

UNIT V: NATURAL RESOURCES

CHAPTER

14

SOURCES OF ENERGY

Syllabus

Different forms of energy, conventional and non-conventional sources of energy: Fossil fuels, solar energy, biogas, wind, water, tidal energy and nuclear energy, Renewable versus non-renewable sources of energy.



STAND ALONE MCQs

(1 Mark each)

Q. 1. Which of the following is a non-renewable source of energy?

- (A) Wood (B) Sun
(C) Fossil fuels (D) Wind

R

Ans. Option (C) is correct.

Explanation: Fossil fuels are non-renewable source of energy because their supplies are limited and can't be recycled once used.

Q. 2. The main constituent of biogas is

- (A) methane. (B) carbon dioxide.
(C) hydrogen. (D) hydrogen sulphide.

R

Ans. Option (A) is correct.

Explanation: Biogas contains upto 75% methane. It burns without smoke and leaves no residue like ash in wood, charcoal and coal burning.

Q. 3. Choose the incorrect statement regarding wind power.

- (A) It is expected to harness wind power to minimum in open space.
(B) The potential energy content of wind blowing at high altitudes is the source of wind power.
(C) Wind hitting at the blades of a windmill causes them to rotate. The rotation thus achieved can be utilised further.
(D) One possible method of utilising the energy of rotational motion of the blades of a windmill is to run the turbine of an electric generator.

U

Ans. Option (A) is correct.

Explanation: Maximum wind power is harnessed in open space, hence, option (A) is wrong.

Q. 4. Choose the incorrect statement :

- (A) We are encouraged to plant more trees so as to ensure clean environment and also provide biomass fuel.
(B) Gobar gas is produced when crops, vegetable wastes, etc., decompose in the absence of oxygen.
(C) The main ingredient of biogas is ethane and it gives a lot of smoke and also produces a lot of residual ash.
(D) Biomass is a renewable source of energy.

U

Ans. Option (C) is correct.

Explanation: The main ingredient of biogas is methane.

Q. 5. Fuel used in thermal power plants is :

- (A) water. (B) uranium.
(C) biomass. (D) fossil fuels.

R

Ans. Option (D) is correct.

Explanation: Large amount of fossil fuels such as coal, natural gas, or petroleum, are burnt every day in power stations to heat up water to produce steam which further runs the turbine to generate electricity.

Q. 6. What is needed to produce biogas in a biogas plant?

- (A) Only oxygen

- (B) Only water
 (C) Both oxygen and water
 (D) Neither oxygen nor water

Ans. Option (B) is correct.

Explanation: Biogas is produced from biomass, by the anaerobic degradation of animal wastes like animal dung or plant wastes in the presence of water.

- Q. 7. In a hydro-electric power plant more, electrical power can be generated if water falls from a greater height because
- (A) its temperature increases.
 (B) larger 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.

Ans. Option (B) is correct.

Explanation: In a hydro-electric power plant, more electrical power can be generated if water falls from a greater height because water at greater height has more potential energy. When it falls it will have greater kinetic energy associated with it. A larger amount of potential energy is converted into kinetic energy due to which more electric power will be obtained.

- Q. 8. Which of the following is not an example of a biomass energy source?
- (A) Wood (B) Gobar-gas
 (C) Nuclear energy (D) Coal

Ans. Option (C) is correct.

Explanation: Biomass is a source of energy which is obtained from biodegradable natural things (plant materials and animal wastes). Nuclear energy is released during nuclear reactions like fission or fusion producing huge amount of energy. Hence, nuclear energy is not an example of biomass energy source. Wood is a plant material, gobar gas is formed from animal dung and coal is a fossil fuel obtained from the buried remains of plants and animals. Hence, these are bio-mass products.

- Q. 9. 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) Biomass

Ans. Option (C) is correct.

Explanation: Nuclear energy is released during nuclear fission or fusion. These reactions produce tremendous amount of energy. The energy released during these reactions comes from the mass of elements (mass converts into energy). There is no role of sunlight on these reactions. Hence, nuclear energy is not ultimately derived from Sun's energy. Geothermal energy, wind energy and biomass are all ultimately derived from solar energy.

- Q. 10. Ocean thermal energy is due to
- (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.

Ans. Option (B) is correct.

Explanation: Ocean thermal energy conversion (OTEC) uses the principle of a heat engine. It works by converting a temperature difference into energy.

This means the difference in temperature between the warmer water on the surface and the cooler water in the depths of the ocean can be converted into electricity.

- Q. 11. Which part of the solar cooker is responsible for greenhouse effect?
- (A) Coating with black colour inside the box
 (B) Mirror
 (C) Glass sheet
 (D) Outer cover of the solar cooker

Ans. Option (C) is correct.

Explanation: Solar cookers are covered with a glass plate which traps infra-red radiations (heat) from sunlight and does not allow them to escape. In other words, we can say that it provides greenhouse effect.

