Board – CBSE	Class – 10th	Topic – Sources of Energy

Q.1 "The calorific value of cooking gas (LPG) is $50 kj/g$ ". What does it mean?

Ans. The calorific value of LPG is $50\ kJ/gm$ means that if 1 gram of LPG is burnt completely,

then it will produce 50 kJ of heat energy.

Q.2 What is a source of energy? What are the two main categories of sources of energy?

Ans. A source of energy can provide an adequate amount of energy in a convenient form over a long period of time.

Two main categories of the source of energy are:

(i) Renewable source of energy

(ii) Non- renewable source of energy

Q.3 State any four characteristics of a good source of energy.

Ans. A good source of energy is one:

(i) which would do a large amount of work per unit mass,

(ii) which is cheap and easily available,

(iii) which is easy to store and transport,

(iv) which is safe to handle and use.

Q.4 Coal is said to be formed from the wood of trees. Why is coal considered a non-renewable source of energy, whereas wood is a renewable source of energy?

Ans. Coal is a non-renewable source because it has accumulated on the earth over a very, very long time. If all the coal gets exhausted, it cannot be produced quickly in nature. Wood is considered a renewable source of energy because if trees are cut to obtain wood, more trees will grow in due course of time.

Q.5 The calorific values of three fuels A, B and C, are $33 kj/g, 48 kj/g$ and $150 kj/g$, respectively. A is solid, B is liquid, and C is a gas at room temperature. On combustion, both A and B produce carbon dioxide while C explodes, forming steam. B and C leave no residue after combustion, while A leaves behind some solid residue.

Which one of the three fuels is the most ideal? Give two reasons to support your answer.

Ans. Fuel B is an ideal fuel because

(i) it leaves no residue on burning.

(ii) It has a high calorific value of 48 kJ/g.

(iii) It does not burn explosively.

Q6. The calorific values of five fuels A, B, C, D and E, are given below:

A $48kj/g$

B $17kj/g$

C $150kj/g$

D $50kj/g$

E $30kj/g$

Which of the fuels could be:

(i) cooking gas

(ii) Alcohol

(iii) wood

(iv) hydrogen

(v) kerosene?

Ans. (i) cooking gas – D

(ii) alcohol - E

(iii) wood - B

(iv) hydrogen - C

(vi) kerosene – A

Q.7 Explain why natural gas is considered to be a good fuel.

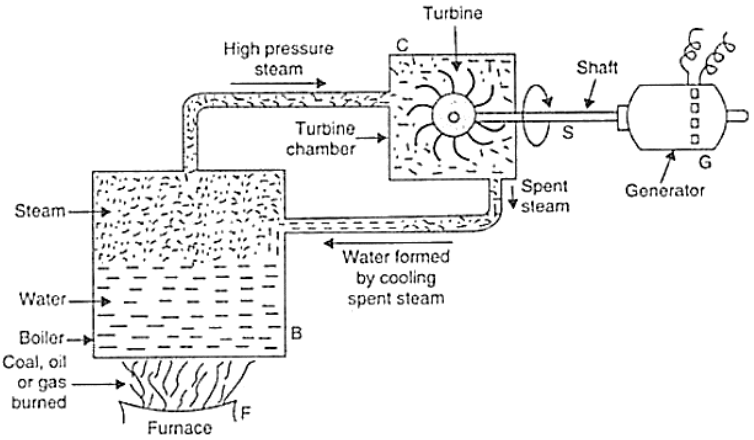
Ans. Natural gas is considered a good fuel because it has a high calorific value, burns with a smokeless flame, causes no air pollution and does not produce any poisonous gas.

Q.8 Explain the principle of working in a thermal power plant. Draw a labelled diagram to illustrate your answer.

Ans. In a thermal power plant, the heat produced by burning coal is used to boil water to form

steam.

At high temperatures and pressure, the steam rotates the turbine and its shaft, which drives the generator to produce electricity.



Q.9 What are the disadvantages of burning fossil fuels?

Ans. Disadvantages of burning fossil fuels are:

(i) The burning of fossil fuels produces acidic gases.

(ii) The burning of fossil fuels produces a large amount of CO_2 gas, which increases the greenhouse effect.

(iii) The burning of fossil fuels produces smoke and leaves behind a lot of ash.

Q.10 What are the various steps which can be taken to control (or reduce) pollution caused by burning fossil fuels?

Ans. Pollution caused by the burning of fossil fuels can be controlled by increasing the efficiency of the combustion process and by using various techniques to reduce the escape of harmful gases and ash into the surrounding air.

Q.11 Why is the leakage of LPG detected easily, although it is odourless? State the steps to be taken in case its leakage is detected in the kitchen.

Ans. For the detection of leakage, a foul-smelling substance called ethyl mercaptan is added to the LPG.

In case of LPG leakage in the kitchen, the following steps must be taken:

1 The door and windows should be opened at once to allow the gas to escape.

2 The source of gas leakage should be checked and then set right with the help of a gas mechanic.

Q.12 The energy in petrol originally came from the sun. Explain how it got into petrol.

