

5

Reproduction in Plants

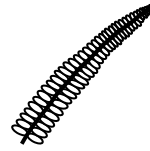
1. Study the diagrams below.



Mushroom



Toadstool

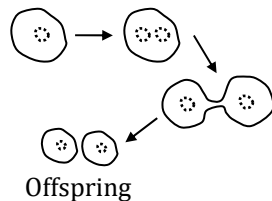


Ladder fern

In terms of reproduction, what do these organisms above have in common?

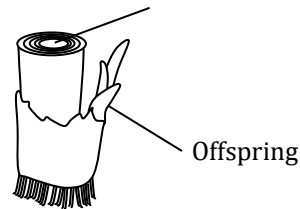
- (1) They contain chlorophyll.
 - (2) They reproduce by spores.
 - (3) They feed on decaying matter.
 - (4) They are flowering organisms.
2. A test is conducted to find out whether light is an essential factor for seed germination. While keeping other conditions favourable for germination, Container A is placed in a cupboard and Container B is placed near the window of a room. What would the results be?
- (1) Only the seeds in Container A will germinate.
 - (2) Only the seeds in Container B will germinate.
 - (3) The seeds in both containers will germinate.
 - (4) The seeds in both containers will not germinate.
3. Three students studied the reproduction methods of Organisms A and B as shown in the diagrams below.

Parent cell of A



Offspring

Parent plant of B



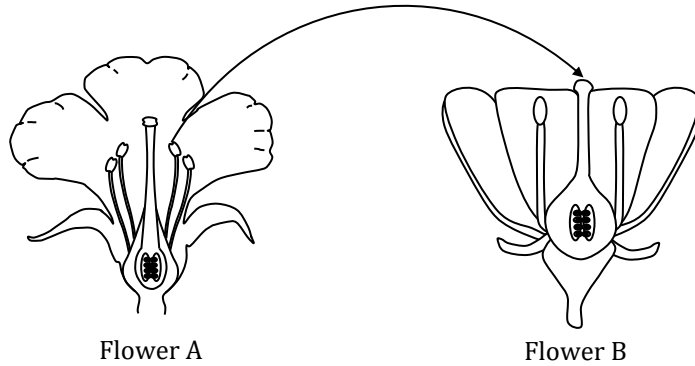
Offspring

The three of them recorded their observations in their Science workbooks. Which of these students made the correct statement(s)?

- A. The offsprings have better resistance against bacteria than their parents.
 - B. The offspring of Organism B is not likely to produce better fruits than its parents.
 - C. Both the offspring of Organisms A and B are genetically identical to their parents.
- (1) A only
 - (2) B only
 - (3) A and B only
 - (4) B and C only

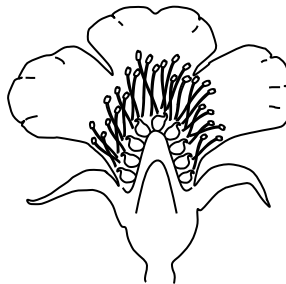


4. Flowers A and B belong to different species. A pollen grain from Flower A lands on the stigma of Flower B as shown in the diagram below.



What will happen after a week?

- (1) A pollen tube will grow down the style of Flower B.
 - (2) The petals of Flower B will wither.
 - (3) No changes to the petals of Flower B.
 - (4) The ovary of Flower B will be swollen.
5. Which one of the following statements about reproduction in flowering plants is incorrect?
- (1) Pollination occurs before fertilisation.
 - (2) Pollen grains are produced in the pollen sac.
 - (3) The male cell fuses with the egg cell in the ovule.
 - (4) The pollen grain moves down the style to reach the ovules.
6. The diagram below shows a male flower. The flower has small petals, long filaments and stamens that are sticking out of the flower.

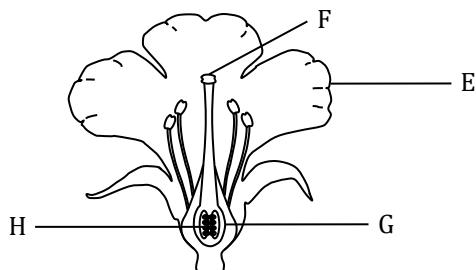


How is the above flower most likely pollinated?

- (1) By wind
- (2) By water
- (3) By animal
- (4) By explosive action

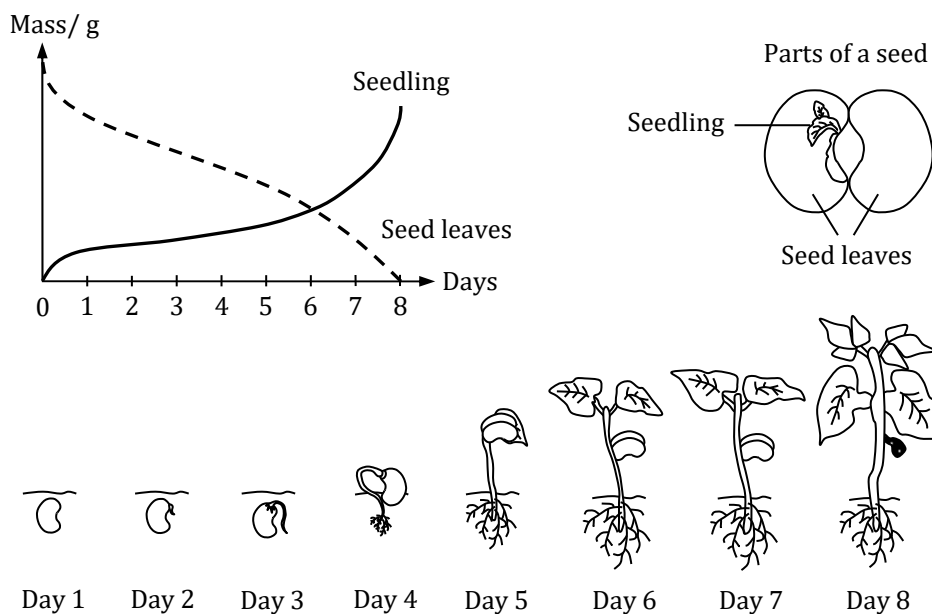


7. The diagram below shows the cross-section of a flower.



Which one of the labelled parts will develop into a fruit?

- (1) E
 - (2) F
 - (3) G
 - (4) H
8. Eight green bean seeds were planted under suitable conditions for them to grow. At the end of each day, one seedling is removed, dried and then weighed to find the masses of its seed leaves and seedling separately. The findings are recorded in the graph below.