- Q. 12. A solar water heater cannot be used to get hot water on
- (A) a sunny day. (B) a cloudy day.
 (C) a hot day. (D) a windy day.

Ans. Option (B) is correct.

Explanation: A solar water heater uses solar energy to heat water. It requires day light (intense sunlight) to function properly. On a cloudy day, the sunlight reflects back in the sky from the clouds and is unable to reach the ground.

Therefore, solar energy is not available for the solar heater to work properly. Hence, solar water heater does not function on a cloudy day.

- Q. 13. Which is the ultimate source of energy?
- (A) Water (B) Sun
 (C) Uranium (D) Fossil fuels

Ans. Option (B) is correct.

Explanation: The energy of the Sun is the original source of most of the energy found on the Earth.

- Q. 14. Which metal is used to connect solar cells in a solar panel?
- (A) Gold (B) Copper
 (C) Silver (D) Nickel

Ans. Option (C) is correct.

Explanation: Solar cells in a solar cell panel are joined together with connecting wires made up of silver.

Q. 15. Which one of the following forms of energy leads to least environmental pollution in the process of its harnessing and utilisation?

- (A) Nuclear energy
- (B) Thermal energy
- (C) Solar energy
- (D) Geo-thermal energy

Ans. Option (C) is correct.

Explanation: Solar energy leads to least environmental pollution in the process of its harnessing and utilisation. In case of nuclear energy, the major concerns of pollution are mainly storage and disposal of spent fuels where there is always a risk of leakage of radiation.

In case of thermal energy, enormous amount of air pollution is produced.

Even in case of geothermal energy, a little amount of pollution is produced.

Q. 16. The major problem in harnessing nuclear energy is how to

- (A) split nuclei ?
- (B) sustain the reaction ?
- (C) dispose of spent fuel safely ?
- (D) convert nuclear energy into electrical energy ?

U

Ans. Option (C) is correct.

Explanation: The major hazard of nuclear power generation is the storage and disposal of spent or used fuels the uranium still decaying into harmful subatomic particles (radiations). Improper nuclear-waste storage and disposal result in environmental contamination.



ASSERTION AND REASON BASED MCQs (1 Mark each)

Directions : In the following questions, A statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as.

- (A) Both A and R are true and R is the correct explanation of A.
- (B) Both A and R are true but R is NOT the correct explanation of A.
- (C) A is true but R is false.
- (D) A is false and R is true.

Q. 1. Assertion (A): Charcoal is better fuel than wood.
Reason (R): Wood is smokeless and leaves no residue.

Ans. Option (C) is correct.

Explanation: Charcoal is better fuel than wood because it is smokeless and leaves no residue. It has higher heat of combustion.

Q. 2. Assertion (A): Burning of coal or petroleum products lead to air pollution.
Reason (R): Coal and petroleum are non renewable source of energy.

Ans. Option (B) is correct.

Explanation: Coal and petroleum are non-renewable sources of energy as they take millions of years to form and are available in very limited amount. Burning of fuels releases gases like CO_2 , SO_2 , NO_2 . These gases cause air pollution. With rain, these pollutants fall as acid rain and cause soil pollution.

Q. 3. Assertion (A): Biogas is a boon to the farmers.

Reason (R): Spent slurry is used as manure and can be used to generate electricity.

Ans. Option (A) is correct.

Explanation: Biogas is considered to be a boon to the farmers as the slurry left in the biogas plant is a good manure for fields.

Q. 4. Assertion (A): Coal and petroleum are renewable source of energy.

Reason (R): They take millions of years to form by the degradation of biomass.

Ans. Option (D) is correct.

Explanation: Coal and petroleum are non-renewable sources of energy. They take millions of years to form by the degradation of biomass. As these resources are being utilised at a much faster rate than their formation, they will be exhausted in the future very soon.

Q. 5 Assertion (A): Solar heating devices are painted black.

Reason (R): Black bodies are good absorbers of heat, so temperature rises quickly.

Ans. Option (A) is correct.

Explanation: Solar heating devices are painted black as black bodies are good absorbers of heat.

Q. 6. Assertion (A): Dam is a barrier that is built across a river or a stream

Reason (R): Large dam can ensure the storage of adequate water for irrigation and also for generating electricity.

Ans. Option (B) is correct.

Explanation: Dam is a barrier that stops or restricts the flow of water or underground streams. A dam is built to control water through placement of a blockage of earth, rock across a stream or river. They usually store water in a reservoir, which is then used for a variety of applications such as irrigation and municipal water supplies.

Q. 7. Assertion (A): Solar cell is a device which converts solar energy *i.e.*, light energy directly into electricity.

Reason (R): They are made up of semi-conductors like-silicon, germanium and selenium.

Ans. Option (B) is correct.

Explanation: Solar cell panel absorb sunlight as a source of energy to generate electricity. It comprises of a large number of photo voltaic

solar cells and can provide much higher power for many uses.

