of environmental pollution.

Fossil Fuels: Fossil fuels are the remains of prehistoric plants and animals which got buried deep inside the early millions of years ago due to some natural processes.
These fossil fuels are non-renewable sources of energy and cause environmental problems due to pollution.

Formation of Fossil Fuels: During its formation, an entire organism or its parts often get buried in sand or mud. These, then decay and disintegrate leaving no signs of their existence. Infact, the harder parts of organisms after their death settle down and are covered by sediments and subjected to extreme pressure and temperature or the Earth converts them into fossil fuels, the process being referred to as fossilization.

Disadvantage of Fossil Fuels

- The fossils are non-renewable sources of energy and once used cannot be renewed.
- Burning of fossil fuels causes air pollution.

- The fossil fuels reserves in the Earth are limited and may get exhausted soon.

Thermal Power Plants: It generates electricity from heat produced by combustion of coal and petroleum. For example; fossil fuels.
Use coal, petroleum and natural gas produce thermal electricity.
Electricity transmission is very efficient.
The steam produced by burning fossil fuels nans the turbine to produce electricity.

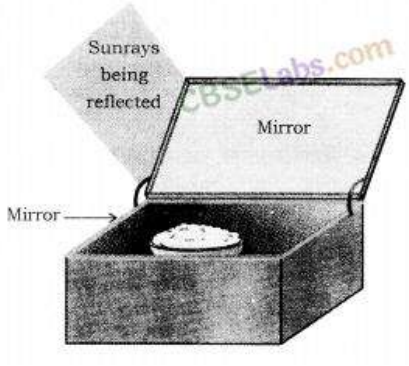
Source of energy are also classified as

- Conventional sources of energy and
- Non- conventional sources of energy.

(i) Conventional Sources of Energy are those which are used extensively and meet a marked portion of our energy requirement and these are :
(a) Fossil fuels (coal, oil and natural gas) and
(b) Hydro energy (energy of water flowing in rivers).
Biomass energy and wind energy also fall in this category as these are being used since ancient times.

(ii) Non-conventional Sources of Energy are those which are not used as extensively as the conventional ones and meet our energy requirement only on a limited scale. Solar energy, ocean energy, (tidal energy, wave energy, ocean thermal energy, OTE), Geothermal energy and nuclear energy belong to this category. These sources of energy which have been tapped with the aid of advances in technology to meet our growing energy needs are also called alternative sources of energy.

Renewable Sources of Energies
1. Solar Energy: The energy produced by the sun in the form of heat and light energy is called as solar energy.
Solar radiations can be converted electricity through solar cells (Photovoltaic cells).
Photovoltaic cells convert solar radiations directly into electricity through silicon solar cells.
Solar cells arrange on a large flat sheets form a Mirror solar panel.
Solar cookers are painted black from outside and a large glass plate to trap solar radiations by green house effect.



Advantages of Solar Cookers

- Eco-friendly.
- Renewable.
- Used in rural areas.
- Retains all the nutrients in food due to slow cooking.

Disadvantage of Solar Cookers :

- Silicon cells are expensive.
- Solar radiations are not uniform over the Earth's surface.
- Cannot be used at night or on cloudy days.
- Cannot be used to make chapattis for frying as these require a temperature of 140°C or more. (Maximum temperature of 100°C only can be achieved in a solar cooker) Other Solar Devices are Solar water heater and Solar furnace.

2. Wind Energy: When large masses of air move from one place to another then it is referred to as wind. During this process, kinetic energy gets associated with it which is referred to as wind energy.
It can be converted into mechanical and electrical energy.
Kinetic energy of wind is used in running of windmills, which are used to lift water, grind grains etc.

Wind mill

Uses of Wind Energy
The important uses of wind energy are :

- It is used to drive windmills, water lifting pumps, and flour mills, etc.
- It is used to propel sale boats.
- It is used to fly engine fewer airplanes or gilders in the air.
- It is used to generate electrically used for various purposes like lightning, heating, etc.

Advantages:

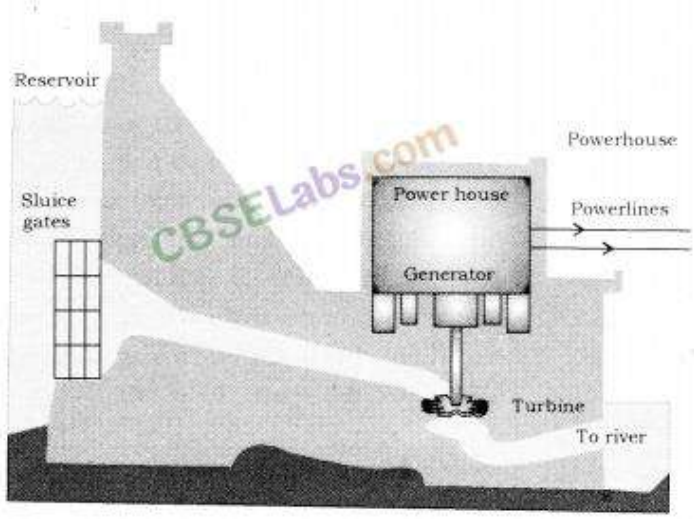
- Eco-friendly
- Renewable.

Disadvantages :

- Wind speed does not uniform always.
- Needs a large area to erect series of windmills.

- Big amount of investment is needed.
- The output is less as compared to investment.

3. Hydro Power Plant (hydro energy): When the water flowing in a river is stored in a high rise dam and allowed to fall from the top of the dam. The water rushes down with a great force, which can be utilized to drive large water Lurbine. These turbines are connected with electric generators which generate electric current. The electricity generated in this process is termed as hydroelectricity or hydel power. In fact the process involves transference of potential energy of the water into kinetic energy' and then into electric energy.
It is the most conventional renewable energy source obtained from water falling from a great height.
It is clean and nonpolluting source of energy.
Dams are constructed to collect water flowing in high altitude river. The stored water has a lot of potential energy.
When water is allowed to fall from a height, potential energy changes to kinetic energy which rotates the turbines to produce electricity.



Hydro power plant.

Advantages of Hydro Power Plant :

- It is readily and abundantly available everywhere free of cost.
- It is eco-friendly and does not produce any kind of environmental pollution.
- It is a renewable source as water itself is a renewable and inexhaustible resource.
- It is a cheap source of energy, as it does not involve any costly investment.

Disadvantages of Hydro Power Plant

- Highly expensive to construct.
- Dams cannot be constructed on all river sites.

- Large areas of human habitation and agriculture fields get submerged.
- People face social and environmental problems.

4. Geothermal Energy: Geothermal energy is the heat of the Earth and is the naturally occurring thermal energy found within rock formations and the fluids held within those formations.
Energy harnessed from the heat of the Sun is called Geo Thermal Energy.
Magma is formed when this heat melts the rocks. The rocks and hot gases are called magma.
The magma gets collected at some depths below the Earth's surface. These places are called 'Hot spots'.
When underground water comes in contact these hot spots, it changes into steam, which can be used to generate electricity.