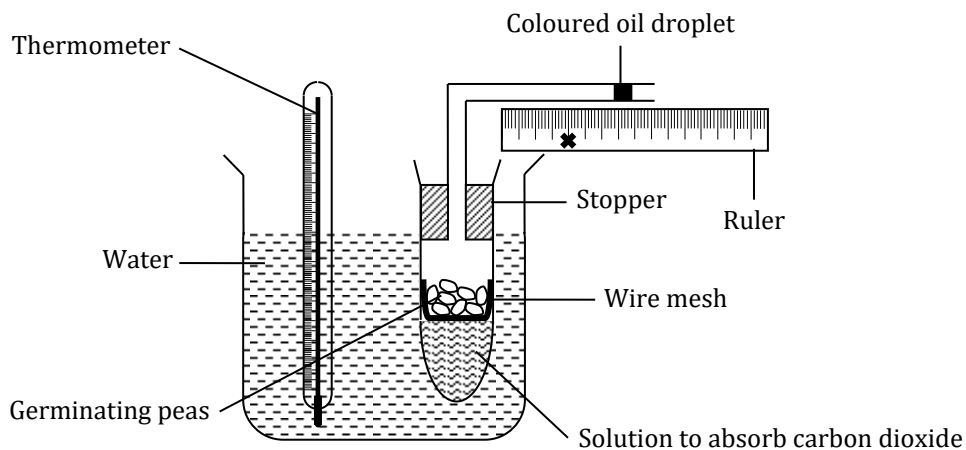
Based on the graph, which one of the following is true?

- (1) Both their masses changed at the same rate.
- (2) The mass of the seedling was similar to the mass of the seed leaves.
- (3) The mass of seed leaves was always greater than the mass of the seedling.
- (4) The mass of the seed leaves decreased as the mass of the seedling increased.

9. Which one of the differences between wind-pollinated flowers and insect-pollinated flowers is incorrect?

	Wind-pollinated flower	Insect-pollinated flower
(1)	Petals usually small and dull	Petals usually large and colourful
(2)	Nectar absent	Nectar present
(3)	Produces less pollen	Produces more pollen
(4)	No smell	Usually has smell

10. An experiment is set up in a dark room as shown in the diagram below.

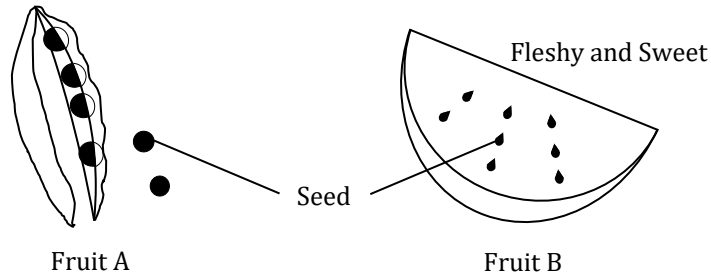


What will be observed about the oil droplet and what is a possible explanation for this?

- (1) It shifts toward X as the germinating peas take in oxygen.
 - (2) It will not move as germination cannot take place in a dark room.
 - (3) It shifts away from X as the germinating peas give out carbon dioxide.
 - (4) It will not move as the germinating peas take in oxygen and release carbon dioxide.
11. Which of the following statements are true?
- A. All flowers have male and female parts.
 - B. Only flowering plants reproduce from seeds.
 - C. The ovary is present in the female part of the flower.
 - D. Pollen grains are produced by the male part of the flower.
- (1) A and B only
 - (2) C and D only
 - (3) B, C and D only
 - (4) A, B, C and D



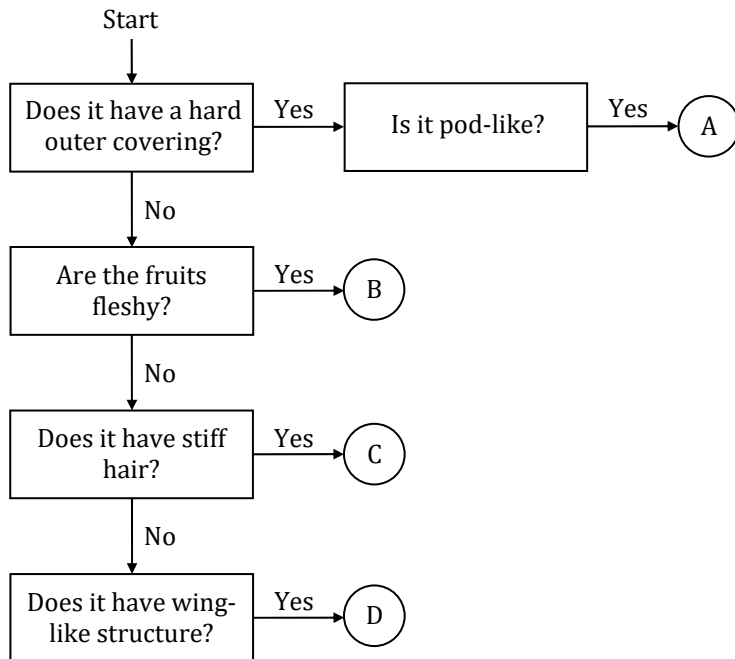
12. The diagram below shows the fruit of some plants.



How are Fruits A and B dispersed?

	Fruit A	Fruit B
(1)	Wind	Animals
(2)	Animals	Wind
(3)	Animals	Splitting Action
(4)	Splitting Action	Animals

13. Study the flowchart below. It shows the characteristics of different plants, A, B, C and D.



Based on the flowchart, which of the following young plant is the most likely to grow near its parent plant?

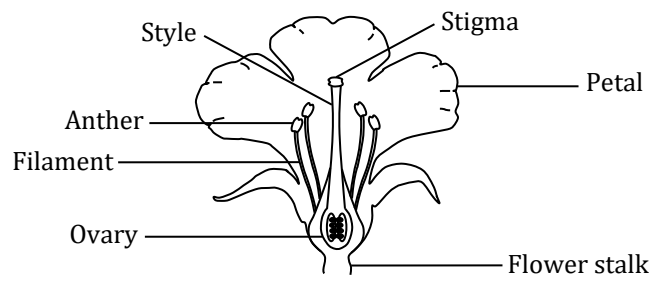
- (1) A
- (2) B
- (3) C
- (4) D



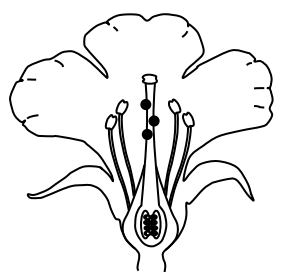
14. Johnson conducted an experiment on the germination of seeds. He placed the same number of seeds in each of Containers A and B. Container A was placed in the cupboard while Container B was placed in the garden. He watered them daily with the same amount of water. After a week, he observed that the seeds which had germinated in Container A had yellow leaves while the seeds which had germinated in Container B had green leaves. What could Johnson conclude from his experiment?