Q. 8. Assertion (A): This energy possessed by the hot water below the earth can be used to produce electricity.

Reason (R): The underground water comes in contact with 'hot spots' present in the earth's crust and steam is generated.

Ans. Option (A) is correct.

Explanation: The underground water comes in contact with 'hot spots' present in the earth's crust and steam is generated. This energy possessed by the hot water below the earth is called geothermal energy. It can be used to produce electricity.

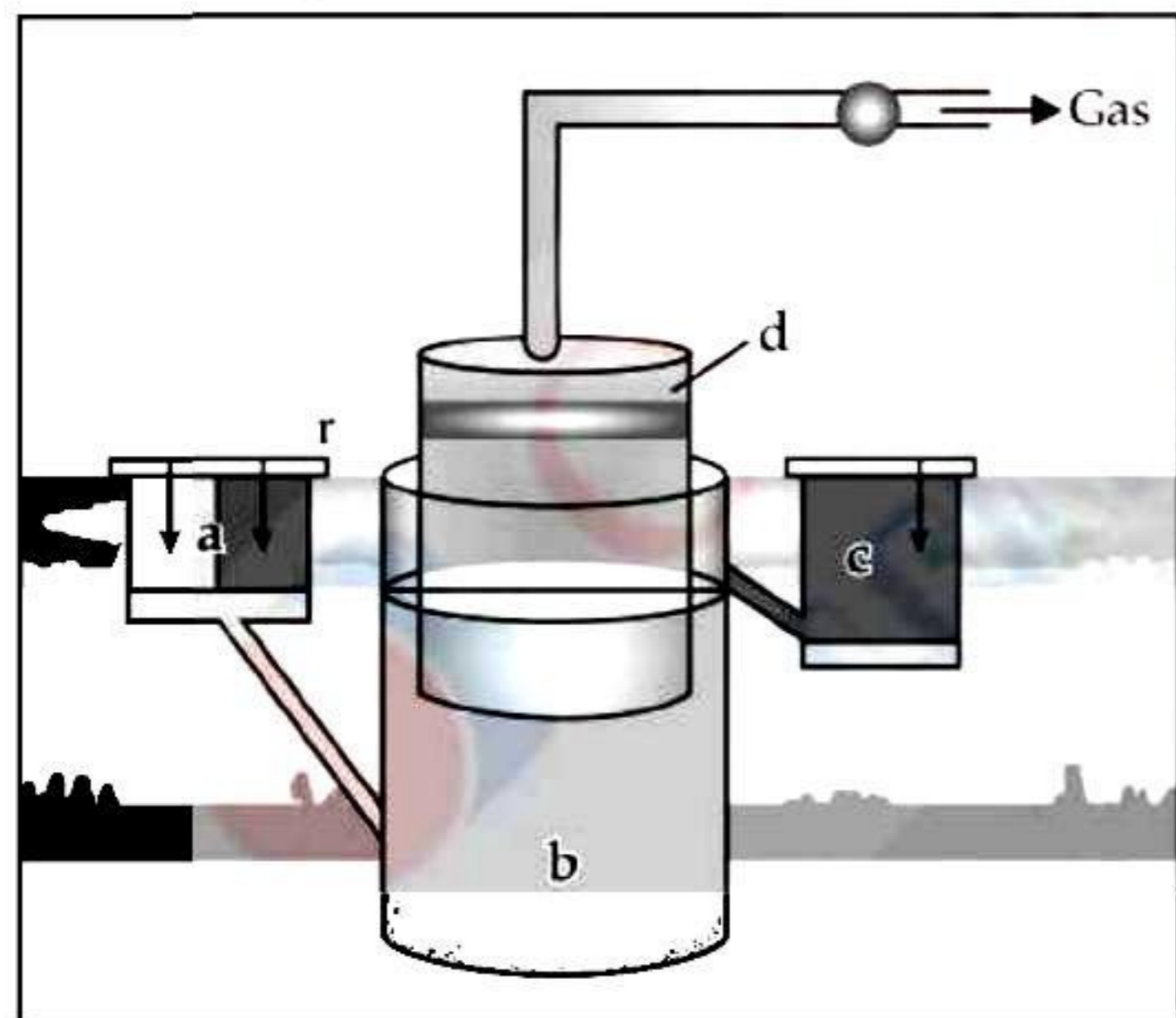


CASE-BASED MCQs

Attempt any 4 sub-parts from each question. Each sub-part carries 1 mark.

Q. 1. Read the following and answer any four questions from Q.1. to Q.5. that follow on the basis of information provided and studied concepts.

A biogas plant is where biogas is produced by fermenting biomass. [CBSE–QB 2021]



Q. 1. In which of the parts would you find anaerobic bacteria ?

- (A) (i) (B) (ii)
(C) (iii) (D) (iv)

Ans. Option (B) is correct.