Ans. Petrol is obtained from petroleum, which is a fossil fuel. Sun's energy was originally made of fossil fuels because the sunlight of long ago made plants and animals grow. So, the energy in petrol originally came from the sun.

Q.13 (a) What is the difference between a thermal power plant and a hydropower plant?

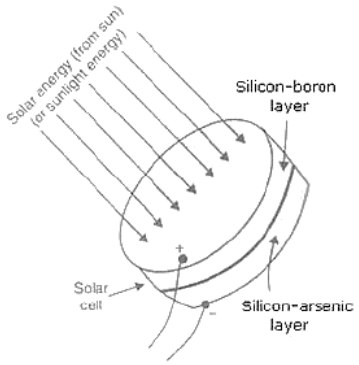
(b) Which of the two causes serious air pollution and how?

Ans. (a) Difference between the thermal power plant and hydropower plant:

The thermal power plant uses non-renewable sources of energy like coal, oil or gas. In contrast, hydropower plant uses a renewable source of energy, i.e. water.

Thermal power plant causes pollution due to the burning of fossil fuels, whereas hydropower plant is environmentally friendly.

(b) Thermal power plant causes serious air pollution because it emits harmful gases and fly ash into the air.



Q.14 (a) What is a solar cell? Draw the labelled diagram of a solar cell.

(b) Name the semi-conductor material which is usually used for making solar cells.

(c) Write the uses of solar cells.

Ans. (a) A solar cell is a device that converts solar

energy directly into electrical energy.

(b) Silicon

(c) Use of solar cells:

(i) To provide electricity in artificial satellites and space probes.

(ii) To provide electricity to remote areas where normal electricity transmission lines do not exist.

(iv) To provide electricity to lighthouses

(iv) To operate traffic signals, watches, calculators and toys.

Q.15 (a) What is the solar constant? What is the value of the solar constant?

(b) If the energy received by $5\,m^2$ area in 10 minutes is $4200kj$, calculate the value of solar constant.

Ans. (a) The amount of solar energy received per second by one meter square area of the near-earth space (exposed perpendicularly to the sun rays) at an average distance between the sun and the earth is known as the solar constant. Its value is $1.4\ kJ/s/m^2$.

(b) Area, $= 5\,m^2$; time, $t = 10\,min = 600sec$; $E = 4200\,kJ$.

$Solar\ constant = E/(Axt)$

$= 4200/(5\times600)$

$= 1.4\ kJ/s/m^2$

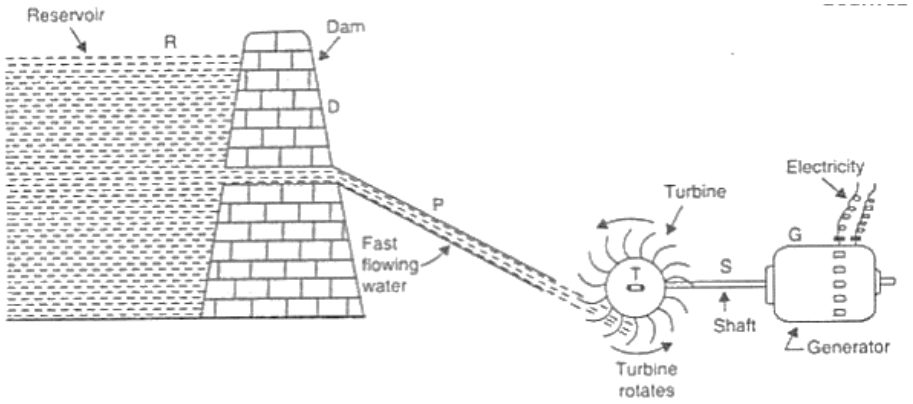
Q.16 (a) What is hydroelectricity? Explain the basic principle of generation of hydroelectricity with the help of a labelled diagram.

(b) State two advantages of producing hydroelectricity.

(c) State two disadvantages of producing hydroelectricity.

Ans. (a) The electricity generated from the hydro power plant is known as hydro electricity. Water is collected in a reservoir at a height, so it has potential energy stored in it. When the water flows down through this large height, its potential energy gets converted into kinetic energy. The fast flowing water

rotates the turbine, which is connected to the generator through its shaft. The generator produces electricity.



(b) Advantage of producing hydroelectricity:

(i) It does not cause any environmental pollution.

(ii) It uses the energy of flowing water, which is a renewable source of Energy

(c) Disadvantage of producing hydroelectricity

(i) Large areas of land are required.

(ii) Large eco-systems get destroyed.

Q.17 A large coal-fired power station produces $2000MW$ of electrical energy. A wind turbine with 33 m blades can produce 300 kW.

(a) How many turbines would be needed to replace the power station?

(b) Why, in actual practice, this number of turbines could not replace the coal-fired power station?

Ans. (a) The electrical energy produced by coal-fired plant $= 2000MW = 2000\times106\ W$

The electrical energy produced by wind turbine $= 300\ kW = 300\times103\ W$

No. of wind turbine required $= 2000\times106/300\times103 = 6666.6$

So, 6667 wind turbines would be needed to replace the power station.