Advantages of Geo Thermal Energy

- Renewable
- Inexpensive

Disadvantages of Geo Thermal Energy
- Only a few sites are available for harnessing energy.
- Expensive

5. Ocean Energy: The oceans acquire almost 71% of the surface of the Earth. The enormous amount of water present in them did not act as a big collector of solar heat energy, but also store large amount of it due to its high specific heat. Thus, ocean water can be used as a renewable resource of energy.
The main forms of ocean energy are described as under :
(i) Ocean Thermal Energy: The energy available due to the temperature difference between the deeper levels and surface of an ocean is called as Ocean Thermal Energy,

(ii) Ocean Tidal Energy: The rise of ocean water due to the attraction of the moon is referred to as high tide and its fall as low tide. The enormous movement of water due to high and low tide provide a large amount of energy known as Ocean Tidal Energy. This tidal energy can be utilized by constructing a tidal barrage or dam.

(iii) Sea Wave Energy: The energy obtained from the high-speed sea waves is referred to as sea wave energy. Infact, these high-speed sea waves have a lot of kinetic energy associated with them, which can be used to drive dynamos which convert kinetic energy into electrical energy.

(iv) Energy from Nuclear Deuterium of Oceans: The oceans water contains an unlimited amount of heavy hydrogen isotope called as deuterium which is isotope hydrogen having one neutron in its nucleus. Scientists are working hard to produce energy by carrying the controlled nuclear fission of deuterium isotope. The process is still in its experimental stage.

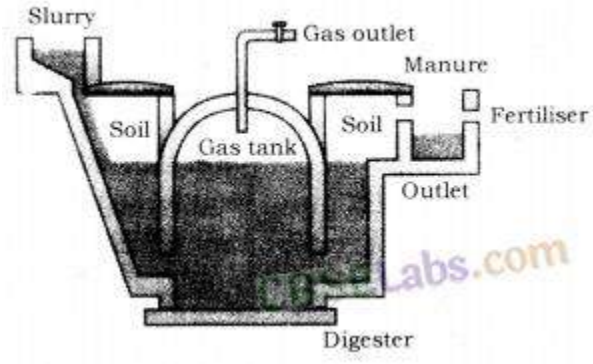
(v) Energy From Salinity Gradient in Seas: The difference in the concentration of salts in the water of the two or more seas is called a salinity gradient. This salinity gradient is now a day used to obtain energy with the involvement of suitable techniques,

(vi) Energy From Sea Vegetation or Biomass: Sea vegetation or biomass is another direct source of energy because the enormous amount of seaweeds present in the sea water provides an endless supply of methane fuel.
Disadvantages: Uniform tidal action is not seen.

6. Bio-Mass: Biomass is defined as living matter or its residue and is a renewable sources of energy.
The biomass includes
- all the new plant growth
- agriculture and forest residues (like Bio-gases, dark, sea dust, wood savings, roots, animals dropping, etc..),

- Carbonaceous wastes (like sewage, garbage, night-soil, etc.)
- Biodegradable organic effluent from industries.

It is the source of the conventionally used fuels that are used in our country. For example; Cow dung cakes, fire-wood, coal, charcoal etc.



Bio-gas: It is a mixture of gases produced during decomposition of bio mass in the absence of oxygen. (Anaerobic Respiration). Methane is the major component of bio-gas.

Bio-gas plants: Animal dung, sewage, crop residues, vegetable wastes, poultry dropping, etc. are used to produce Bio-gas in Bio-gas plants.

Advantage of Bio-gas

- A Bio-gas plant, is quite simple, can easily be built in rural areas. A small plant using dung from 3 to 4 heads of cattle is capable of supplying Bio-gas for 6 hours daily for cooking purposes.
- Bio-gas is a clean fuel that burns without smoke and leaves no ash.
- The main constituent of Bio-gas, i.e., ethane has a higher calorific value (55 kj/g) that of petrol (50kj/g).
- The spent slurry, being rich in nitrogen and phosphorus is good manure.
- By using Bio-gas, firewood is saved and deforestation is reduced.

Composition of Bio-gas: Bio-gas is mainly composed of methane (up to 75%), C02 (25%) and traces of other gases such as nitrogen and hydrogen. Whereas methane is a high-value calorific fuel, carbon dioxide is an inert gas.

7. Nuclear Energy: A reaction in which, the nucleus of an atom undergoes a change to form a new atom and releases an enormous amount of energy is called as nuclear energy. There are two distinct ways of obtaining nuclear energy, (a) Nuclear fission and (b) Nuclear fusion.
Energy released when some changes take place in the nucleus of the atom of a substance is called Nuclear energy.
It is used for heat generation, fuel for marine vessels.

Advantages of Nuclear Energy

- The alternative source of energy due to depletion of fossil fuels.
- From a small amount of fuel, a large amount of energy is released.

Disadvantages of Nuclear Energy :

- Risk of nuclear waste leakage.
- High cost of setting up of nuclear plant.
- Pollution of environment.

Environmental consequences of the increasing demand for energy :

- The combustion for fossil fuels produces acid rain and damages plants (crops), soil and aquatic life.
- The burning of fossil fuels is increasing the amount of greenhouse gas, carbon dioxide in the atmosphere.
- The construction of hydropower plants is a disturbing ecological balance.
- Nuclear power plants are increasing radioactivity in the environment.

Difference between Nuclear Fission and Fusion

Nuclear Fission	Nuclear Fusion
1. It involves breaking of a heavy nucleus into lighter nuclei.	1. It involves the binding of two nuclei.
2. It is carried out by the bombardment of neutrons over a heavy nucleus.	2. It is carried out by heating an extreme temperature.
3. It is a chain reaction.	3. It is not a chain reaction.
4. It is a controlled process.	4. It is an uncontrolled process.
5. It produces an enormous amount of energy.	5. It produces more energy than nuclear fission.
6. Fission products are hazardous.	6. It does not cause pollution.

Need for Energy: The ability of a body to do work is called energy. No activity will occur without energy. So energy is required in all walks of life.

Characteristics of a good source of energy.

- It should be able to do a large amount of work for each unit of mass or volume.
- It should be easily accessible.

- It should be easily transported.
- It should be economical.

Conventional Sources of Energy.
The sources of energy which have been in use since a long time are called conventional sources of energy. For example, Coal, petroleum, natural gas, hydel energy, wind energy and nuclear energy are considered to be the conventional sources of energy. Firewood is also a conventional source of energy but its usage is now limited to kitchens in rural India.

Fossil Fuels.
Coal: Coal was formed millions of years ago. The plants got buried under swamps and due to high pressure and high temperature inside the earth; they were converted into coal. Coal is the highest used energy source in India. During the days of the steam engine, coal was used in steam engines. Moreover, coal was also used as kitchen fuel; before LPG became popular. Nowadays, coal is mainly being used in industries.

Petroleum: Petroleum was also formed millions of years ago. The animals got buried under the ocean surface and were converted into petroleum; in due course of time.
Petroleum is the third major source of energy being used today. Petroleum products are used as automobile fuel and also in the industries. Natural gas mainly comes from the oil wells and is also a major source of energy.

Non-renewable Sources of Energy.
It takes millions of years for the formation of fossil fuels. Since they cannot be replenished in the foreseeable future, they are known as non-renewable sources of energy.