Explanation: B is the digester where the sludge is treated with anaerobic organisms.

Q. 2. Which one of the following is NOT correct for biogas?

- (A) its carbon neutral
(B) its non-renewable

- (C) it depends on micro-organisms
(D) yields rich manure

Ans. Option (B) is correct.

Explanation: Biogas is a renewable resource.

Q. 3. Which of the following best indicates the steps of anaerobic digestion ?

- (A) Waste water feed → biogas storage → generator → biogas
(B) Waste water feed → digester → biogas → biogas storage → generator
(C) Generator → waste water feed → digester → biogas → biogas storage
(D) Waste water feed → biogas → digester → biogas storage → generator

Ans. Option (B) is correct.

Explanation: Following steps are involved in obtaining biogas:

- (i) Mixing (Slurry of cattle-dung and water).
(ii) Digesting (decomposition of cattle-dung by anaerobic bacteria).
(iii) Formation of biogas.
(iv) Collecting Residue left after the formation of biogas.

Q. 4. Biogas is a better fuel than animal dung cake because

- (i) Biogas is a renewable source of energy
(ii) Animal dung cake has higher calorific value
(iii) Biogas has high heating capacity
(iv) Biogas burns without smoke.
(A) (i) only (B) (ii) only
(C) (iii) and (iv) (D) (i) and (ii)

Ans. Option (C) is correct.

Explanation: Biogas is a better fuel than animal dung cake as it has high heating capacity and they burn without smoke.

- Q. 5.** Biogas is formed in the
 (A) presence of air only
 (B) presence of water only
 (C) presence of air and absence of water
 (D) presence of water and absence of air.

Ans. Option (D) is correct.

Explanation: Biogas is a mixture of gases, like methane, carbon dioxide, hydrogen and hydrogen sulphide which is produced by the anaerobic degradation of biomass (animal and plant wastes) in the presence of water but in the absence of oxygen.

II. Read the following and answer any four questions from Q.1. to Q.5. that follow on the basis of information provided and studied concepts.

In Kunjpura village, located in Karnal district, Haryana, Aditya Aggarwal and his older brother Amit Aggarwal run Tee Cee Industries, a steel plant set up by their ancestors in 1984. Along with this, they also run a gaushala that houses 1,200 cows that can no longer produce milk.

The cow shelter was manageable but running the steel plant was turning out to be expensive because they spent a whopping Rs 5 lakh every month on electricity.

The brothers struck upon an idea. Why not run the factory with the biogas produced from cow dung from the shelter and other gaushalas, along with bio and agri-waste like sewage, farm waste, etc. This led Aditya and Amit to start Amrit Fertilisers, a biogas project, in 2014, without any government support.

- Q. 1.** Biogas is a mixture of the following gases.
 (A) Ethane, Carbon monoxide, Nitrogen and Butane
 (B) Methane, Hydrogen, Carbon dioxide and Nitrogen
 (C) Butane, Carbon monoxide, Propane and Hydrogen
 (D) Carbon monoxide, Sulphur dioxide and Hydrogen

Ans. Option (B) is correct.

