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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.

Question-1
What is a good source of energy?
Solution:
A good source of energy would be one,
i) Which would do a large amount of work per unit volume or mass.
ii) Be easily accessible.
iii) Be easy to store and transport, and
iv) Perhaps most importantly, be economical.

Question-2
What is a good fuel?
Solution:
A good fuel would be one,
i) Which is easily available.
ii) It should not produce too much of smoke.
iii) On burning should release less amount of heat.

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Question-3
If you could use any source of energy for heating your food, which one would you use and why?
Solution:
Solar energy can be used for heating food because it is easily available, it will not produce smoke and it will not release any amount of heat.

Question-4
What are the disadvantages of fossil fuels?
Solution:
Fossil fuels are non-renewable. Burning of coal or petroleum products causes the air pollution. The oxides of carbon, nitrogen and sulphur that are released on burning fossil fuels are acid oxides. These lead to acid rain, which affects water and soil resources.

Question-5
Why are we looking at alternate sources of energy?
Solution:
The fossil fuels are non-renewable sources of energy. So we need to conserve them. If we were to continue consuming these sources at such alarming rates, we would soon run out of energy. In order to avoid this, alternate sources of energy were explored.

Question-6
How has the traditional use of wind and water energy been modified for our convenience?
Solution:
The wind possesses kinetic energy. This energy was harnessed by windmills in the past to do mechanical work. Today, wind energy is also used to generate electricity. Another traditional source of energy was the kinetic energy of flowing water or the potential energy of water at a height. Hydropower plants convert the potential energy of falling water into electricity.

Question-7
What kind of mirror - concave, convex or plane - would be best suited for use in a solar cooker? Why?
Solution:
Plane mirror would be best suited for use in a solar cooker. A plane mirror is used as a reflector. The reflector is used to increase the area over which the solar energy is collected so that more and more heat rays of the sun may enter the solar cooker.

Question-8
What are the limitations of the energy that can be obtained from the oceans?
Solution:
The energy from the oceans can be obtained mainly in three forms,
a) Tidal energy
b) Ocean waves energy
c) Ocean thermal energy
The energy potential from sea is quite large, but efficient commercial exploitation is difficult.
Question-9
What is geothermal energy?
Solution:
‘Geo’ means ‘earth’ and ‘thermal’ means ‘heat’. Thus the geothermal energy is the heat energy from the hot rock present inside the earth. This heat can be used as a source of energy to produce electricity.

Question-10
What are the advantages of nuclear energy?
Solution:
The advantages of nuclear energy is as follows,
(a) It generates electricity.
(b) Disease like cancer can be treated.
(c) It helps for the improvement in the agriculture and industry.

Question-11
Can any source of energy be pollution-free? Why or why not?
Solution:
Yes, Solar energy does not cause any pollution. Solar cells make use of the ‘everlasting solar energy’ and their use does not produce any environmental pollution.

Question-12
Hydrogen has been used as a rocket fuel. Would you consider it a cleaner fuel than CNG? Why or why not?
Solution:
Yes, hydrogen is a cleaner fuel than CNG because of its very high calorific value, hydrogen is an extremely good fuel.

Question-13
Name two energy sources that you would consider to be renewable. Give reasons for your choices.
Solution:
Hydro Energy and Solar Energy
Hydro energy or water energy is renewable source of electric energy, which will never get exhausted, since water is available in plenty.
Solar energy is also known as light energy, which is obtained from the sun and it will never get exhausted.

Question-14
Give the names of two energy sources that you would consider to be exhaustible. Give reasons for your choices.
Solution:
Coal and petroleum are the two energy sources that are considered to be exhaustible. They are non-renewable sources of energy and are present in a limited amount in the earth. Once exhausted, they will not be available to us again.

Question-15
A solar water heater can be used to get hot water on
(a) a sunny day.
(b) a cloudy day.
(c) a hot day.
(d) a windy day.
Solution:
(a) a sunny day.

**Question-16**
Which of the following is not an example of a bio-mass energy source?
(a) wood
(b) gobar-gas
(c) nuclear energy
(d) coal.
Solution:
(c) nuclear energy.