Renewable Sources of Energy.
Those sources of energy which can be replenished quickly are called renewable sources of energy. Hydel energy, wind energy and solar energy are examples of renewable sources of energy.

Hydel Energy: Hydel energy is produced by utilizing the kinetic energy of flowing water. Huge dams are built over a source of water. Water is collected behind the dam and released. When the water falls on the turbine; the turbine moves; because of kinetic energy of water. Thus, electricity is generated by the turbine. Electricity; thus generated is called hydel energy or hydroelectricity.

Limitations of Hydroelectric Plants.

- Dams can be constructed only in a limited number of places, preferably hilly areas.
- Large areas of agricultural land and human habitation get destroyed by the construction of dams.
- Large eco-systems get submerged under water. The vegetation which is submerged underwater rots under anaerobic conditions and gives rise to large amounts of methane which is a greenhouse gas.
- Rehabilitation of displaced people is another major problem.

Thermal Power Plant: In a thermal power plant, coal or petroleum is used for converting water into steam. The steam is used to rim the turbine; to generate electricity.

Biomass: The material obtained from the bodies of plants and animals is called biomass.
Examples: cattle dung, sewage, crop residue, wood, etc.

Biogas: Biogas is a mixture of methane, carbon dioxide, hydrogen and hydrogen sulphide. It contains 65% of methane gas. Biogas is produced by the anaerobic degradation of biomass in the presence of water but in the absence of air.

Wind Energy: Wind energy has been in use since ages. Windmills have been in use; especially in Holland; since the medieval period. Nowadays, windmills are being used to generate electricity. The kinetic energy of wind is utilized to run the turbines; which generate electricity. At present, Germany is the leading country in terms of wind energy production and India comes at number five. In India, Tamil Nadu is the largest wind energy producing state. The largest wind farm in India is near Kanyakumari; in Tamil Nadu; which generates 380 MW of electricity.

Limitations of Wind Energy: Wind farms can only be established at those places where the wind speed is high enough and is more than 15 km/hr for most parts of the year. Wind farms need to be established on large tracts of land. The fan of the windmill has many moving parts; so the cost of maintenance and repair is quite high. The initial cost of establishing a wind farm is very high.

Non-conventional Sources of Energy: Energy sources which are relatively new are called non-conventional sources of energy, e.g., nuclear power and solar energy.

Solar Energy: The sun is the main source of energy for all living beings on this earth. Even the energy in the fossil fuels has come from the sun. The sun has an endless reservoir of energy which would be available as long as the solar system is in existence. Technologies for harnessing the solar energy have been developed in recent times.

Solar Cooker: Solar cooker is very simple in design and mode of function. It is usually made from mirrors. Plain mirrors are placed inside a rectangular box. The light reflected from the plain mirrors concentrates the solar energy inside the solar cooker which generates enough heat to cook food.

Solar Furnace: Solar furnace is made like a concave mirror. Large solar furnace has many smaller mirrors to compose a very large convex mirror. The thing to be heated is placed near the focus of the mirror.

Solar Cells: Solar cells are made from silicon. The solar panel converts solar energy into electrical energy which is stored in a battery; for later use.

Limitations of Solar Energy: The technologies for harnessing solar energy are at a nascent stage. At present, the cost-benefit ratio for using solar energy is not conducive. Using solar energy is exorbitantly costly.

Tidal Energy: Due to the gravitational pull of the moon, tides happen near seashores. Water rushes up near the seashore during high tide and goes down during low tide. Dams are built near seashores to collect the water which comes during a high tide. When the water runs back to the ocean, the flow of water can be utilized to generate electricity.

Wave Energy: Waves can also be a good source of energy. Many devices are being designed and tested to produce wave energy. For example; a hollow tower is built near the seashore. When water gushes in the tube because of wave, it forces the air upwards. The kinetic energy of air in the tube is used to run a turbine. When the wave goes down; air from up goes down the tube which is also used in running the turbine.

Ocean Thermal Energy: The water at sea surface is hot during the daytime, while the water at a lower level is cold. The temperature differential in water levels can be utilized to generate energy. If the temperature differential is more than 20°C, then ocean thermal energy can be utilized from that place. For this, a volatile liquid; like ammonia; is boiled using the heat from the hot water at the surface. The steam of the volatile liquid is utilized to run the turbine to generate electricity. Colder water from the surface below is utilized to condense ammonia vapour which is then channelized to the surface to repeat the cycle.

Geothermal Energy: Heat energy from molten rocks present inside the earth created under certain favourable conditions by natural processes is called geothermal energy. It is the only type of energy which does not use solar energy.

Nuclear Energy: Nuclear fission is the process during which a bigger nucleus breaks to produce two smaller nuclei. The process generates a huge amount of energy. This phenomenon is utilized in nuclear power plants. Nuclear power is safest for the environment but the risk of damage due to accidental leaks of radiation is pretty high. Further, the storage of nuclear waste is a big problem because of the potential risk of radiation involved.

Advantages of nuclear energy.

- A very large amount of energy can be produced by a nuclear process on using very small amount of nuclear fuel in a nuclear reactor.
- The energy so produced can be easily transformed into electrical energy.
- It does not produce harmful gases.

Important Questions of Sources of Energy

Question 1. The biggest source of energy on Earths surface is
(a) Biomass
(b) Solar radiations
(c) Tides
(d) Winds (2020)
Answer: (b) The biggest source of energy on Earths surface is solar radiations.

Answer question numbers 2-5 on the basis of your understanding of the following paragraph and the related studied concepts:
The Tehri dam is the highest dam in India and one of the highest in the World. The Tehri dam withholds a reservoir of capacity 4.0 km^3 and surface area 52 km^2. It is used for irrigation, municipal water supply and the generation of 1000 MW of hydro electricity.

The Tehri Dam has been the object of protests. Environment activist Shri Sunder Lai Bahuguna led the "Anti Tehri Dam Movement" from 1980s to 2014. The protest was against the displacement of town inhabitants and environmental consequences of the weak ecosystem. The relocation of more than 1,00,000 people from the area has led to protracted legal battles over resettlement rights and ultimately resulted in the delayed completion of the project. (2020)

Question 2. How is hydropower harnessed?
Answer: Potential energy of water stored in a dam is converted into kinetic energy of falling water and then, this kinetic energy is converted into electrical energy.

Question 3. Define 1 MW.
Answer: 1 MW is the power consumed or dissipated by a device which consumes or dissipates 1 mega joule of energy per second.

Question 4. Mention two disadvantages of constructing Tehri Dam.
Answer: For the construction of Tehri Dam, relocation of more than 100000 people was needed which led to widespread protests and legal battles. Also large ecosystems were destroyed when it submerged under the water in dams causing emission of large amounts of methane which is a green-house gas.

Question 5. What happens when water from great heights is made to fall on blades of turbine?
Answer: When water from great heights is made to fall, the potential energy of these waters get converted into kinetic energy and when it falls on the blades of turbines, it rotates the turbine of a generator, thus producing electricity.