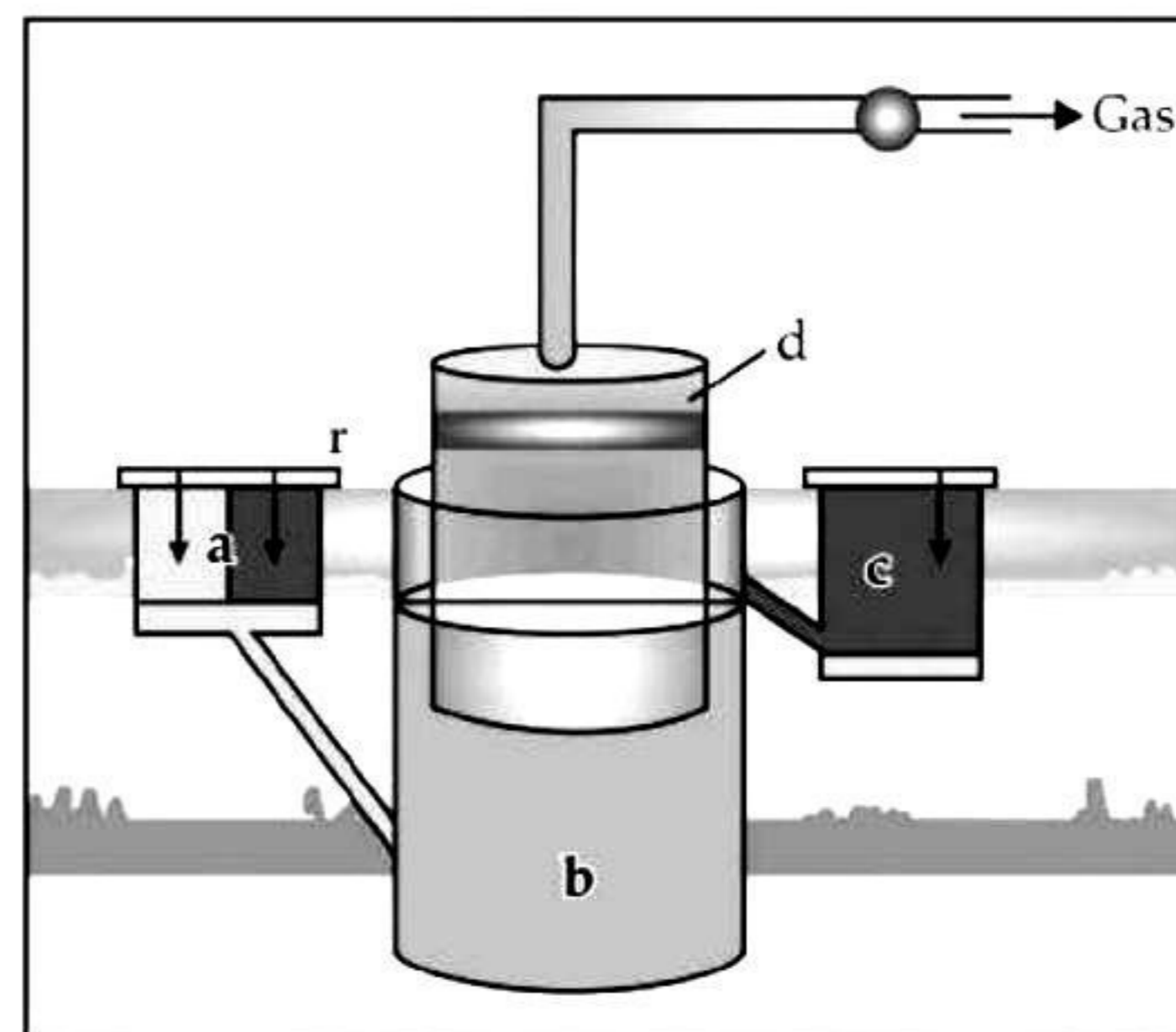
Explanation: Biogas is a mixture of methane, carbon dioxide, hydrogen, nitrogen and hydrogen sulphide.

- Q. 2.** Raw material used in biogas plant is:
 (A) Animal dung (B) crop residue
 (C) Food waste (D) All of the above

Ans. Option (D) is correct.

Explanation: Animal dung, crop residue, food waste are the raw material used in biogas plant.

Q. 3. The correct labelling in a biogas plant is given in



- (A) a-Manure b-Slurry c-Gas tank d-Digester
 (B) a-Slurry b-Digester c-Manure d-Gas tank
 (C) a-Gas tank b-Manure c-Digester d-Slurry
 (D) a-Digester b-Gas tank c-Slurry d-Manure.

Ans. Option (B) is correct.

Explanation: In the given diagram, A represent slurry, B represents digester, C is manure and D is a gas tank.

Q. 4. Biogas is a better fuel than animal dung cake because

- (i) Biogas has lower calorific value.
 (ii) Animal dung cake has higher calorific value.
 (iii) Biogas has high heating capacity.
 (iv) Biogas burns without smoke.
 (A) (i) only (B) (ii) only
 (C) (iii) and (iv) (D) (i) and (ii)

Ans. Option (C) is correct.

Explanation: Biogas is a better fuel than animal dung cake as it has high heating capacity and they burn without smoke.

- Q. 5.** Biogas is formed in the
 (A) presence of air only.
 (B) presence of water only.
 (C) absence of air only.
 (D) presence of water and absence of air.

Ans. Option (D) is correct.

Explanation: Biogas is a mixture of gases, like methane, carbon dioxide, hydrogen and hydrogen sulphide which is produced by the anaerobic degradation of biomass (animal and plant wastes) in the presence of water but in the absence of oxygen.

III. Read the following passage and answer any four questions from Q.1. to Q.5.

Fossil fuels are at the verge of getting exhausted. It is because of their non-replenishment, increasing demand, increasing population and more energy dependent technologies. Therefore, one has to

look upto the sources which can be regenerated and cause the minimum possible environmental damage.

- Q. 1. "I" am a fossil fuel that is very important for daily use. I am non-renewable source and regarded as the cleanest source of energy. I am found deep inside the earth in the gaseous state. Who am "I"?
- (A) Petroleum (B) Gasoline
(C) Geothermal Energy (D) Natural Gas

Ans. Option (D) is correct.

Explanation: Natural gas is a non-renewable source and regarded as the cleanest source of energy. It is found deep inside the earth in the gaseous state.

- Q. 2. If the temperature of the earth keeps increasing due to the burning of fossil fuels and all other reasons that cause the Global Warming, then what all can happen to the earth?
- (i) Changes in weather.
(ii) Melting of all the glaciers into water. This will cause an increase in the sea level and widespread decrease in the snow and ice.
(iii) Deforestation
- (A) (i) and (iii) only (B) All of these
(C) (i) and (ii) only (D) (ii) and (iii) only

Ans. Option (C) is correct.