**Question-17**
Most of the sources of energy we use represent stored solar energy. Which of the following is not ultimately derived from the Sun's energy?
(a) geothermal energy
(b) wind energy
(c) nuclear energy
(d) bio-mass.
Solution:
(c) nuclear energy.

**Question-18**
Compare and contrast fossil fuels and the Sun as direct sources of energy.
Solution:
Fossil fuels are non-renewable sources of energy. These non-renewable sources of energy (like coal, petroleum, natural gas) are present in a limited amount in the earth. Once exhausted, they will not be available to us again.
The sun is the source of all energy. The sun is a renewable source of energy, provides us heat and light energy free of cost. The energy obtained from the sun is called solar energy. The energy coming from the sun contains heat rays, visible light, ultra-violet rays and some gamma rays.

**Question-19**
Compare and contrast bio-mass and hydro electricity as sources of energy.
Solution:
The waste material of living things and the dead parts of living things is called bio-mass. Bio-mass contains carbon compounds and it is the oldest source of heat energy for domestic purposes. The important examples of bio-mass being used as a fuel are wood, cattle dung and agriculture wastes like bagasse.
Hydropower plants convert the potential energy of falling water into electricity. Water energy is a renewable source of electric energy, which will never get exhausted. The construction of dams on rivers helps in controlling floods and in irrigation.

**Question-20**
What are the limitations of extracting energy from
(a) the wind?
(b) waves?
(c) Tides?
Solution:
a) There are many limitations in harnessing wind energy. Wind energy farms can be established only at those places where wind blows from the greater part of a year. The wind speed should also be higher than 15 Km/h to maintain the required speed of the turbine. There should be some back-up facilities to take care of the energy needs during a period when there is no wind.
b) The waves are generated by strong winds blowing across the sea. Wave energy would be a viable proposition only where waves are very strong.
c) Tidal energy is harnessed by constructing a dam across a narrow opening, the location where such dams can be built are limited.

Question-21
On what basis would you classify energy sources as
(a) renewable and non-renewable?
(b) exhaustible and inexhaustible?
Are the options given in (a) and (b) the same?
Solution:
The options given in (a) and (b) are the same.
Those sources of energy, which are being produced continuously in nature and are inexhaustible are called renewable sources of energy.
Those sources of energy, which have accumulated in nature over a very, very long time and cannot be quickly replaced when exhausted are called non-renewable sources of energy.

Question-22
What are the qualities of an ideal source of energy?
Solution:
The important qualities of an ideal source of energy is
a) It should be a renewable source of energy.
b) It should be pollution-free.
c) It should be economical.
d) It should be easily accessible.

Question-23
What are the advantages and disadvantages of using a solar cooker? Are there places where solar cookers would have limited utility?
Solution:
The advantages of a solar cooker
i) The use of solar cooker for cooking food saves fuel.
ii) The use of solar cooker does not produce smoke due to which the environment also does not get polluted.
iii) When food is cooked in a solar cooker, its nutrients do not get destroyed. This is because in a solar cooker, food is cooked at comparatively lower temperature.
iv) In a solar cooker, upto four food items can be cooked at the same time.
The disadvantages of a solar cooker
i) The box-type solar cooker cannot be used to make chappaties.
ii) The box-type solar cooker cannot be used for ‘frying’.
The limited utility of a solar cooker is
i) The solar cooker cannot be used to cook the food during nighttime.
ii) If the day-sky is covered with clouds, even then the solar cooker cannot be used to cook...
the food.

iii) The direction of reflector of solar cooker has to be changed from time to time to keep it facing the sun.

Question-24
What are the environmental consequences of the increasing demand for energy? What steps would you suggest to reduce energy consumption?

Solution:
Exploiting any source of energy disturbs the environment in some way or the other. The source we would choose depends on factors such as the case of extracting energy from that source, the economics of extracting energy from the source, the efficiency of technology available and the environmental damage that will be caused by using that source.

We cannot depend on the fossil fuels for much longer, if we manage bio-mass by replacing the trees we cut down for fire-wood, we can be assured of a constant supply of energy at a particular rate. Renewable energy is available in our natural environment, in the form of some continuing or repetitive current of energy, or is stored in such large under ground reservoirs that the rate of depletion of reservoirs because of extraction of usable energy is practically negligible.

