PRISM WORLD

Std.: 10 (English) **Science - II**

Chapter: 5

Q.1 **Textbook activity question.** **10**

1 What are different types of Energy?

Ans i. Kinetic Energy.
ii. Potential Energy.
iii. Nuclear Energy.
iv. Chemical Energy.
v. Heat Energy.
vi. Light Energy.
vii. Sound Energy.
viii. Electrical Energy.

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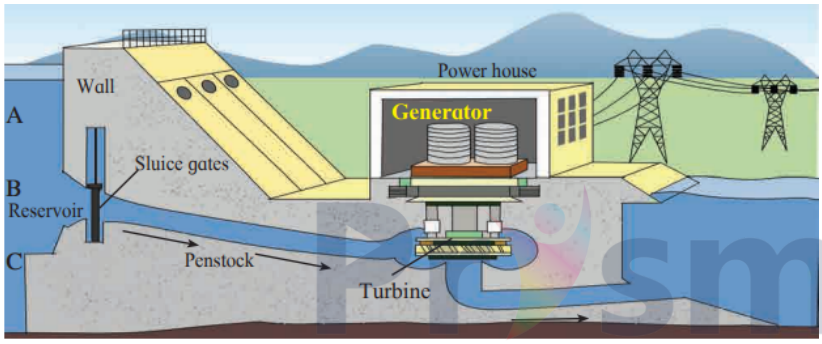

What will be the effect on electricity generation, if the channel taking water to turbine starts at point A?

Ans As height increases , potential energy increases. Thus at point A , potential energy of water will be maximum. If a canal/penstock carrying water from dam starts at point A, this maximum potential energy will be converted into kinetic energy due to which turbines will rotate with more speed. Thus more electrial energy will be generated.

3 Why steam is used to rotate the turbine?

Ans When water is heated, it converts into steam. This steam in under high pressure and temperature. This force of steam rotates the terbines. The same steam is again condensed and converted back into water. The excess heat in turbine again makes this water turn into steam. In this way turbine rotates very effetively due to steam, hence, steam is used to rotate the turbine.

4 How does nuclear fission take place?

Ans i. In nuclear fission, the atom of a heavy element is bombarded by a neutron to form an unstable isotope.
ii. The unstable isotope further splits into two or more smaller nuclei releasing extra neutrons and energy.
iii. In nuclear fisson, huge amount of energy and heat is released.

5 How Electric energy is produced ?

Ans Electric energy is produced in the generators. By using the principle of electromagnetic induction, the magnetic field around conducting wires is changed and this creates the potential difference. This results in the formation of electric energy.

6 Where do we use electrical energy in our day-to-day life?

Ans We use electric energy in various appliances such as bulbs and tubelights. Fans, iron, refrigerator, water pumps, cellphone chargers, television sets, tape recorders and computers.

7 Why the energy in the coal is called as chemical energy?

Ans a. Chemical energy is energy stored in the bonds of chemical compounds and often on combustion comes out in the form of thermal energy

b. During combustion of coal , energy stored in the bonds of coal is released in the form of heat. Hence energy in coal is called as chemical energy.

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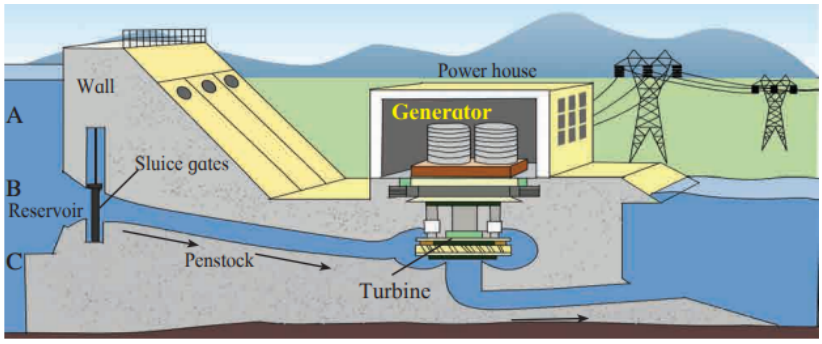

With reference to point B, potential energy of how much water reservoir in the dam will be converted into kinetic energy?