Explanation: If the temperature of the earth keeps increasing due to the burning of fossil fuels and all other reasons that causes the Global Warming, then there could be serious changes in the weather- the cold days and night can decrease and also due to high temperature all the glaciers will melt which means the ice and snow will convert in water, thus increasing the sea level. Deforestation is not caused by change in temperature.

- Q. 3. Seema and Meena are good friends. Both live in the same colony and work in the same company. They both use their cars to go to office which runs on petrol. As petrol is a non-renewable resource it cannot be replenished within a short duration of time. As a common friend of both what best advise will you give them to save petrol ?
- (A) Go to office by bus/public transport.
(B) Use cycle to go nearby places.
(C) Can use car pooling.
(D) All of these

Ans. Option (D) is correct.

Explanation: The activities that we can do on our own to save non-renewable resources are:
(i) Go to office by bus/public transport
(ii) Use cycle
(iii) They can do car pool

- (iv) Avoid the use of non-renewable sources of energy.
(v) Planting trees.

- Q. 4. Which of the following causes the least pollution when burnt?
- (A) Petrol (B) Diesel
(C) Coal (D) Natural gas

Ans. Option (D) is correct.

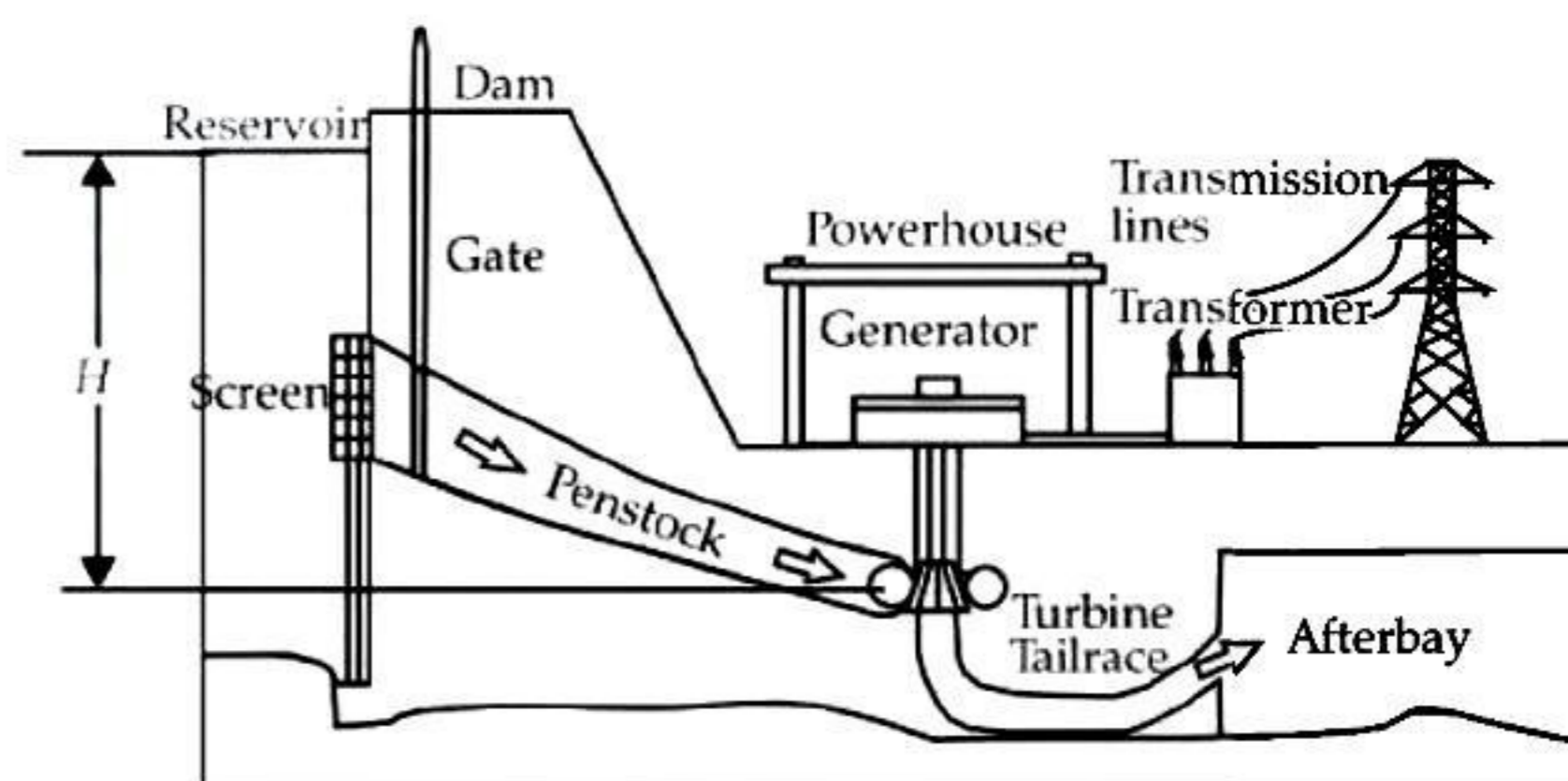
Explanation: Natural gas causes the least pollution when it is burnt.