Question 6. Why is biogas considered an excellent fuel? (Delhi 2019)
Answer: Biogas is considered as excellent fuel because

- it does not produce smoke.
- slurry left behind can be used as an excellent manure.

Question 7.
Name any two nutrients that the spent slurry has in the biogas plant. (AI 2019)
Answer:
Nitrogen and phosphorus.

Question 8.
Write the energy conversion that takes place in a hydropower plant. (2018)
Answer:
Hydropower plant converts the potential energy of stored yrater into electrical energy.

Question 9.
Name any two fossils fuels. (Board Term I, 2017)
Answer:
Coal and petroleum are two fossil fuels.

Question 10.
Name any two conventional sources of energy. (Board Term I, 2016)
Answer:
(i) Fossil fuels (ii) Wind energy

Question 11.
What is meant by the term 'Biomass'? (Board Term I, 2014)
Answer:
Biomass : Cow-dung, various plant materials like the residue after harvesting the crops, vegetable wastes and sewage which can be decomposed in the absence of oxygen is called biomass.

Question 12.
Write the characteristic features of the micro organisms which help in the production of biogas in a biogas plant. (Board Term I, 2014)
Answer:
In a biogas plant, anaerobic micro-organisms are used. They do not require oxygen to decompose or break-down complex compounds of the cow- dung slurry.

Question 13.
What are fossil fuels? "Burning fossil fuels may lead to intense global warming." Justify this statement. (Foreign 2014)
Answer:
Fossil fuels : The combustible substances formed from the dead remains of the animals and plants which were buried deep under the surface of the earth for over millions of years are called fossil fuels. Burning of fossil fuels produces carbon dioxide and excess carbon dioxide in the atmosphere causes the greenhouse effect, leading to intense global warming.

Question 14.
What is the main constituent of biogas? How is biogas obtained from biomass? Write any two advantages of using this gas. (Delhi 2011)
Answer:
Tlie main constituent of biogas is methane (75%). Biogas is obtained by anaerobic decomposition of biomass in a biogas plant. The two advantages of using this gas are

- It does not produce smoke.
- It has high calorific value.

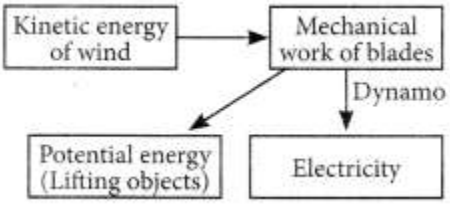
Question 15.
Define:
(i) Biomass
(ii) Anaerobic degradation (Foreign 2011)
Answer:
(i) Refer to answer 11.
(ii) Anaerobic degradation : Breaking of large organic molecules into simple molecules in the absence of air is called anaerobic degradation.

Question 16.
There are many limitations associated with the setting up of wind energy farms to harness energy. Raman wants to generate electricity by using wind mill in his parental village in Uttar Pradesh.
(i) Is it advisable to set up such wind energy farms in his village? Give reason for your answer.
(ii) Write any two limitations associated with the wind energy farms.
(iii) Write the energy transformations which take place when wind mill is used for generating electricity? (Board Term I, 2016)
Answer:
(i) No, it is not advisable to set up such wind energy farms in his village because wind energy farms can be established only at those places where wind blows for the greater past of a year. The wind speed should also be higher than 15 km/h to maintain the required speed of the turbine.

(ii) Limitation of wind energy:
(a) Initial cost of establishment of the farm is quite high.

(b) The tower and blades need a high level of maintenance.

(iii)



Question 17.
Explain with the help of labelled diagram the process of production of biogas in a biogas plant. (Board Term I, 2013)
Answer:

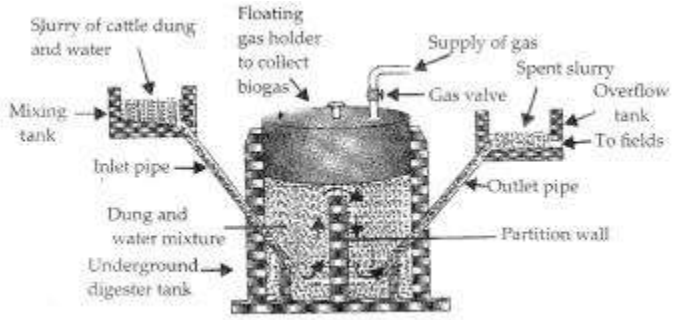


Fig.tA floating gas holder type biogas plant

Working of the biogas plant:
Dung and domestic/agricultural wastes are mixed with water in the mixing tank. The slurry so obtained is fed into the digester through the inlet chamber. Gradually, the anaerobic fermentation sets in and biogas is produced. It takes about 6-8 weeks for a new biogas plant to start producing biogas at a reasonably fast rate. When the pressure of biogas inside the dome increases, it starts pushing the spent slurry into the outlet chamber, and finally into the overflow tank. The spent slurry being a rich source of plant nutrients is used as a manure in agricultural fields.

Biogas can be taken out for supply by spinning the gas valve. To make the biogas plant run continuously, dung slurry is fed into the digester and the spent slurry is removed from it from time to time.

Question 18.
List any four disadvantages of using fossil fuels for the production of energy. (AI 2011)
Answer:
Disadvantages of using fossil fuels for the production of energy are :

- Fossil fuels are non-renewable source of energy.
- It causes air pollution to the environment.
- It takes millions of years for its formation.
- It causes acid rain.

Question 19.
Which one of the following statement is not true about nuclear energy generation in a nuclear reactor?
(a) Energy is obtained by a process called nuclear fission.
(b) The nucleus of Uranium is bombarded with high energy neutrons.
(c) A chain reaction is set in the process.
(d) In this process a tremendous amount of energy is released at a controlled rate. (2020)
Answer:
(b) In a nuclear reactor, to produce nuclear energy, uranium is bombarded with low energy neutrons.

Question 20.
Assertion (A) : In the process of nuclear fission, the amount of nuclear energy generated by the fission of an atom of uranium is so tremendous that it produces 10 million times the energy produced by the combustion of an atom of carbon from coal. Reason (R) : The nucleus of a heavy atom such as uranium, when bombarded with low energy neutrons, splits apart into lighter nuclei. The mass

difference between the original nucleus and the product nuclei gets converted to tremendous energy.
(a) Both (A) and (R) are true and (R) is the correct explanation of the assertion (A).
(b) Both (A) and (R) are true, but (R) is not the correct explanation of the assertion (A).
(c) (A) is true, but (R) is false.
(d) (A) is false, but (R) is true. (2020)
Answer:
(a) Both (A) and (R) are true and (R) is the correct explanation of the assertion (A).

Answer question numbers 21-24 on the basis of your understanding of the following paragraph and the related studied concepts :
Geothermal energy is the energy produced by the heat of molten rocks formed in the deeper hot regions of the earth's crust. This energy is harnessed to generate electricity. When water is made to flow deep underground in the rocks it returns as steam (or hot water, which is later converted to steam) to drive a turbine on an electric power generator.
In India, exploration and study of geothermal fields started in 1970. The Geological Survey in India has identified 350 geothermal energy locations in the country. The most promising of these is in Puga valley of Ladakh. The estimated potential for geothermal energy in India is about 10000 MW. There are seven geothermal provinces in India namely the Himalayas, Sohna, West coast, Cambay, Son-Narmada-Tapi; Godavari and Mahanadi. Most power station in India produce Alternating Current (AC). (2020)

Question 21.
What are geothermal energy hot-spots?
Answer:
Due to geological changes, molten rocks formed in the deeper hot regions of earths crust are pushed upward and trapped in certain regions. These regions are called hot spots.