Ans When the sluice gate at point .B. is opened, potential energy of the stored water at level .A. and .B. in the dam will be converted into kinetic energy.

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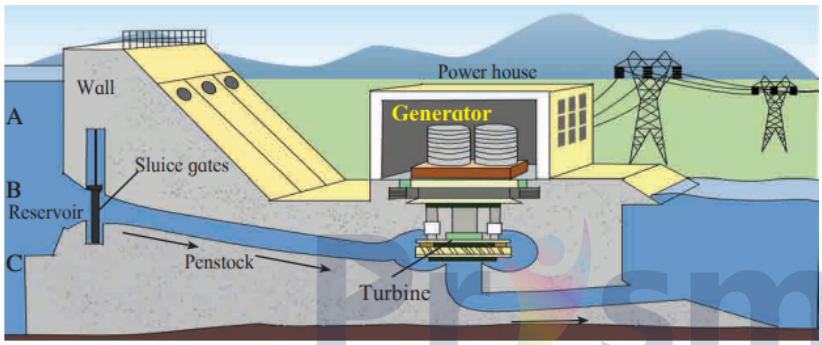


What will be the effect on electricity generation, if the channel taking water to turbine starts at point C?

Ans As height decreases potential energy decreases. Thus at point C, potential energy of water will be minimum. If a canal/penstock carrying water from dam starts at point C, this minimum potential energy will be converted into kinetic energy due to which turbines will rotate with less speed. Thus less electrical energy will be generated.

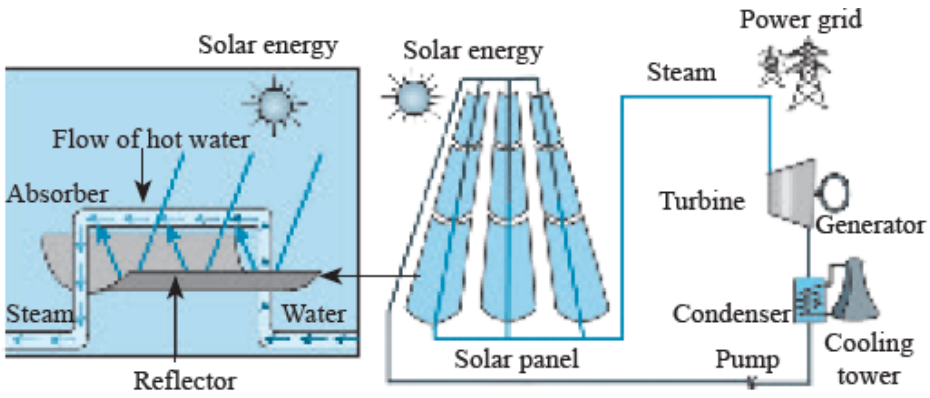
10 What is Energy?

Ans Energy is the capacity for doing work. It may exist in potential, kinetic, thermal, helectrical, chemical, nuclear, or other forms.

Q.2 **Draw neat labelled diagrams.** **4**

1 Draw a schematic diagram of solar thermal electric energy generation.

Ans

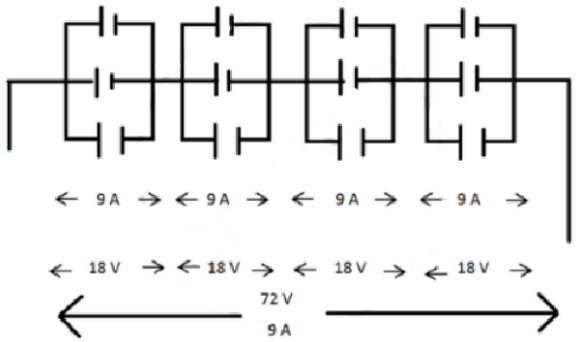


Schematic diagram of solar thermal electric energy generation.

2 One solar panel produces a potential difference of 18 V and current of 3A. Describe how you can obtain a potential difference of 72 Volts and current of 9 A with a solar array using solar panels. You can use sign of a

battery for a solar panel.

Ans We can obtain a potential difference of 72 V by forming a string of 4 solar panels in series. Now, to obtain current of 9 A, connect 3 such identical strings in parallel. The same has been shown below.