- (1) The seeds in Container B germinate faster than those in Container A as light is present.
- (2) The seeds in both containers need light, water, air and warmth to germinate.
- (3) The seedlings in both containers need green light to make food.
- (4) The leaves in both containers need light to produce chlorophyll.

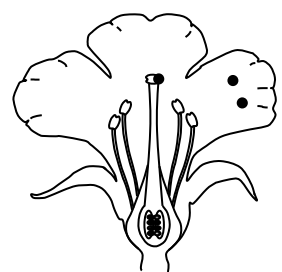
15. The diagram below shows the different parts of a flower.



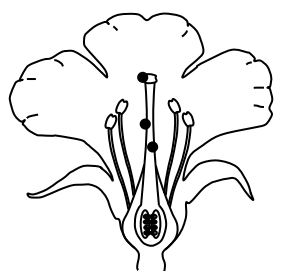
If the black dots in the options below represent pollen grains from the flower, which of the following flowers have been successfully pollinated?



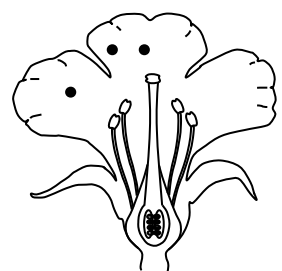
Flower A



Flower B



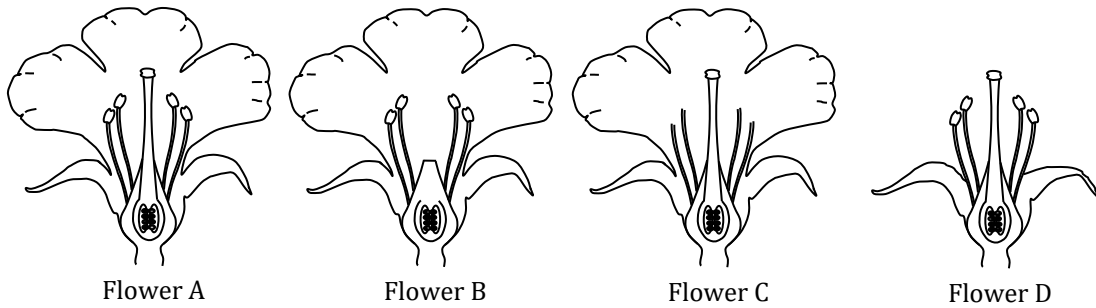
Flower C



Flower D

- (1) Flowers A and B only
- (2) Flowers B and C only
- (3) Flowers A, C and D only
- (4) Flowers A, B, C and D

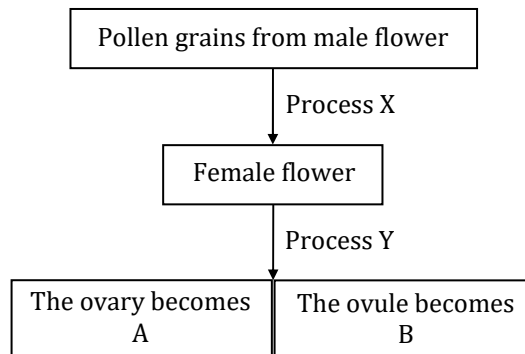
16. The diagrams below show the same type of flowers found in a garden. Flowers B, C and D have some parts removed from them.



Which flower(s) could still possibly develop into a fruit?

- (1) Flower A only
- (2) Flowers A and D only
- (3) Flowers B and C only
- (4) Flowers A, C and D only

17. Study the flowchart below.

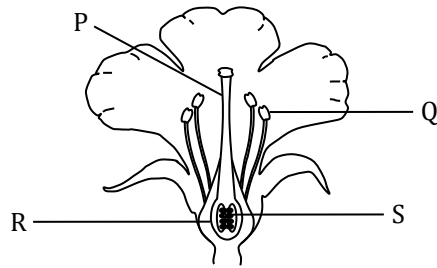


Which one of the following correctly identifies the processes X, Y and the parts A, B?

Processes		Parts of the plant	
X	Y	A	B
(1) Fertilisation	Pollination	Fruit	Seed
(2) Pollination	Fertilisation	Seed	Fruit
(3) Pollination	Fertilisation	Fruit	Seed
(4) Fertilisation	Pollination	Seed	Fruit



18. The diagram below shows the cross-section of a flower.

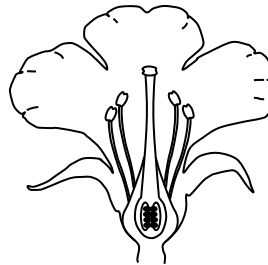


Which of the following statements below are true about the parts P, Q, R and S of the flower?

- A. Part P allows the pollen tube to reach Part S.
- B. Part Q attracts pollinators like insects and birds.
- C. Part R will enlarge and develop into a fruit.
- D. Part S is the area where fertilisation occurs.

- (1) A and B only
- (2) A and D only
- (3) A, C and D only
- (4) B, C and D only

19. The diagram below shows the cross-section of a flower.

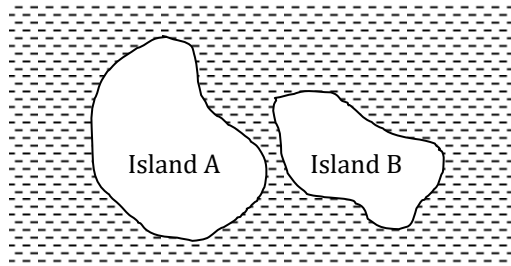


Based on the above diagram, identify the correct method of pollination for this flower and its corresponding characteristic.

	Pollination Method	Characteristic
(1)	Insect	The reproductive parts are hidden in the flower.
(2)	Insect	Nectar, which attracts insects, is produced by the reproductive parts.
(3)	Wind	The petals are large, enabling the pollen grains to collect inside the flower.
(4)	Wind	The female reproductive part is longer than the male reproductive part.



20. The diagram below shows two uninhabited islands, A and B, which are surrounded by the sea.



Ten years ago, four types of plants were found growing on Island A but none of these was found growing on Island B. Some characteristics of the fruits of the four plants found on Island A are shown in the table below.