Question 22.
Name two countries, other than India, where power plants based on geothermal energy are operational.
Answer:
Many geothermal power plants are operational in countries such as New Zealand and United States of America.

Question 23.
Name the phenomenon that explains the working of an electric generator.
Answer:
An electric generator works based on the principal of electromagnetic induction.

Question 24.
State an important advantage of using AC over DC.
Answer:
A.C. can be transmitted to distant places without much loss of electric power than D.C.

Question 25.
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, 2017)
Answer:
Silicon is used to make a solar cell. A typical cell develops a voltage of 0.5 – 1 V.

Question 26.
Write the name of the substance whose vapours are used to run the turbine of the generator of ocean thermal energy plant. (Board Term I, 2016)
Answer:
Volatile liquid ammonia.

Question 27.
Name the energy obtained from sea or ocean water due to the difference in temperature at the surface and in deeper sections of these water bodies. (Board Term I, 2015)
Answer:
Ocean thermal energy.

Question 28.
Explain the term 'Hot Spots' in the context of geothermal energy production. (Board Term I, 2013)
Answer:
Refer to answer 21.

Question 29.
Name any two elements that are used in fabricating solar cells. (Board Term I, 2013)
Answer:
Silicon, Silver.

Question 30.
Differentiate between energy obtained by burning fossil fuels and that obtained as solar energy. (Board Term I, 2017, 2013)
Answer:

- The reserves of fossil fuels are limited, i.e., exhaustible whereas solar energy is available in abundance (and that too without any cost), i.e., it is inexhaustible.
- Fossil fuels cause pollution on burning whereas solar energy is pollution free.
- Fossil fuels can provide energy at any required time whereas solar energy becomes unavailable when the sky is covered with clouds.

Question 31.
Define the process of nuclear fission. Write the steps involved in generating electricity in a nuclear reactor. (Board Term I, 2016)
Answer:
The phenomenon of splitting up of a heavy nucleus, on bombardment with slow speed neutrons, into two fragments of comparable mass, with the release of two or more fast moving neutrons and a large amount of energy is known as nuclear fission.
Steps involved in generating electricity:

- Large atoms like uranium or plutonium are bombarded by slow moving neutron.
- Large atoms break and releases lots of heat energy.
- This heat is used to boil water to steam.
- This steam rotates the turbine which produces electricity.

Question 32.
Name the three forms in which energy from sea is available for our use and write one limitation of each. (Board Term I, 2016)
Answer:

- Tidal Energy:
  Limitation : The rise and fall of water during tides is not high enough to generate electrical energy on a large scale. There are very few places suitable for building dams. It is for these reasons, the tidal energy is not likely to be a major source of energy.
- Wave energy:
  Limitation : Wave energy would be a viable proposition only where waves are very strong.
- Ocean thermal energy Limitation : The efficient commercial exploitation is difficult.

Question 33.
Nuclear power is an excellent non-conventional source of energy. Still it is not used commonly for power generation. Why? State three reasons. (Board Term I, 2015)
Answer:
Nuclear power can not be exploited easily because:

- the waste products of nuclear reactions (produced at nuclear power plants) are radioactive which keep on emitting harmful nuclear radiations for thousands of years. So, it is very difficult to store or dispose off nuclear wastes safely. Improper nuclear waste storage or disposal can pollute the environment.
- there is the risk of accidents in nuclear reactors (especially the old nuclear reactors). Such accidents lead to the leakage of radioactive materials which can cause serious damage to the plants, animals (including human beings) and the environment.
- the high cost of installation of nuclear power plants and the limited availability of uranium fuel make the large scale use of nuclear energy prohibitive.

Question 34.
Explain the principle and process of converting ocean thermal energy into electricity. (Board Term I, 2014)
Answer:
Principle : There is a temperature difference between the water at the surface of the sea and deep below the sea. The difference in temperature at many places is of the order of 20°C. This difference in temperature can be exploited to produce electric energy in ocean thermal energy conversion plant (OTEC).

Working : In one of the methods, a low melting point liquid or fluid such as ammonia (volatile liquid) or chlorofluorocarbon (CFC) is used to run the turbine of a generator. The warm surface water is used to boil the liquid like ammonia or CFC in a heat exchanger and vapours thus formed are used to drive the turbine of the generator. In another exchanger cold water from the depth of the ocean is pumped up to condense the vapours of the ammonia again to liquid. This ammonia is reused and the cycle repeats.

Question 35.
Give two examples each of the following :
(i) Renewable sources of energy
(ii) Non-renewable sources of energy (AI 2011)
Answer:
(i) Examples of renewable sources of energy are wind energy, solar energy, etc.
(ii) Coal, petroleum and natural gas are the examples of non-renewable sources of energy.

Question 36.
Write two points of difference between renewable and non-renewable sources of energy. Give one example of each. (Board Term I, 2017)
Answer:

Renewable source of energy	Non-renewable source of energy
1. These sources of energy are replenishable.	These sources of energy are not replenishable.
2. It takes less time to form again.	It takes hundreds of years to form again.
3. Examples: sun wind etc.	Example: coal, petroleum etc.

37.Name any two fossil fuels.
Ans. A good fuel is the one which

- has high calorific value,
- is non-polluting,
- is easy to transport and easily available,
- has moderate ignition temperature.

38.Mention the purpose of blackening the interior of a solar cooker.
Answer. The purpose of blackening the interior of a solar cooker is that the black surface absorbs more heat radiations of incident solar energy (about 98%) as compare to white or other light coloured surface

39.Why do people oppose the construction of Tehri Dam on the river Ganga and Sardar sarover project on the river Narmada. (Or)
Mention three disadvantage of producing hydroelectricity by constructing the dams.(Or)
List any three ways in which construction of dams for production of electricity adversely affects the environment of that place.
Answer.

1. Large area is required to build the dam that result rehabilitation of displaced people.
2. Large eco-systems are destroyed when submerged under the water in dams.
3. The vegetation which is submerged rots under anaerobic conditions and gives rise to large amounts of methane gas which leads to a green-house effect.