Q.3 **Match the pair** **2**

1

Column "A"	Column "B"	Column "C"
i. Water reservoir	Potential energy	Wind electricity plant
ii. Wind	Kinetic energy	Hydroelectric plant
	Nuclear energy	Thermal plant
	Thermal energy	Nuclear power plant

Ans

i. Water reservoir	Thermal energy	Thermal plant
ii. Wind	Nuclear energy	Nuclear power plant

2

Column "A"	Column "B"	Column "C"
i. Coal	Potential energy	Wind electricity plant
ii. Uranium	Kinetic energy	Hydroelectric plant
	Nuclear energy	Thermal plant
	Thermal energy	Nuclear power plant

Ans

i. Coal	Thermal energy	Thermal plant
ii. Uranium	Nuclear energy	Nuclear power plant

Q.4 **Give scientific reasons** **10**

1 Saving energy is the need of the hour.

Ans

i. To generate energy, several power plants are built in which different sources are utilized to create energy transformations and get desired energy.

ii. Natural resources such as Natural Gas, coal, crude oils, petroleum gas are fossil fuels used to generate electricity. Use of these resources cause environmental degradation.

iii. Air pollution is major result. If energy is not conserved, use these resources increase and leads to exploitation and depletion of these resources.

iv. Majority sources used today are conventional and non-renewable. Also they have hazardous impact on environment causing global warming and acid-rains. Therefore, saving energy is the need of the hour.

2 It is possible to produce energy from mW to MW using solar photovoltaic cells. Explain ?

Ans

i. Solar cell is the basic unit in solar electric plant in which cells are connected using solar strings.

ii. The cells in the panel and the panels can be connected in series or in parallel manner depending on the requirement of electric power.

iii. The potential difference in parallel connection remains same across every cell but when connected in series, is summed up giving large difference in potential of cells.

iv. Therefore, from mW to MW using using different connections it is possible to produce energy using photovoltaic cells.

3 Hydroelectric energy, solar energy and wind energy are called renewable energies.

Ans i. Renewable energies are the energies obtained from the renewable source that are inexhaustible sources.
ii. These energy sources can be ued for a long span of time which cause less or no pollution.
iii. Hydroelectric energy uses water force for energy generation which can be used again and again for simultaneous electric power production.
iv. Wind energy similarly makes use of wind velocity to produce electrical energy and wind cannot be depleted.
v. Also solar energy uses sunlight and solar radiations to produce electric power which is again a never-ending source of energy.
vi. As these energies can be produced, without the need of conservation can be utilized, these sources are renewable sources and energy produced is renewable energy.

4 The construction of turbine is different for different types of power plants.
OR
The scematic of a turbine also varies according to the type of power generation.

Ans i. Turbines used in different types of power plants are of varied design and structure.
ii. In different power plants, the energy that creates kinetic energy in the turbine is different and in different conditions of temperature and pressure.
iii. To get maximum yield of electric power, the design of turbine is essential to look after and increase the efficiency of the processing plant.
iv. Gas turbine, steam turbine, water turbine all are distinguish by their blade structure and body designs. Therefore, turbines used are different in different types of power plants.

5 It is absolutely necessary to control fission reaction in nuclear power plants.

Ans i. In nuclear fission, neutrons are bombarded to an element namely uranium – 235 and its isotope is formed uranium-236. This isotope is very unstable and fission of the nucleus occurs easily.
ii. Uranium- 236 on fission forms three neutrons which further causes fission in other three atoms. The process expands on large scale emitting high energy radiations in surrounding.
iii. If not controlled, the chain reaction continues and extreme amount of energy will be liberated which can cause a huge nuclear explosion.
iv. To avoid large accidents and control the nuclear waste, it is absolute necessary to command over the nuclear fission in nuclear power plants.

Q.5 Write properties/characteristics/uses/advantage/effects. **4**

1 What are advantages of solar energy?

Ans Advantages :
a. Solar power is pollution free and does not emit any harmful gases during the process.
b. It does use natural fuels as coal, CNG and thus dependence on fossil on fuels is reduced.
c. It produces renewable clean power every day, with long life span.