Plant	Characteristic of the fruit
S	Fibrous husk
T	Sweet and juicy
U	Feathery structures
V	Dry fruit wall

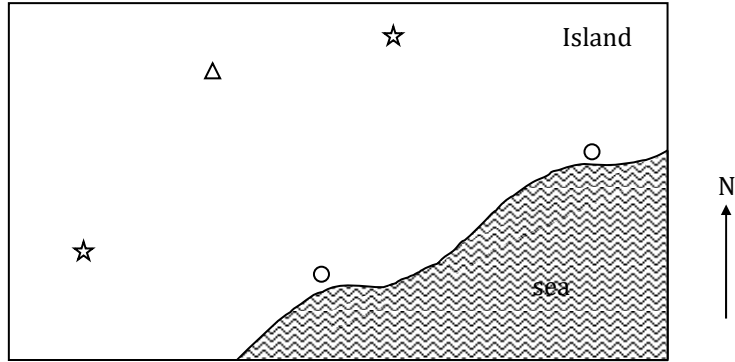
New plants are now found growing on Island B. Researchers believe that these plants originated from Island A. Which plant(s) can these possibly be?

- (1) S only
- (2) T and U only
- (3) S, T and U only
- (4) T, U and V only

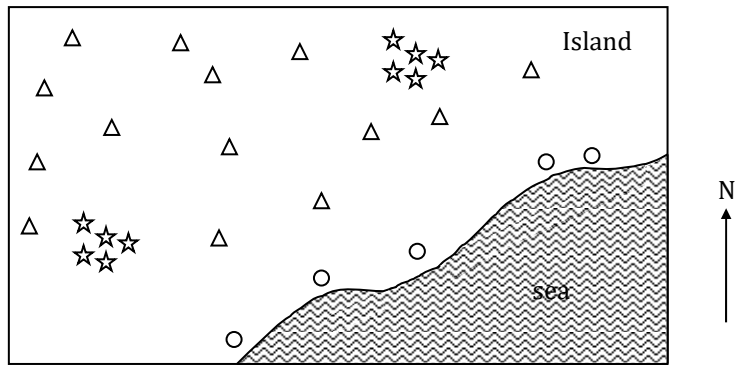
21. Which of the following best describe the importance of seed dispersal?

- A. To prevent overcrowding
 - B. To increase the seedling's chances of survival
 - C. To enable the young plant to obtain enough nutrients from the parent plant
 - D. To allow the young plant to have the same characteristics as the parent plant
- (1) A and B only
 - (2) B and C only
 - (3) A, B and C only
 - (4) A, B, C and D

22. The diagram shows part of an island where three types of plants, ☆, Δ and ○ are growing.



The wind direction was northwards. After five years, the number of each type of plant has increased, as shown in the diagram below.



How are the fruits or seeds of each type of plant dispersed?

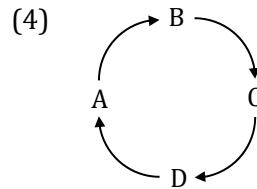
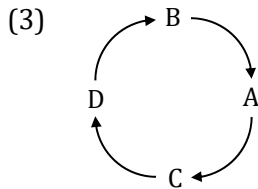
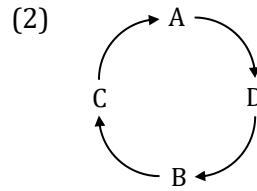
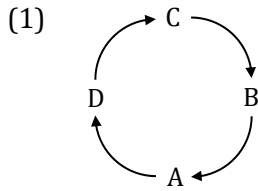
	☆	Δ	○
(1)	Wind	Animals	Splitting action
(2)	Wind	Water	Animals
(3)	Splitting action	Wind	Water
(4)	Splitting action	Animals	Water



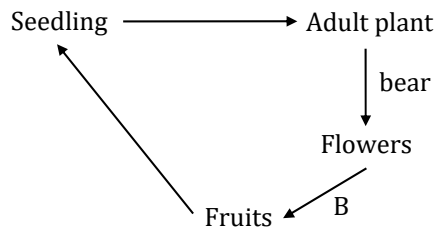
23. A, B, C and D are processes occurring in the life cycle of a plant.

- A. Dispersal
- B. Fertilisation
- C. Pollination
- D. Seed germination

Which of the following shows the correct order of the processes?



24. The diagram below shows the development cycle of a plant.



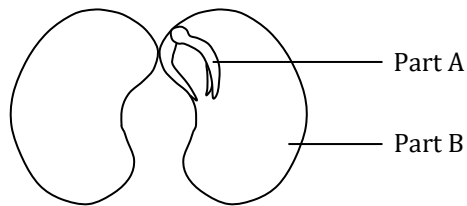
Which of the following best represent processes at B?

- A. Dispersal
 - B. Germination
 - C. Pollination
 - D. Fertilisation
- (1) A and B only
 (2) A and C only
 (3) C and D only
 (4) B and C only



Question 25

The diagram below shows the cross-section of the seed of a bean plant.



(a) Name the labelled Part A. (1 m)

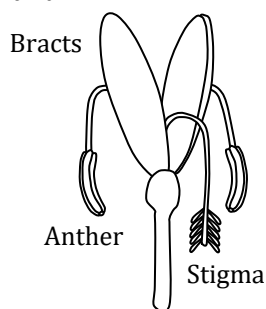
(b) What is the function of Part B during germination? (1 m)

(c) Tick the factors that are required for the germination of the seed. (3 m)

Factors	Put a '✓' if it is one of the factors required for germination
Water	
Warmth	
Food	
Light energy	

Question 26

The diagram below shows a flower of Plant W.



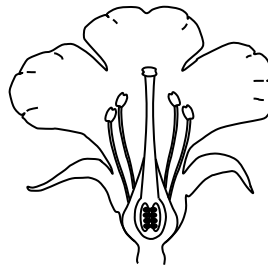
(a) Based on the above diagram, state the method of dispersal for this flower. (1 m)

(b) Give two reasons for your answer in part (a). (2 m)



Question 27

The diagram below shows the cross-section of a flower.

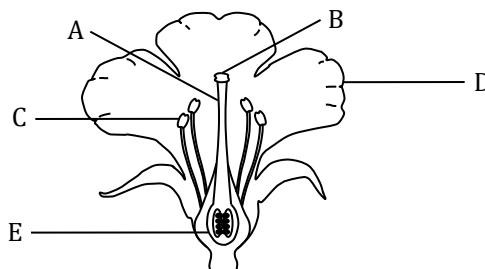


(a) For a flower to develop into a fruit, two important processes have to occur. State these processes. (2 m)

(b) In the diagram above, label the anther and stigma of the flower. (2 m)

Question 28

The diagram below shows the cross-section of a flower.