40. Reena's father works with a company that builds dams. Once he took her to the site where a dam was being built. Reena saw a group of people sitting there and shouting slogans against the building of dam. She talked the group of people and asked them about their problems and then discussed it with her father. She then tried to convince the people to talk with the

authorities and come to an amicable solution. The discussion was successful. Reena's father was very proud of his daughter. Now answer the following questions:
(i) Why was Reena's father proud of his daughter?
(ii)Why was the group of people protesting against the building of dam?
(iii) Reena's contribution to the peaceful resolution of the conflict proved to boon for many citizens of the country. How?
Answer.
(i) Because she convinced the people by explaining them the advantage of constructing dam and come with a solution of rehabilitation of displaced peoples. So the contribution to the peaceful resolution of the conflict make Reena's father proud of his daughter.
(ii)The group of people protesting against the building of dam because of following disadvantages
(a) A large area of agricultural land and human habitation are sacrificed as it get submerged at the dam site.
(b) Large ecosystems are destroyed when submerged under water.
(c) The decomposition of vegetation under anaerobic condition produces methane gas which is also a greenhouse gas.
(iii)(a) The citizens are not affected by flood as it can be controlled by storing the water behind the dam.
(b) Farmers get benefited as water for irrigation is available for the whole year.
(c) Low cost of production of electricity gives monetary gain which is a boon to citizens.

41.Bio gas is an excellent fuel. Justify the statement by giving two reasons. Mention the main constituents of bio gas along with its percentage.
Answer.
(i) It burns without smoke and leave no residue therefore causes no atmospheric pollution.
(ii)Its heating capacity is high, i.e. it has high calorific value. Main constituents of bio gas: The composition of bio gas varies depending upon the nature of organic matter feeding in'the digester and advanced waste treatment technology. The typical composition of bio gas is

Methane	50 – 75%
Carbon dioxide	25 – 50%
Nitrogen	0 – 10%
Hydrogen	0 – 1%
Hydrogen sulphide	0 – 3%

42.(a) Define tidal energy.
(b) Explain how the tidal energy is harnessed and write one limitation of the use of tidal energy.
Answer.
(a) Tidal energy: The energy produced by the surge of ocean water during high and low tides due to difference in sea-levels is called tidal energy. The high and low tides occur due to the gravitational pull of the moon. This causes enormous movement of water.
(b) Tidal energy is harnessed by constructing a dam near the shores. During the high tides water flows into the dam and during the low tides, water flows out. This flowing water rotates the turbine, present at the opening of the dam and produces electricity.

43. Define process of nuclear fission. Writ the steps involved in generating electricity in a nuclear reactor.
Answer. Nuclear Fission: The process in which a heavy nucleus (such as uranium, plutonium or thorium) is broken into two nearly equal fragments when bombarded with low-energy neutrons and a tremendous amount of energy is released. This process is called nuclear fission.
Steps involved in generating electricity:

1. The fuel rods full of uranium pellets are placed in a nuclear reactor chamber.
2. Low-energy neutrons are bombarded on uranium fuel rod.
3. A self-sustaining fission chain reaction starts that releases energy at a controlled rate.
4. With this heat the reactor converts water to steam at a high temperature and pressure.
5. This high temperature and pressure steam spins generator turbines producing electricity.
6. The steam cools back into water, which can then be used over again.

44.Nikhil and Neha went to a remote village in Kerala to meet their grandmother. They were 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 farms had rich vegetation. They contacted sarpanch of the village and convinced him to set up a biogas plant for village community.
(a) Mention the values displayed by Mr. Nair, Nikhil and Neha.
(b) Explain the possible arguments given by Nikhil and Neha to the sarpanch to convince him to set up community biogas plant.
Answer.
(a) Mr Nair: Higher degree of general awareness, helping nature.

Nikhil and Neha: Knowledge sharing.
• helping nature.
• concern for community advantage.
(b) Possible arguments given by Nikhil and Neha in favour to set up community biogas plant, to the sarpanch on

1. Economical source of energy.
2. Cleanliness of the whole village.
3. Use of slurry left behind as mannar which is rich in nitrogen and phosphorous.
4. It reduces air pollution and greenhouse effect.
5. It raises the standard of living.
6. It is beneficial to entire village community. Basically they discuss and explain the advantages of community bio gas plant for the'entire village.

45.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 uses Solar cooker instead of LPG? Give reasons for your answer.
(ii) Name the phenomenon which is responsible for obtaining high temperature in solar cooker.
Answer.
(a)(i) There are no energy losses while cooking on the solar cooker as the food gets cooked in a controlled environment whereas cooking on the LPG leads to maximum percentage of energy loss.
(ii) Temperature controlled cooking retains the nutrient value of the food.
(iii) Using the solar cooker, LPG can be served which result reduction in the emission of CO_2.
(iv) It saves a lot of prestigious time which is normally consumed for cooking purpose.
(b) Greenhouse effect.

46. Manoj's father works in a nuclear power reactor. He asked his father to take him for a visit to nuclear power reactor. But his father was not keen to take him there. Now answer the following questions:
(i) What could be the possible reason of Manoj's father not taking him to the nuclear power reactor?
(ii) Write one advantages and one disadvantage of setting up a nuclear power reactor. .
Answer.
(a) (i) Safety concerns.
(ii) Health concerns.
(b) Advantage: From a small amount of nuclear fuel, a large amount of energy is released in a nuclear power reactor.
Disadvantage: There is risk of harmful radiation leakage from nuclear waste.

47. Name the part of a biogas plant where reactions take place in the absence of oxygen.
Answer. Digester chamber.

48. Name the kind of energy possessed by wind and the device used to harness it.
Answer. Kinetic energy, wind mill.

49. List two non-conventional sources of energy.
Answer. Geothermal, solar, biomass, water, wind are the non-conventional sources of energy, (any two)

50. A black surface absorbs more heat radiations as compared to a white or a reflecting surface under identical conditions. List two solar devices which make use of this property in their design.
Answer. Solar cooker, solar water heater.

51. Name any two elements that are used in fabricating solar cells.
Answer. Germanium, Silicon.

52. Why a solar cooker painted black form outside?
Answer. Black surface absorbs more heat as compared to white or reflecting surface under identical conditions.

53. Define fuel. List any two characteristics that you would look for in a good fuel.
Answer. A substance that produces useful energy when it burn or undergoes a chemical f or nuclear reaction. The fuel such as coal, wood, oil, or gas provides energy when burned. A good fuel is the one which produces a huge amount of heat on burning. It does not produce a lot of smoke and is easily available.

54. State any three reasons to justify that LPG is considered as an ideal fuel.
Answer. LPG is considered as an ideal fuel because

1. It is easy to store, handle and transport.
2. It produces large amount of heat on burning.
3. It does not leave any residue on burning,

55. Sate any three advantages of charcoal over wood.
Answer. Advantages of charcoal over wood

1. It has higher calorific value, i.e. higher heat generating efficiency.
2. Charcoal does not produce smoke on burning so it is a clean fuel.
3. It is easier to transport and ready to use in a convenient dry and broken-up form.

56. Ramesh is a student of standard X. He organized many activities in his school to convey the students about the various advantages and disadvantages of using renewable and non-renewable sources of energy. Many students of the school took part and concluded about the best choices of energy sources on this basis.
Answer the following questions:
(i) What activities Ramesh might have had assigned for the students?
(ii) Name any two renewable sources of energy.
(in) Which two values are reflected in Ramesh's thought and action?
Answer.
(i) Activities that Ramesh have had assigned for the students are:
(a) Hands on projects related to renewable and non-renewable sources of energy.
(b) Photograph exhibitions on the topic "use of fossil fuel and its impact on the environment."
(c) Essay writing competition on a "renewable energy technology that could potentially be used for community."
(d) Group discussion on advantages and disadvantages of using renewable and non-renewable sources of energy for selection of best source of energy.
(ii) Solar energy, hydro energy.
(iii) Ramesh's thought: Higher degree of general awareness proper use of renewable source of energy.
Ramesh's action: Concern for community advantage and good management.