2 What are the limitations of solar energy?

Ans Disadvantages :
a. It requires high initial costs for materials and installation.
b. Electric energy cannot be produced at night and thus requires large storage bank to store solar energy.
c. It produces DC power while most equipment's for domestic or commercial purposes use AC power.

Q.6 Write Short Notes on **2**

1 Electrical energy generation and environment.

Ans Today electrical energy generation has become the need of the hour. We cannot imagine our life without electricity. We have been able to generate electrical energy by various methods. In these methods, a generator is present which works on the principle of electromagnetic induction. A turbine is used to rotate this generator and this turbine itself is rotated with the help of an energy source. This energy source can be renewable source such as wind, sunlight, nuclear fuels etc. as well as non- renewable source such as coal, petrol, water etc. The energy sources such as wind, sunlight have proved to be green sources as they do not pollute the environment and are economical too. But the use of fossil fuel such as natural gas, coal, nuclear

energy etc. as energy source has harmful effects on environment. The harmful radiations emitted from the nuclear waste has fatal effect on the environment and humans. Even the release of soot particles and various greenhouse gases such as carbon dioxide, carbon monoxide on burning or incomplete burning of fossil fuels affects the health of living beings as well as the environment adversely. Also, the release of these greenhouse gases is day by day increasing the danger of global warming. We need to as soon as possible find suitable environment friendly substitutes to fossil fuels to save our Earth.

Q.7 **Write Distinguish between** **4**

1 Thermal electricity generation and solar thermal electricity generation.
OR
Thermal Power Plant and Solar Thermal Power Plant.

Ans

	Thermal electricity generation	Solar thermal electricity generation
i.	It uses coal as the source of energy.	It uses solar radiation i.e. sunlight as source of energy.
ii.	It is based on conventional source of energy, thus non-renewable.	It is based on non-conventional source of energy, thus renewable.
iii.	Resource is exhaustible and thus has limited span of energy production.	Resource is inexhaustible and thus can be used for long period of time.
iv.	Energy can be produced whenever required in day or night.	Energy is produced only during the day in sunlight.
v.	Steam produced in the process is by thermal energy from coal combustion.	Steam produced in the process by thermal energy obtained from solar heat radiations.
vi.	No solar panels used instead chemical energy of coal is utilized.	Solar panels are set up through which heat energy is generated.

2 Conventional and Non-conventional sources of energy

Ans

	Conventional Sources	Non-Conventional Sources
i.	These resources cannot be renewed after using and thus are non-renewable sources.	Those sources can be renewed and are thus called renewable sources.
ii.	These resources cause adverse effects on environment by causing pollution.	These resources are ecofriendly and do not cause any pollution.
iii.	Depletion of these sources occur over a period of time.	No depletion is seen and can be used for life long period of time.
iv.	The sources are in the form of fuels from which energy is extracted like fossil fuels, nuclear fuels except water.	The sources are not fuels but naturally occurring phenomena like flow of wind, sunlight, bio wastes.
v.	Set-up of power plant using these resources required low cost.	Set-up of power plants using these resources requires high cost.
vi.	The sources need to be conserved.	No conservation is required.

Q.8 **Give explanation using the given statements.** **3**

1 Explain electrical energy generation and environment.

Ans i. Several different resources available naturally in environment are used for electrical energy generation.

ii. Sources of energy can be conventional non-conventional. Conventional sources are non-renewable (except water) while non-conventional sources are renewable.

iii. Conventional sources when used for generation of electrical energy, they require fuel which produces energy in any convertible form.

iv. Fuels used are basically fossil fuels such as coal, crude oils, natural gases like LPG and CNG or nuclear fuels like uranium and plutonium.

v. Fossil fuels are burnt to given chemical and thermal energy while nuclear fuels emit nuclear energy.

vi. Emitted gases while combustion along with soot particles are harmful for environment. Gases emitted are carbon dioxide, carbon monoxide, sulphur oxide and nitrogen oxide.

vii. Nuclear energy generation results in nuclear waste which is radioactive and hazardous for health. Thus, non-renewable energy have adverse affect on environment.