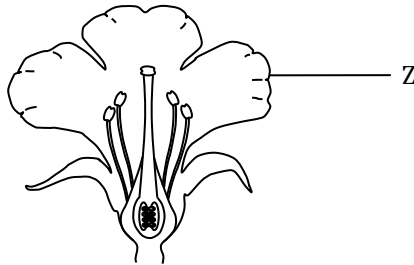
(a) The table below shows the functions of the different parts of the flower labelled A, B, C, D and E in the given diagram. Complete the table by writing in the correct letters A, B, C, D and E next to each function. (2 m)

Function of the flower parts	Part
Attracts insects	
Protects the ovules	
Contains pollen sacs	
Catches pollen grains	

(b) What change would take place at E several days after the male reproductive cell has fused with the egg cell? (1 m)

Question 29

The diagram below shows the cross-section of a flower.



- (a) The table below shows two parts of the flower, X and Y, that have similar functions to certain organs in the human reproductive system.

Parts	Similar function to certain organs in the human reproductive system
X	Producing sperms
Y	Producing eggs

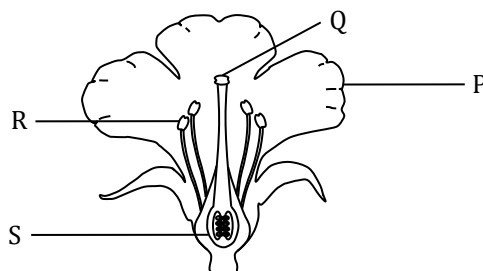
Label Parts X and Y in the diagram above. (2 m)

- (b) If Part X is removed from the flower, will the flower still be able to develop into a fruit? Explain why. (1 m)

- (c) What is the function of Part Z? (1 m)

Question 30

The diagram below shows the cross-section of the flower of a plant.



- (a) Which part, P, Q, R or S, performs a similar function as the testis in the human reproductive system? (1 m)

- (b) What would you observe about Part S when the male sex cell fuses with the egg? (1 m)

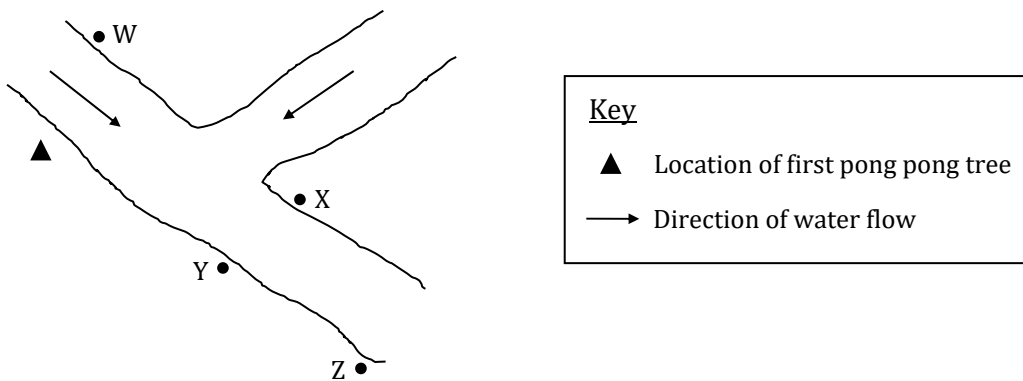


Question 31

The picture below shows some pong pong fruits.



The diagram below shows the location where the first pong pong tree was grown, and the different possible parts, W, X, Y and Z, of a river where pong pong trees can be found two years later.

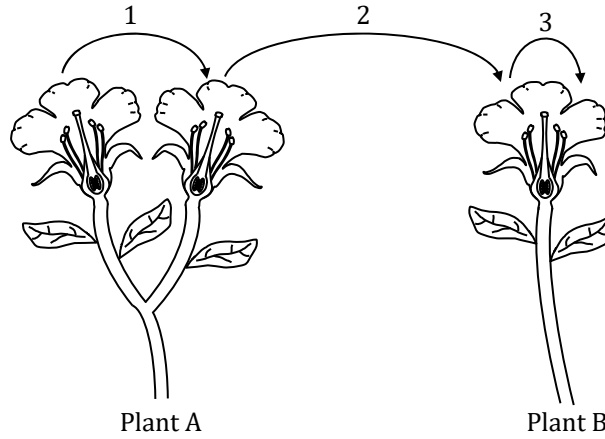


(a) Which is the most unlikely part of the river where young pong pong trees can be found? Explain your answer. (2 m)

(b) The pong pong fruit has a fibrous husk. Explain how this feature enables it to be dispersed by water. (1 m)

Question 32

The diagram below shows two plants, A and B, of the same species. The three arrows, 1, 2 and 3, show the process of pollination in plants.



(a) Which arrow(s) show(s) cross-pollination? (1 m)

(b) Will the flowers develop into fruits after pollination? Explain your answer. (1 m)

(c) Put a tick (✓) in the appropriate column to indicate if each of the following statements is 'True' or 'False'. (2 m)

Statements	True	False
The flowers of Plants A and B are most likely pollinated by wind.		
It is possible for Plant B to produce fruits even if all the anthers of the flower are removed.		



Question 33

The table below shows the characteristics of three different plants, Q, R and S.

Plant	Does it have flowers?	Can the flower develop into a fruit?	Length of petals/cm
Q	Yes	No	2.1
R	Yes	Yes	4.6
S	Yes	Yes	7.5

(a) Give a possible reason why the flower of Plant Q cannot develop into a fruit. (1 m)

(b) Which plant can best attract pollinators? Explain your answer. (1 m)

Question 34

Study the following fruits.



Rambutan



Jackfruit

(a) Based on the photographs above, what can you conclude about the number of ovules in a rambutan flower and a jackfruit flower? (1 m)

(b) Explain your answer in part (a). (1 m)

5

Reproduction in Plants

1. 2

Mushroom, toadstool and ladder fern are non-flowering plants and hence do not produce seeds. They produce spores which can grow into new plants.

2. 3

Germination is the process in which a plant or fungus emerges from a seed or spore and begins growth. A seed needs air, water and a suitable temperature to germinate. Mature seeds are often dry and need to absorb a significant amount of water before cellular metabolism and growth can resume. Temperature affects the cellular metabolism and growth rates. Seeds usually have a temperature range within which they will germinate and they will not do so above or below this range.

Most seeds are not affected by light or darkness and will germinate whether it is placed in a cupboard or near the window of a room.

3. 4

The offsprings and their parents will be identical genetically and in terms of fruits-producing.

4. 3

If Flowers A and B are of the same species, when the pollen grain from Flower A lands on the stigma of Flower B, fertilisation will take place in the following steps:

- (a) After pollination, the pollen grains germinate in response to the sugary fluid secreted by the mature stigma.
- (b) A pollen tube grows out from each pollen grain.
- (c) The pollen tube grows downwards towards the ovule, enters the ovule and releases two male gametes.
- (d) One male gamete fuses with the ovum to form a zygote. The other male gamete fuses with the definitive nucleus to form the endosperm nucleus.