- Q. 5. Which of the given problems is associated with the burning of coal?
- (A) It causes acid rain.
(B) Carbon dioxide is released.
(C) Ash with toxic metal impurities are produced.
(D) All of the above

Ans. Option (D) is correct.

Explanation: On burning coal, carbon dioxide is released. Coal also releases acidic oxides, which combine with water vapour to form acid rain. Ash with toxic metal impurities are also produced.

IV. Study the given diagram and answer any of the four questions from Q.1. to Q.5.



- Q. 1. The given picture is of :
- (A) Geothermal plant
(B) Hydropower plant
(C) Thermal power station
(D) None of these

Ans. Option (B) is correct.

Explanation: The given picture represents the hydropower plant.

- Q. 2. In a hydro-power plant :
- (A) potential energy possessed by stored water is converted into electricity.
(B) kinetic energy possessed by stored water is converted into potential energy.
(C) electricity is extracted from water.
(D) water is converted into steam to produce electricity.

Ans. Option (A) is correct.

Explanation: The water in a reservoir behind a hydro-power dam is an example of gravitational potential energy. The stored energy in the reservoir is converted into kinetic energy (motion) as the water flows down a large pipe called a penstock and spins a turbine, to generate electricity.

Q. 3. This plant is considered as renewable source of because :

- (A) Water can be replenished by water cycle.
- (B) It can be used to generate electricity.
- (C) It causes least environmental pollution
- (D) All of these

Ans. Option (A) is correct.

Explanation: It is because water can be replenished by water cycle.

Q. 4. Which of these represents the positive impact of this plant on the ecosystem?

- (A) A large variety of plants, animals and their habitats get submerged in water.
- (B) It decreases the fertility of the soil in the downstream area and affect crops.
- (C) It convert the potential energy of falling water into electricity.
- (D) All of these

Ans. Option (C) is correct.

Explanation: Hydropower plants, convert the potential energy of falling water into electricity. The energy of water flowing through rivers has been used for rotating the wheels of watermills operating in remote hilly areas. Other two options are the negative impacts of hydropower plant on ecosystem.

Negative impacts of hydropower plant on ecosystem are :

- (A) A large variety of plants, animals and their habitats get submerged in water.
- (B) It decreases the fertility of the soil in the downstream area and affect crops.

Q. 5. Which one of the following forms of energy leads to least environmental pollution in the process of its harnessing and utilisation?

- (A) Nuclear energy (B) Solar energy
- (C) Thermal energy (D) Geothermal energy

Ans. Option (B) is correct.

Explanation: Solar energy leads to least environmental pollution in the process of its harnessing and utilisation.

V. Read the passage and answer any of the four questions from Q.1. to Q.5.

All of our energy comes from the sun, which is our nearest star. The sun sends out huge amounts of energy through its rays every day. We call this

energy solar energy or radiant energy. Without the sun, life on earth would not exist, since our planet would be totally frozen. The sun's energy is stored in coal, natural gas, water and wind. Coal, oil, and natural gas are known as fossil fuels. Fossil fuels were formed over millions of years ago when the remains and fossils of prehistoric plants and animals sank to the bottom of swamps and oceans. These animal and plant remains were slowly covered and crushed by layers of rock, mud, sand, and water. The pressure of all those layers caused the plants and animals to break down and change into coal, oil and natural gas. We use the energy in these fossil fuels to make electricity. As of the year 2019, most of the energy we use comes from fossil fuels. However, fossil fuels are known as non-renewable sources of energy. They cannot be used over and over again. This means that one day they will run out!

Q. 1. Which of these is not derived from the Sun's energy?

- (A) Geothermal energy (B) Nuclear energy
- (C) Solar Energy (D) Both (A) and (B)

Ans. Option (D) is correct.

Explanation: Geothermal energy is the heat Energy obtained from within the Earth. Hence, not derived from Sun's Energy.

Q. 2. Which among the following is not a renewable source of energy?

- (A) Solar energy (B) Biomass energy
- (C) Hydro-power (D) Geothermal energy

Ans. Option (B) is correct.

Explanation: Biomass is not a renewable source among the options. Biomass is produced by the burning of the wood. If this source of energy is used, then eventually all the trees will be cut and all the wood are over.