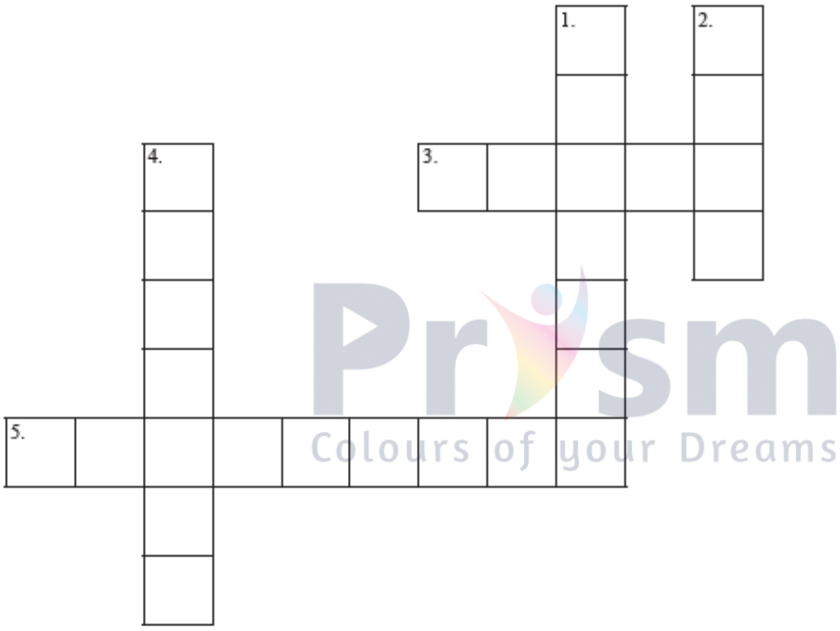
viii. On the other hand, renewable sources used cause minimal or no pollution at all and are inexhaustible sources so the energy conservation is not necessary.

ix. Renewable sources are sunlight, wind, biofuels which do not impact negatively on environment.

x. Thus, these resources when used to produce energy, it is also called as green energy.

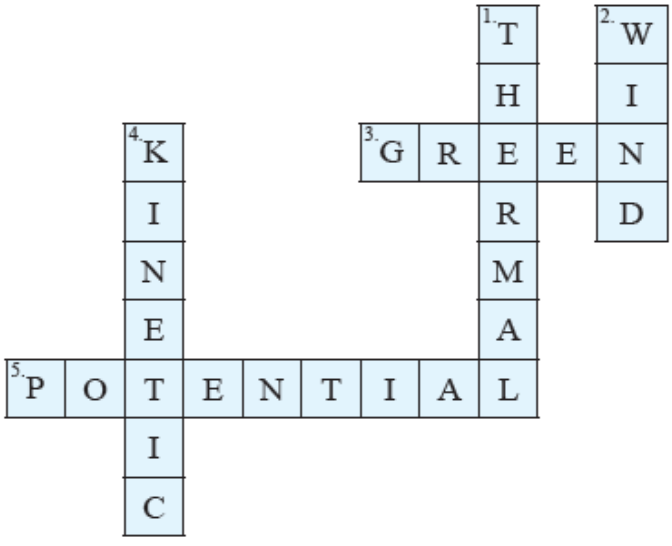
Q.9 **Complete the table/ web/ flow chart** **3**

1 Solve the following crossword puzzle.



1. Maximum energy generation in India is done using ..... energy.
2. ..... energy is a renewable source of energy.
3. Solar energy can be called ..... called energy.
4. ..... energy of wind is used in wind mills.
5. ..... energy of water in dams is used for generation of electricity.

Ans

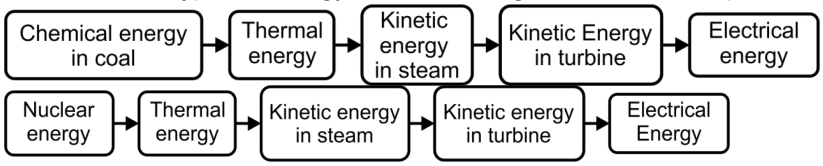


Q.10 Answer the following **18**

1 Which type / types of power generation involve maximum number of steps of energy conversion ? In which power generation is the number minimum.