However, since Flowers A and B are of different species, fertilisation will not occur and there will be no changes to the petals of Flower B.

5. 4

It should be pollen tube moving down the style to reach the ovules.



6. 1

7. 3

Part G is the ovary. A fruit is the ripened ovary or ovaries — together with seeds — from one or more flowers.

8. 4

9. 3

The following table gives a more detailed comparison.

Feature	Wind-pollinated flower	Insect-pollinated flower
Petals	Flowers are usually small and dull-coloured, without petals.	Flowers are usually large with brightly-coloured petals to attract insects.
Nectar	Nectar is absent.	Nectar is present.
Scent	Flowers do not have scent.	Flowers are fragrant or sweet-smelling.
Stigmas	Stigmas are large and feathery and usually protrude out of the flower to provide a large surface area to trap pollen.	Stigmas are usually small and compact and do not protrude out of the flower.
Stamens	Stamens have long filaments and protruding anthers. Pollen grains are hence easily shaken out from the anthers.	Stamens usually do not protrude out of the flower.
Pollen	Pollen is more abundant. Pollen grains have smooth surfaces and are tiny and light so that they are easily blown about by the wind.	Pollen is fairly abundant. Pollen grains are usually larger with rough surfaces so that they can readily cling onto the body of insects.
Nectar guides	Nectar guides are absent.	Nectar guides may be present on the petals to guide insects towards the nectar.



10. 1

Oxygen is required by the germinating peas for metabolism. Oxygen is used in aerobic respiration, the main source of the seedling's energy until it grows leaves. Hence, the oil droplet shifts toward X because the germinating peas take in oxygen. The carbon dioxide given out by the germinating peas does not affect the experiment as it is absorbed by the solution.

11. 3

12. 4

Fruit A is dispersed by splitting/ explosive action. It splits open to release its seeds after the fruit has dried up. Fruit B is dispersed by animals. The seeds found in its fleshy and sweet fruit are dispersed when animals eat the fruits and throw away the seeds or pass the seeds out in their droppings after eating both the fruit and seeds.

13. 1

Plant A disperses by splitting/ explosive action. Plants dispersed using this method are most likely to grow near their parent plants.

14. 4

- Option 1: False. Seeds need only air, water and warmth to germinate. Light is not necessary during germination. The seeds in Container B should germinate at the same rate as the seeds in Container A.
 - Option 2: False. Light is not necessary during germination.
 - Option 3: False. Light is necessary for the plants to make food. It may not necessarily be green light.
 - Option 4: True. Yellow leaves on the plants in Container A show that there is a lack of chlorophyll.
-

15. 2

For a flower to be successfully pollinated, the pollen grains must land on the surface of the stigma.

16. 4

The stigma and style of Flower B have been removed. Fertilisation cannot take place for Flower B and hence it cannot develop into a fruit. The anthers of Flower C have been removed. It can still develop into a fruit if the pollen grains of another flower of the same species land on its stigma.



17. 3

Process X is pollination, which is the process in which pollen grains from the anther are transferred to the stigma of a flower. Process Y is fertilisation, which is the process in which the male reproductive cell is fused with the egg cell.

After fertilisation, most of the flower parts, except for the ovary, usually wither and drop off. The ovary enlarges and becomes a fruit, while the ovules in the ovary develop into seeds.

18. 3

Option A: True. Part P is the style. When the pollen grains land on the surface of the stigma, each pollen grain produces a pollen tube. This tube grows down from the stigma, through the style to the ovules in the ovary.

Option B: False. Part Q is the anther. Insects and birds are attracted to large and brightly-coloured petals as well as the scent of flowers.

Option C: True. Part R is the ovary.

Option D: True. Part S is the ovule.

19. 1

For insect-pollinated flowers, the reproductive parts usually do not protrude out of the flower.

20. 3

Plant S is dispersed by water. Plant T is dispersed by animal. Plant U is dispersed by wind. It is possible that these plants can be dispersed from Island A to Island B. However, it is not possible for Plant V to be dispersed to Island B as it is dispersed by splitting/ explosive action and will be dispersed only a short distance away from the parent plant.

21. 1

Plants need to ensure that their seeds are scattered or dispersed as far away as possible. Dispersal prevents overcrowding and reduces the competition of young plants among themselves and with the parent plant. Plants that grow too closely together have to compete for sunlight, water and minerals.



22. 4

☆ is dispersed by splitting/ explosive action as the new plants are found growing very near to the parent plant.

△ is dispersed by animals as the new plants are dispersed over a wide area. It is not dispersed by wind because the wind direction was northwards but new plants are found to the south of the parent plant.

○ is dispersed by water as the new plants are found along the coast.

23. 1

Seed germination is the process by which plants, fungus and bacteria emerge from seeds and spores, and begin growth.

Pollination is the transfer of pollen grains from the anther to the stigma of a plant. Self-pollination is the transfer of pollen grains from the anther to the stigma of the same flower or of a different flower on the same plant. Cross-pollination is the transfer of pollen grains from one plant to the stigma of a flower in another plant of the same species.

Fertilisation is the process by which the male gamete fuses with the female gamete to form a zygote. After fertilisation, the ovule develops into a seed and the ovary into a fruit.

24. 3

In order for flowering plants to reproduce sexually, the pollen grains must be transferred from the anthers to the stigmas so that the male and female gametes can later be brought together. This transfer of pollen grains is called pollination. Pollination is usually brought about by insects or wind.

After pollination, fertilisation can take place. One male gamete fuses with the ovum to form a zygote. The other male gamete fuses with the definitive nucleus to form an endosperm nucleus. After fertilisation, the ovule develops into the seed. The ovary develops into the fruit.



Solution 25

(a) Shoot

(b) It provides the bean seedling with food.

(c)

Factors	Put a '✓' if it is one of the factors required for germination
Water	✓
Warmth	✓
Food	✓
Light energy	

Solution 26

(a) Wind dispersal

(b) The anther and stigma are sticking out of the flower and the stigma is feathery.

Solution 27

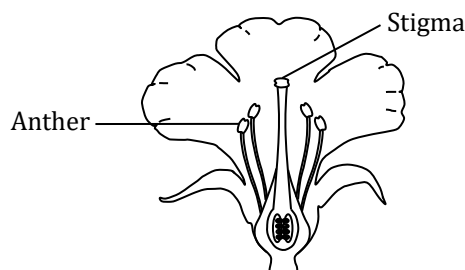
(a) Pollination and fertilisation.