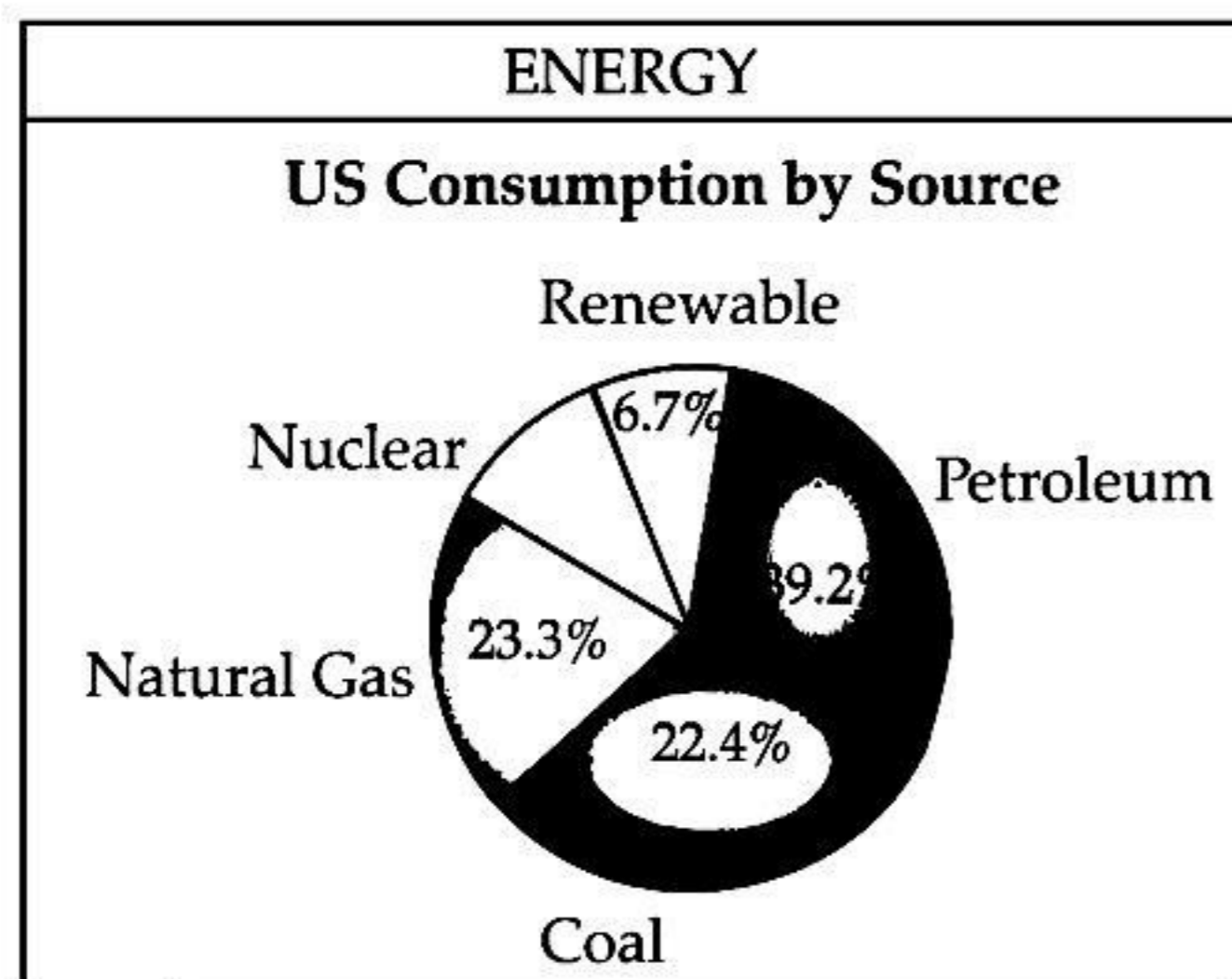
Q. 3. The energy source that uses collectors to heat water or air in buildings is

- (A) Wind energy (B) Solar energy
- (C) Electrical energy (D) Water energy

Ans. Option (B) is correct.

Explanation: The energy source that uses collectors to heat water or air in buildings is solar energy. These collectors are called as solar cells.

Q. 4. The pie chart below shows the consumption of various energy sources in the USA. Depending on the data given, if we consider that the quantity of all these sources are equal, then which source of energy is most likely to exhaust first?



Ans. Option (A) is correct.

Explanation: The Sun has 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, it can be taken as an inexhaustible source of energy.

Q. 5. Choose the correct statement.

- (A) Sun can be taken as an inexhaustible source of energy.
- (B) There is infinite storage of fossil fuel inside the Earth.
- (C) Hydro energy and wind energy plants are non polluting sources of energy.
- (D) Waste from a nuclear power plant can be easily disposed off.

Ans. Option (A) is correct.

Explanation: Fossil fuel is an exhaustible source. Hydro and wind energy plants can have large environmental impacts by changing the environment and affecting land use, homes, and natural habitats in the dam area. Disposing off waste from a nuclear power plant is the major issue faced by nuclear plant. So only Option A is correct.