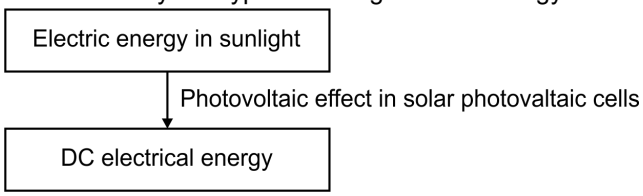
Ans i. Maximum steps of energy conversion are observed in two types of energy generator plants.
a. Thermal power plant.
b. Nuclear power plant.

ii. It involves four types of energy conversion to generate electrical power as follows:



iii. The minimum types of energy during conversion is when solar cells produce electrical power.

iv. It involves only two types of energies solar energy and electrical (DC) energy.



2 Explain: Energy obtained from fossil fuels is not green energy. Or Fossil energy is not an example of green energy.

Ans The energy generation through environmentfriendly sources like water, wind, sunlight, and biofuels is
1. environment-friendly, as it does not lead to environmental degradation. Therefore, energy generated using such sources is called green energy.
2. Burning of fossil fuels results in the emission of soot particles and gases like carbon dioxide, sulphur oxide, and nitrogen oxide, which are harmful to our health.
3. Incomplete combustion of fuels leads to formation of carbon monoxide, causing air pollution.
4. Nitrogen dioxide generated due to burning of fuels like coal, diesel, and petrol leads to problems like acid rain which adversely affects our health.
5. As energy generation from fossil fuels leads to environmental hazards, it is not considered as green energy.

3 Give your opinion about whether hydroelectric plants are environment friendly or not?

Ans In order to answer the question, let us consider the advantages and disadvantages of hydroelectric power generation:

Advantages

i. Hydroelectric power generation does not involve burning of fuels; hence there is no pollution arising from combustion of fuel.
ii. If there is sufficient water storage in the dam, it is possible to generate electricity as and when necessary.
iii. Water in the dam can be replenished during rainy season, enabling uninterrupted power generation.

Disadvantages

i. The backwater due to storage of water in dams may submerge nearby villages, forests, and fertile land, posing a serious issue – rehabilitation of displaced population.
ii. New studies show that flooding results in uncontrolled decomposition of the submerged vegetation, which releases much CO_2 and methane gases, polluting the environment.
iii. The obstruction of the flow of river water may have adverse effect on living things in the river.
iv. As the normal flow of the river is practically stopped by a dam, the level of dissolved oxygen in the water reduces, leading to the death of aquatic organisms such as fish.

Thus, we see that hydroelectric plants provide clean, pollution-free energy, but they can also harm the environment. However, they are more environment-friendly when compared to thermal and nuclear power plants.

4 Other than thermal power plant, which power plants use thermal energy for power generation? In what different ways is thermal energy obtained.

Ans i. In addition to thermal power plants, nuclear power plants and solar thermal plants also use thermal energy for power generation.

ii. In a thermal power plant, thermal energy is obtained by burning of coal. The thermal energy is used to heat water and generate steam of very high temperature and pressure, which drives the turbine to produce electrical energy.

iii. In a nuclear power plant, nuclear fission is used to generate the thermal energy for conversion of water to steam.

iv. In power generation plant based on energy of natural gas, the turbine is run by a gas at very high temperature and pressure generated by combustion of natural gas and electricity is generated.

v. In a solar thermal plant, heat from solar radiation is used to generate steam by heating water. This steam is then used to drive the turbine and produce electrical energy.

5 Which fuel is used in thermal power plant ? What are the problems associated with this type of power generation ?

Ans i. Coal is the fuel used to generate electrical energy in thermal power plant.

ii. In this, the chemical energy of coal is used by burning and released as thermal energy.

iii. The thermal energy produces steam and generates kinetic energy in the steam which causes rotation of the steam turbine.

iv. Rotation of steam turbine is then converted to electrical energy by the generator.