Additional notes

Pollination is the transfer of pollen grains from the anther to the stigma of a plant. Self-pollination is the transfer of pollen grains from the anther to the stigma of the same flower or of a different flower on the same plant. Cross-pollination is the transfer of pollen grains from one plant to the stigma of a flower in another plant of the same species.

Fertilisation is the process by which the male gamete fuses with the female gamete to form a zygote. After fertilisation, the ovule develops into a seed and the ovary into a fruit.

(b)



Solution 28

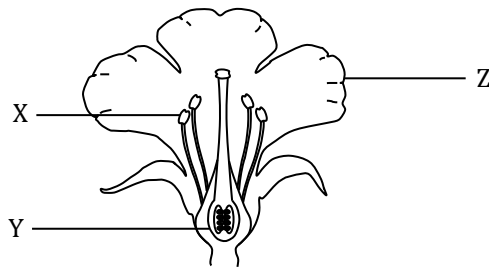
(a)

Function of the flower parts	Part
Attracts insects	D
Protects the ovules	E
Contains pollen sacs	C
Catches pollen grains	B

(b) It will swell and become a fruit.

Solution 29

(a)



(b) Yes, the pollen grains from another flower of the same species can still pollinate the flower and thus, fertilise the ovules in the ovary.

(c) Part Z attracts insects like bees to collect nectar and in the process pollinate the flowers.

Additional notes

For insect-pollinated flowers:

- Flowers are usually large with brightly-coloured petals to attract insects.
- Nectar is present.
- Flowers are fragrant or sweet-smelling.
- Stigmas are usually small and compact and do not protrude out of the flower.
- Stamens are not pendulous and usually do not protrude out of the flower.
- Pollen is fairly abundant. Pollen grains are usually larger with rough surfaces so that they can readily cling onto the body of insects.
- Nectar guides may be present on the petals to guide insects towards the nectar.

Solution 30

(a) Part R

(b) It would become swollen and soon turn into a fruit.



Solution 31

- (a) Part W. The pong pong fruit is dispersed by water and it will follow the direction of water flow in the river. Since Part W is upstream from the location where the first pong pong tree was grown, it is not possible for young pong pong trees to be found there.
- (b) The fibrous husk traps air into its air space to allow the pong pong fruit to float on water.
-

Solution 32

- (a) 2 only
- (b) No. Fertilisation must take place before they develop into fruits.
- (c)

Statements	True	False
The flowers of plants A and B are most likely pollinated by wind.		✓
It is possible for plant B to produce fruits even if all the anthers of the flower are removed.	✓	

Solution 33

- (a) It is a male flower.
- (b) Plant S. It has the longest petals to attract pollinators.
-

Solution 34

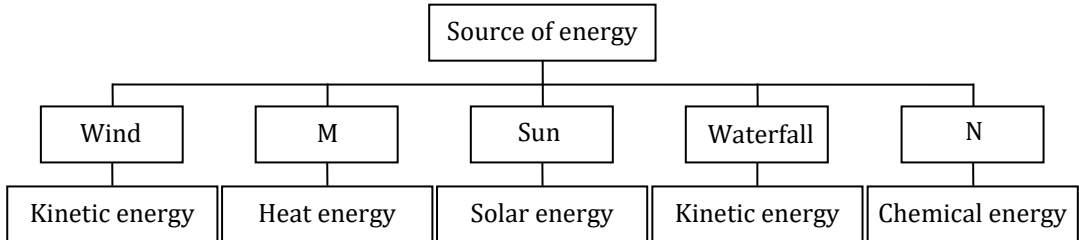
- (a) A rambutan flower has only one ovule while a jackfruit flower has many ovules.
- (b) A rambutan has only one seed while the jackfruit has many seeds. Since ovules develop into seeds, the jackfruit flower has many ovules which will develop into seeds in the jackfruit.
-



23

Sources of Energy

1. Study the classification table below.



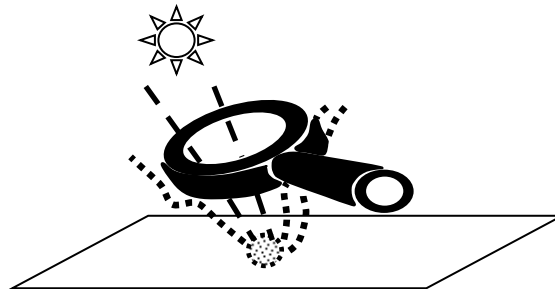
Which one of the following options will best represent M and N?

	M	N
(1)	Biomass	Geothermal
(2)	Oil	Natural gas
(3)	Geothermal	Coal
(4)	Oil	Biomass

2. Fossil fuels are energy resources. Which one of the following about fossil fuels is not true?

- (1) They have stored energy indirectly from the sun.
- (2) They take many millions of years to form in the ground.
- (3) They can exist in the solid, liquid and gaseous states.
- (4) They cannot be converted to other forms of energy.

3. Tim used a magnifying glass to carry out an experiment on a sunny day as shown in the diagram below and managed to get a burn mark on his paper.

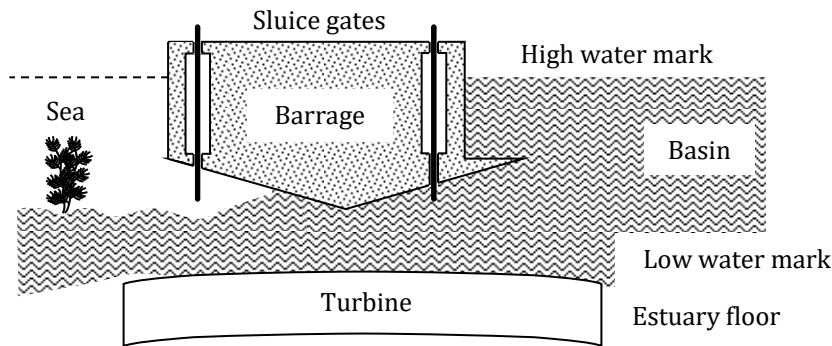


What energy changes took place?

- (1) Solar energy was converted to heat and chemical energy.
- (2) Solar energy was converted to light and heat energy.
- (3) Solar energy was converted to kinetic and sound energy.
- (4) Solar energy was converted to potential energy only.