(b) In actual practice, this no. of wind turbines could not replace the coal-fired

power plant because the efficiency of wind turbines keeps changing due to changes in wind speed, but the efficiency of steam turbines used in coal-fired power stations remains the same.

Q.18 Why is biogas considered an ideal fuel for domestic use?

Ans. Biogas is considered an ideal fuel for domestic use because:

(a) Biogas burns without smoke and hence does not cause air pollution.

(b) Biogas has a high calorific value. That is, biogas produces a large amount of heat per unit mass.

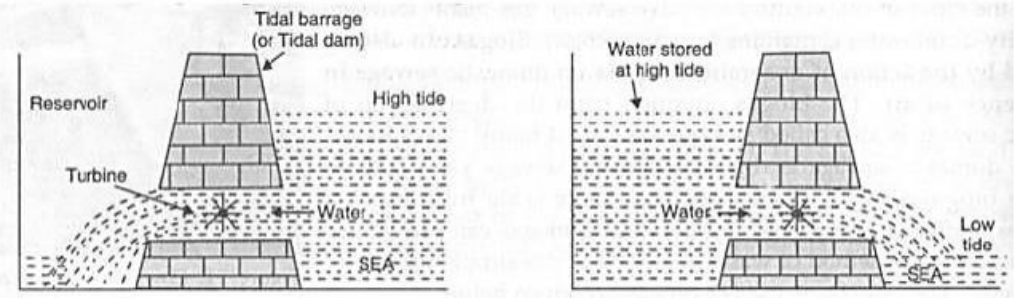
(c) Biogas is cheaper than most common fuels.

(d) Biogas is a clean fuel since it burns completely without leaving any residue behind.

Q.19 (a) Explain how tidal energy can be used to generate electricity.

(b) Why is tidal energy not likely to be a potential source of energy?

Ans.



(*a*) At high tide, water flows from sea into reservoir and turns the turbine

(*b*) At low tide, stored water flows out from reservoir into sea and turns the turbine

During high tide, when the level of water in the sea is high, seawater flows into the reservoir of the barrage and turns the turbines. The turbines then turn the generator to produce the electricity. And during the low tide, when the level of seawater is low,

the seawater stored in the barrage reservoir is allowed to flow out into the sea. This flowing water also turns the turbines and generates electricity.

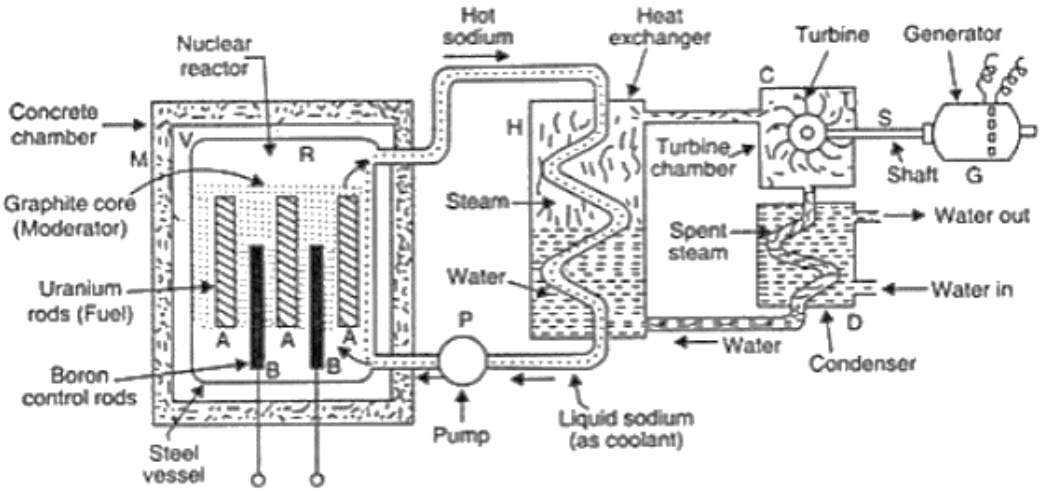
(b) Tidal energy is not likely to be a potential energy source because there are very few sites around the world that are suitable for building tidal barrages. The rise and fall of seawater during high and low tides is not enough to generate electricity on a large scale.

Q.20 (a) What is a nuclear reactor? What is the fuel used in a nuclear reactor?

(b) With the help of a labelled diagram, describe the working of a nuclear power plant.

Ans. (a) A nuclear reactor is a device designed to maintain a chain reaction producing a

steady flow of neutrons generated by the fission of heavy nuclei. Uranium-235 is used as a fuel in a nuclear reactor.



In a nuclear power plant, the fission of uranium- 235 is carried out in a reactor R. Uranium235 rods are inserted in a graphite core which acts as a moderator to slow down the neutrons. Boron rods B absorb excess neutrons and control the rate of reaction. Liquid sodium or carbon dioxide gas pumped continuously through pipes embedded in the reactor using a pump P is used as a 'coolant' to transfer the heat produced to the heat exchanger for converting water into steam. The hot steam at

high pressure goes into a turbine chamber and makes the turbine rotate. The shaft of the generator also rotates and drives a generator connected to it.