Multiple Choice Questions (MCQs) [1 Mark each]

Question 1.
Which of the following is a non-renewable source of energy? [NCERT Exemplar]
(a) Wood  
(b) Sun  
(c) Fossil fuel  
(d) Wind

Answer: 
(c) The fossil fuels are non-renewable sources of energy whereas wood, the Sun and wind are renewable sources of energy. Non-renewable sources of energy are those which are exhaustible and cannot be replaced, once they have been used. They are also known as conventional sources of energy.

Question 2.
Fuel used in thermal power plant is [NCERT Exemplar]
(a) water  
(b) uranium  
(c) bio-mass  
(d) fossil fuels

Answer: 
(d) The thermal power plant generates electric power from heat produced by burning fossil fuel, i.e. coal and petroleum. Everyday we burn a large amount of fossil fuels to heat up water to produce steam. The steam so produced runs turbines to generate electricity.

Question 3.
In a hydroelectric power plant more electrical power can be generated, if water falls from a greater height because [NCERT Exemplar]
(a) its temperature increases  
(b) a large amount of potential energy is converted into kinetic energy  
(c) the electricity content of water increases with height
(d) more water molecules dissociate into ions

Answer:
(b) In a hydroelectric power plant, more electrical power can be generated, if water falls from a greater height, because the rise in water level causes the increase in potential energy of water. Thus, when it flows from higher position more amount of kinetic energy is formed by the conversion of higher potential energy and this kinetic energy in the form of moving water can produce more electrical power.

Question 4.
The power generated in a windmill [NCERT Exemplar]
(a) is more in rainy season, since damp air would mean more air mass hitting blades
(b) depends on the height of the tower
(c) depends on wind velocity
(d) can be increased by planting tall trees close to the tower

Answer:
(c) Wind energy farms can be located only in vast open areas located in favourable wind conditions as the minimum velocity for a windmill to functions is 11-16 km/h and is called as cut in speed. Thus, the power generated in a windmill depends on wind velocity.

Question 5.
Choose the correct statement. [NCERT Exemplar]
(a) Sun can be taken as an inexhaustible source of energy
(b) There is infinite storage of fossil fuel inside the Earth
(c) Hydro and wind energy plants are non-polluting sources of energy
(d) Waste from a nuclear power plant can be easily disposed off

Answer:
(a) The Sun has been radiating an enormous amount of energy at the present rate for nearly 5 billion years and will continue radiating at that rate for about 5 billion years more, so the Sun can be taken as an inexhaustible source of energy.

Question 6.
Which part of the solar cooker is responsible for greenhouse effect? [NCERT Exemplar]
(a) Coating with black colour inside the box
(b) Mirror
(c) Glass sheet
(d) Outer cover of the solar cooker

Answer:
(c) Glass sheet present in the solar cooker easily passes the radiation into the solar cooker and the radiation gets absorbed and that reflected back by the black coating is of longer wavelength and cannot pass back out through the glass. Thus, glass sheet produces greenhouse effect in solar cooker.

Question 7.
Ocean thermal energy is due to [NCERT Exemplar]
(a) energy stored by waves in the ocean
(b) temperature difference at different levels in the ocean
(c) pressure difference at different levels in the ocean
(d) tides arising out in the ocean

Answer:
(b) The water at the surface of the sea or ocean is heated by the Sun, while the water in
deeper sections is relatively cold. This difference in temperature between these layers ranges from 10-30 °C and is exploited to obtain energy. Thus, ocean thermal energy is due to temperature difference at different levels in the ocean.

**Question 8.**
The major problem in harnessing nuclear energy is how to [NCERT Exemplar]
(a) split nuclei
(b) sustain the reaction
(c) dispose off spent fuel safely
(d) convert nuclear energy into electrical energy

**Answer:**
(c) The major hazard of nuclear power generation is the storage and disposal of spent or used fuels. Improper nuclear waste storage and disposal result in environmental contamination as well as risk of accidental leakage of nuclear radiation. It happened in Chernobyl disaster 1986, Fukushima Nuclear disaster 2011 caused great damage to the living beings and habitats.

Hope given [NCERT Solutions for Class 10 Science Chapter 14] helpful to you.

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