57. Megha asked her mother to install a solar water heater on the roof top. Her mother asked about the need of such installation. Megha convinced her mother and succeeded in setting up a solar water heater on her roof top.
(i) State one advantage of installing the solar water heater to Megha's family and to the society.
(ii) What qualities of Megha are reflected in her action?
(iii) State one limitation in using solar water heater.
Answer.
(i) Advantage of solar water heater (any one)
(a) Once solar water heater installed, the family and society never need to pay for heating up the water again.
(b) Megha's family and society make their contribution to the nation to curb the emission of green house gases.
(ii) General awareness, concern for community advantage and proper use of ' renewable source energy.
(iii) (a) It does not work at night as well as on cloudy day.
(b) Relatively low heating system efficiency of passive solar water.

58. Mariyam made a solar cooker on her own. She used a white metallic box with a lid. She put the food in the solar cooker for heating and closed the lid. But she did not get good results. She then consulted her teacher to know her mistakes. Her teacher pointed out her mistakes, which she later rectified.
(a) According to you, which two mistakes were made by Mariyam and what did she do to rectify them?
(b) Which qualities of Mariyam are rectified in her action.
answer.
(a) The possible mistakes were made by Mariyam are:

- The outer and interior of solar cooker might not have been blackened.
- Instead of using glass lid she might have been used plastic cover.
- The solar cooker might not have been insulated properly.
- The cooker utensil used for cooking might not have been blackened.

(b) • Gaining practical knowledge of what she have learned in theory. She wanted to adopt the eco-friendly life style.

59. Aditya suggests his family to install a solar water heater at their residence. But some of the family members were in favour of installing an electric geyser. Ultimately the family got water heater installed.
(a) Which according to you was correct? Give two reasons in support of your answer.
(b) Mention two possible changes in the thinking of the family members because of the arguments Given by Aditya.
answer. (a) The decision of installing the solar water heater was correct this is due to
(i) Their system use solar energy which is a renewable source of energy and free.
(ii)It will reduce our dependence on fossil fuel, improving on our energy security and reduce the country import bill for fuel.
(b) Two possible changes in the thinking of the family members because of the arguments given by Aditya are:
(i) We should conserve the non-renewable fuels for application for which renewable source of energy is not easily available.
(ii)Solar water heating is good investment and cost effective. It is one of the safe and efficient way to deliver hot water free of cost.

60. 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 principle pointed out the examples of four of their teachers who were carpooling for the past several years. She asked the parents to adopt this method to sort out the problem.
(i) List two values shown by the teachers mentioned by the principal.
(i) Explain two advantages that will occur if more parents emulate the examples of these teachers.
answer.
(a) The two values shown by the teachers mentioned by the principle are:
(i) Eco-friendly life style.
(ii) Co-ordination and friendship.
(b) (i) Reduction in air pollution and traffic congestion: Car pooling reduces the emission of CO_2 into the atmosphere as every car pooling participant takes another car off the road.
(ii) Save money: Car pooling saves money by using less fuel. It reduces the cost involved in repetitive or long distance journey.

61. On returning home, Neha, a IXth std. student noticed that her 6 years old brother Neresh, watching T.V 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 curtain aside, which illuminated and aerated the room. Then she made Naresh put "off" the lights and made him understand the reason behind her action. (Assume that they are getting electric supply from Thermal Power Plant)
(a) List the two value exhibited by Neha.
(b) Explain how she tried to give same values to her brother.
answer.(a) The values exhibited by Neha are:
(i) Responsible citizen in the conservation of energy resources.
(ii) Adopt fuel and money saving technique in her life.
(b) Neha tried to give the same values to her brother Naresh by opening the windows, draw the curtain aside, which illuminated and aerated the room. This way she shows the practice of adopting renewable sources of energy like solar energy and conserve the fossil fuel like coal.

62. What is acid rain?
answer. Acid rain: The rain containing the acidic oxides such as oxides of carbon, nitrogen and sulphur.

63.Write the name of the substance whose vapours are used to run the turbine of the generator of ocean thermal energy plant.
answer. Ammonia.

64. Mention the minimum temperature difference required between surface water and water at a depth of upto 2 km in an ocean thermal energy plant.
answer. 20 °C or 293 K in trapping geothermal energy

65. State the principle of working of ocean thermal energy conversion plant. Explain how the plant works? Write one essential condition for it to operate properly.
answer. Principle of working of OTEC: The water at the surface of the ocean is warmer than the water at deeper depths. This temperature difference can be used by

Ocean Thermal Energy Conversion (OTEC) systems to generate electricity.
Working of OTEC:

- In OTEC plant, the energy of warm surface water is used to convert low i boiling point liquid ammonia into gaseous state.
- The vapour of ammonia at high pressure is used to spin the turbines of generators converting the Ocean thermal energy to electricity.
- The used vapour pass through the condenser where cold water, pumped from the deeper parts of ocean condenses ammonia vapour back into a liquid.
- This process is repeated again and again ,to get continuous production of electricity.
  Essential condition for it to operate properly: The temperature difference between the warmer water at the surface and colder water at depths up to 2 km should be 293 K (20°C) or more.

66.Name one fuel used in nuclear reactor.
answer. Uranium-235.

67.Name any two elements that are used in fabricating solar cells.
answer. Germanium, Silicon.

68.Name the reaction responsible for large energy production in the sun.
answer. Nuclear fusion.

69.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. Also mention three uses of solar cells.
answer. It is not possible to make use of solar cells to meet all our energy needs because:
(i) of limited availability of special grade semiconducting materials such as silicon and germanium.
(ii)solar cells have lower efficiency as they depend entirely on intensity of solar radiation.
(iii) the process of manufacturing of solar cells is very expensive, silver used for interconnection of cells in the panel further adds to the cost.
Uses of solar cells:
(i) They provide electric power to satellites and space probes.
(ii) They provide electric power to off-shore drilling platforms and light houses.
(iii) TV relay stations or wireless transmission systems located in remote areas use solar panels to get electric power.

70.Out of two elements A and B with mass number 2 and 235 respectively, which one is suitable for making ,
(a) a nuclear reactor,
(b) a hydrogen bomb?
Name the nuclear reaction involved in each case. Write one difference between the two types of nuclear reactions.
answer.
(a) For a nuclear reactor— element 'B' with mass number 235 is suitable as a fuel in a nuclear reactor.
(b) For a hydrogen bomb— element 'A' with mass number 2 is suitable for making the hydrogen bomb.
The nuclear reaction involved in
(a) nuclear reactor is nuclear fission reaction and
(b) nuclear bomb is nuclear fusion reaction.
Difference between fission and fusion:
Fusion reaction releases much greater energy with non-radioactive products than the energy released in fission reaction with radioactive products.