Problems associated with thermal power plant :

a. Air pollution due to burning of coal: Burning of coal results in emission of gases like carbon dioxide, sulpur oxide and nitrogen oxide which are harmful to the health.

b. Along with the emission of gases due to burning coal, soot particles are also released into environment. This may cause serious health problems related to respiratory system.

c. The reserves of fuel used i.e. coal are limited. Therefore, in future, there will be limitations on availability of coal.

6 What are the advantages and limitations of solar energy?

Ans **Advantages of solar energy:**

i. Solar energy is green energy i.e. it is renewable and does not cause pollution.

ii. Solar panels for the generation of electricity requires less maintenance.

iii. With the help of solar energy, electricity is possible to be generated even in the most remote, inaccessible locations where electric power lines cannot be laid.

Limitations of solar energy:

i. Electricity generation based on solar energy is weather dependent and hence it is less reliable. In winters and in cloudy days, the production becomes less.

ii. The whole set-up of the panels requires lot of space to generate considerable amount of electricity.

iii. The initial cost of a solar panel is sufficiently high.

Q.11 **Answer the following in detail** **10**

1 How can we get required amount of energy by connecting solar panels?

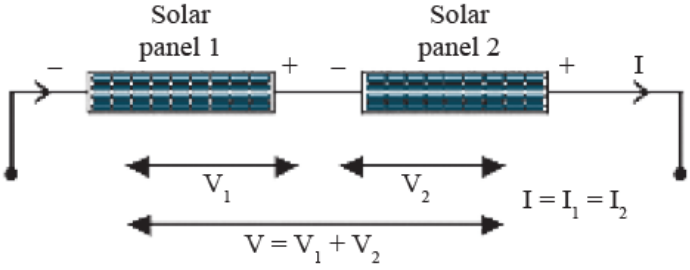
Ans i. Solar photovoltaic cells convert the solar radiation energy directly into electrical energy.

ii. The solar photovoltaic cell is the basic unit in a solar power plant.

iii. Many solar cells are wired together to form a solar panel or a solar module.

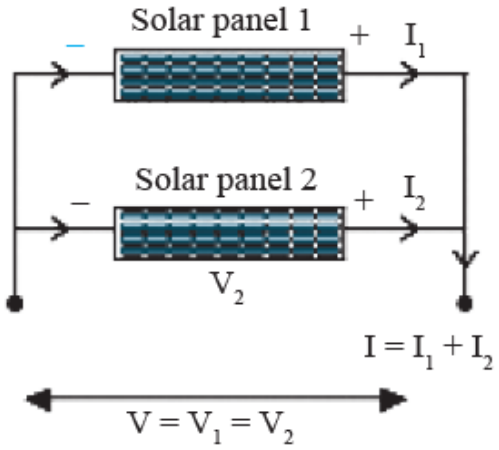
iv. If two solar panels are connected in series as shown in the figure, the potential difference obtained from this combination is the addition of the potential differences of individual solar panels.

v. The current generated from this combination is same as the current generated from individual panels.



vi. If two solar panels are connected in parallel as shown in figure below, the current generated from this combination is the summation of the currents from the individual solar panels.

vii. The potential difference obtained from this combination is the same as the potential difference obtained from individual solar panels.



viii. Therefore, by connecting the solar panels in series or in parallel, we can obtain the required amount of energy.

ix. For example, if 36 solar cells, each of size 100 cm^2 are connected in series in a solar panel, it will give a potential difference of 18 V and current of 3 A.

2 i. What is meant by green energy ?

ii. Which energy resources can be called as green energy resources and why ?

iii. Give any four examples of green energy sources.

Ans i. Green energy can be defined as energy produced from the resources which are non-conventional or renewable and do not cause any environmental degradation during process of energy generation.

ii. a. Resources which cause least harm to the environment during energy generation are called as green energy sources.

b. Fossil fuels like coal, CNG, LPG cause air pollution while nuclear fuels like uranium and plutonium cause radiations.

c. Such conventional or non-renewable sources can result in environmental harm and depletion of natural resources.

d. Thus, to reduce the natural disturbance and balance the environmental condition, use of green energy other than fossil or nuclear fuels is necessary.

iii. Examples of green energy sources are :

a. Wind

b. Sunlight

c. Biogas

d. Tidal waves

e. Water reservoir (any four)