71. List two nutrients that the slurry left behind in the biogas plant contain.
answer. Nitrogen and phosphorous.

72. Biogas is also known as gobar gas. Justify.
answer. Starting material for biogas is mainly cow dung. So, it is also known as gobar gas.

73. List two practical uses of biogas in rural areas.
answer. Practical uses of biogas in rural area are:

1. It is an excellent fuel which burns without smoke with high heating capacity.
2. It is also used for lighting.

74. Bio gas is considered to be a boon to the farmers. Give reasons.
answer.

1. It is the source of excellent manure, rich in nitrogen and phosphorous which can be obtained from the biogas plant in addition to biogas.
2. It provides the safe, efficient and profitable disposal method for bio-waste and sewage material.

75. What are the advantages of nuclear energy?
answer. Advantages of nuclear energy are:

1. A small quantity of nuclear fuel is needed to produce a large amount of useful energy.
2. Nuclear power plant produces less atmospheric pollution than thermal power plants, if the nuclear fission reaction is performed properly.
3. Small amount of nuclear fuel can run a nuclear power plant over a long period of time. There is no need of inserting the nuclear fuel in the nuclear reactor again and again in a short period as in case of thermal power plant.

76. What is a solar cell panel? Mention any three of its applications.
answer. A large number of solar cells combined in an arrangement to obtain large electrical power is called solar cell panel.
Applications of solar cell panel are:
It provides the electric power for the:

1. working of artificial satellites stationed in outer space,
2. running of irrigation water pumps by the farmers in rural areas,
3. street lighting in remote areas.

77. Out of two solar cookers, one was covered with a plane glass slab and the other was left open. Which of the two solar cookers will be more efficient and why?
answer. The solar cooker which was covered with a plane glass slab would be more efficient. The glass lid allows the heat radiation from sun to enter the solar cooker but does not allow the reflected heat radiation to escape or go outside the box. Thus, heat trapped inside the box increases the temperature. Glass lid also reduces heat loss due to reflection.

78.List any three hazards of nuclear waste. How does the disposal of nuclear waste pose a problem for the plant and animal life?
answer. Hazards of nuclear wastes are:

1. Nuclear waste contains radioactive substances which emit harmful nuclear radiations.
2. There is a high risk of environmental contamination.
3. It is highly toxic.
   Effect of nuclear waste on plant and animal life is:
   The radiations emitted from the nuclear waste penetrate deep inside the human or animal body where they can damage biological cells thereby initiate cancer or causes genetic disease.
   Increased mortality of plants, soil invertebrates and mammals and reproductive losses in plants and animals have also been observed.

79. (a) Charcoal is a better fuel than wood. Why? .
(b) How does biogas plant help to reduce the problem of pollution?
answer.
(a) Charcoal is considered to be a better fuel than wood because:

1. It burns without flames.
2. It is comparatively smokeless.
3. It has higher calorific value, i.e. higher heat generating efficiency than wood.

(b) Biogas plant helps to reduce the problem of pollution in the following ways.

1. It provides better sanitation due to safe disposal of bio-waste and sewage material.
2. Biogas obtained from this plant produces less smoke on burning. (Hi) The residue left can be used as a manure which can be used as an alternative
   of fertilizers. Thus, it prevents soil and water from degradation.

80. (a) What is geothermal energy?
(b) What are the advantages of wind energy?
answer.
(a) The heat energy obtained from the molten rocks formed in the deeper hot regions inside the earth are called geothermal energy.
(b) Advantages of wind energy are:

1. It is an inexhaustible source of energy.
2. It does not cause any environmental pollution.
3. It is available at free of cost.

81. (a) How does construction of dams across the river get linked with production of greenhouse gases?
(b) How do technological inputs improve the efficiency of biomass fuels?
answer.
(a) A vast variety of plants get submerged in water, rot under anaerobic conditions and produce large amount of greenhouse gases such as methane.
(b) Traditional uses of biomass fuels are not only efficient but they also produce a lot of pollutants which are hazardous to health. Therefore, technological inputs are necessary to improve the efficiency of these fuels and make them environment friendly. With the help of technology, smokeless chulhas and biogas plants have been designed.

82. Mention any four limitations in harnessing wind energy on a large scale.
answer. Limitations in harnessing wind energy are:

1. Speed of wind is not available at all time and at all places.
2. To establish the wind energy farm, a large area of land is needed.
3. Speed of wind should be higher than 15 km/h to harness the wind energy.
4. Construction of windmill and its installation is very expensive.

83. What happens when wood is burnt in a limited supply of oxygen? Name the residue left behind after the reaction and state two advantages of using this residue as a fuel over wood.
answer. When wood is burnt in a limited supply of oxygen, volatile materials present in it get removed and cooled to get wood tar and wood gas.
The black residue left behind aftqr the reaction is known as charcoal. Advantages of using charcoal as a fuel over wood are:

1. Burning of charcoal does not produce smoke. On the other hand, wood produces a lot of smoke on burning.
2. For a given quantity, charcoal produces ,more heat than wood.

84. Name four gases commonly present in biogas. State two advantages of using this gas over fossil fuels.
answer. Methane, carbon dioxide, hydrogen and hydrogen sulphide.
Advantages of using biogas over fossil fuels are:

1. Biogas burns without smoke, leaves no residue unlike coal.
2. Biogas is cheaper as compared to fossil fuels.

85. How are the wastes produced in nuclear power plants different from those produced in a thermal power plants ? What happens to the waste of a nuclear power plant?
answer. The waste obtained from nuclear power plants is highly radioactive in nature which emits harmful radiations, whereas waste produced in a thermal power plant is non-radioactive.
Management of nuclear waste is given as follows:

1. Some products of nuclear waste are buried in sealed steel/lead containers for a long term storage, buried under the ground or dumped in vacated coal mines.
2. Other waste products transforms into less harmful products or to products with a shorter half life.

86. In a solar cooker, the following arrangements are made. Write one function of each arrangement.
(a) The box is made of insulating material such as plastic or wood.
(b) The inner walls of the box are painted black.
(c) The box is covered with a transparent glass sheet.
(d) A plane mirror is hinged at an angle at the top of the box.

answer.
(a) To avoid loss of heat from solar cooker to the surroundings.
(b) Black surface absorbs more heat radiations of incident energy.
(c) Transparent glass sheet does not allow the reflected heat radiation to go outside the box.
(d) To increase the amount of solar energy incident on the transparent glass sheet.

87. Describe how hydro energy can be converted into electrical energy. Write any two limitations of hydro energy.
answer. Conversion of hydro energy into electrical energy

- High rise dams are constructed on the river to obstruct the flow of water to collect it at a suitable height. The stored water has a lot of potential energy.
- The water from a suitable height is allowed to fall on the blades of a turbine located at the bottom of a dam through a pipe.
- Kinetic energy of flowing water rotates the turbine rapidly. Rotation of turbine helps the armature coil of generator to rotate rapidly in the magnetic field. Thus, hydroelectricity is generated.
  Limitations of hydro energy:
  (i) All river-sites are not suitable for construction of dams.
  (ii) Large ecosystems are destroyed when submerged under the water in dam.