4. Which one of the following pairs are examples of sources of energy?
- (1) Steam and coal
 - (2) Sound energy and water
 - (3) Elastic potential energy and wind
 - (4) Gravitational potential energy and kinetic energy
5. Which one of the following statements is correct?
- (1) All energy on earth is created by the Sun.
 - (2) Potential energy in fossil fuel originates from the Sun.
 - (3) Solar energy only refers to light energy from the Sun.
 - (4) All life depends directly or indirectly on the Sun's light energy only.
6. Which of the following statement(s) about fuel is/are not true?
- A. They are sources of potential energy.
 - B. They can be in solid, liquid or gaseous state.
 - C. They only come from organisms that are once alive.
 - D. They are the only source of energy for generating electricity.
- (1) B and C only
 - (2) C and D only
 - (3) A, B and C only
 - (4) B, C and D only
7. The diagram below shows how tide water is used to generate electricity.



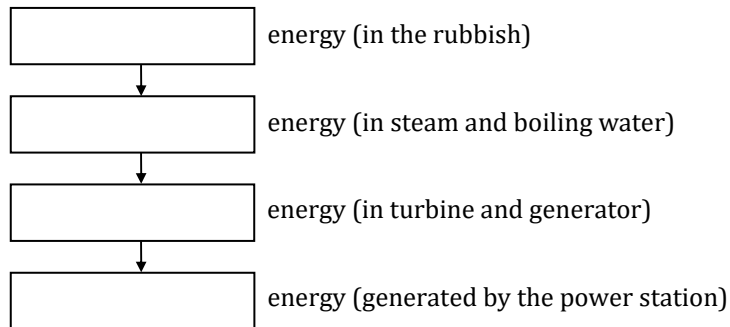
Which form(s) of energy does tide water possess in order to generate electricity?

- A. Potential Energy
 - B. Kinetic Energy
 - C. Sound Energy
 - D. Heat Energy
- (1) A only
 - (2) A and B only
 - (3) B and D only
 - (4) B, C and D

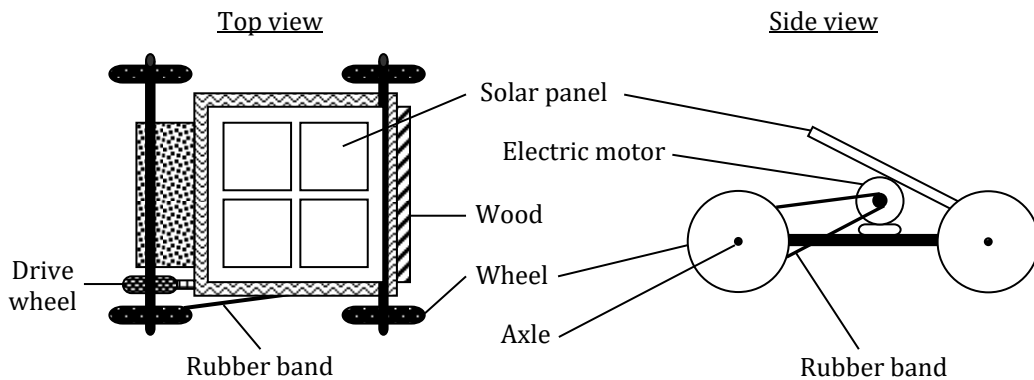


Question 8

A power station uses rubbish instead of fossil fuel to generate electricity. Complete the boxes with the main forms of energy to show the conversion of energy that takes place in the power station. (2 m)

**Question 9**

The diagram below shows a solar-powered model car.



(a) Explain how the solar-powered car gets its energy to move. (2 m)

(b) The toy car was modified by increasing the size of the solar panel.

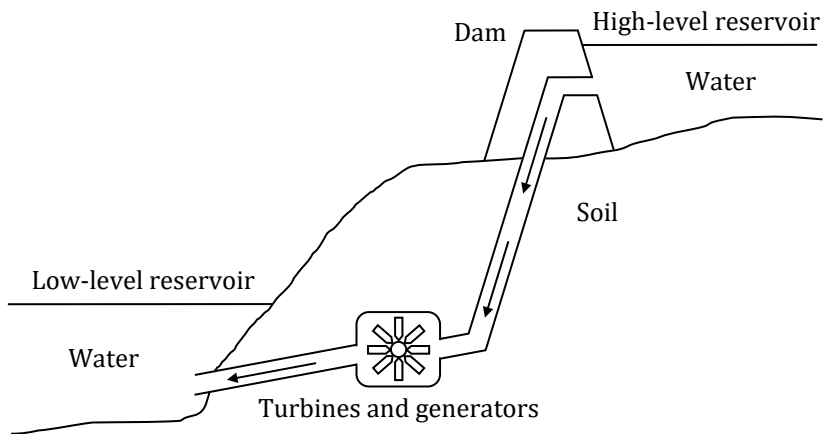
(i) Explain why the modified toy car could move faster than the original toy car. (2 m)

(ii) To carry out an investigation to compare the speed between the original toy car and the modified toy car, state one variable that should be kept constant. (1 m)



Question 10

The diagram below shows a hydroelectric power plant.



The dam is built on higher ground for storage of water, creating a large reservoir. When water flows out from the dam, it turns a turbine which is connected to a generator. Electricity is then produced.

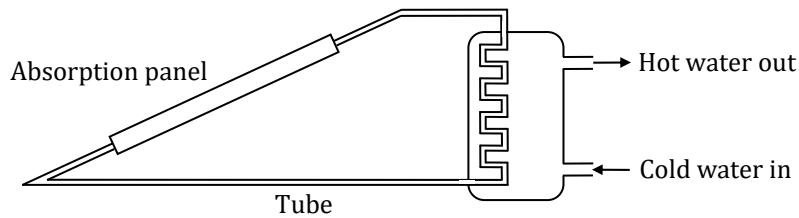
(a) Why do you think water is stored at a higher ground in a hydroelectric power plant? (1 m)

(b) State one advantage of generating electricity using a hydroelectric power plant. (1 m)



Question 11

The diagram below shows a simplified solar water heater. The absorption panel is placed facing the sun so as to absorb as much heat as possible. A tube passes through the absorption panel, into the water tank and then out again towards the absorption panel. Water fills up the tube and circulates in the tube.



(a) Explain how the water in the water tank gets heated up. (2 m)

(b) The tube is made of metal. Explain how this would make the solar water heater more effective. (1 m)



23

Sources of Energy

1. 3

Geothermal energy is the heat from the Earth. It is clean and sustainable. Resources of geothermal energy range from the shallow ground to hot water and hot rock found a few miles beneath the Earth's surface, and down even deeper to the extremely high temperatures of molten rock called magma.

Coal contains chemical energy. During the combustion of coal, the chemical bonds of carbon and oxygen break apart to release energy.

2. 4

Fossil fuels result from a transformation of plant and animal material over millions of years. The solar energy originally stored in the plant or animal is eventually converted into energy stored in carbon and hydrogen bonds of the fossil fuel. Fossil fuels can be converted to other forms of energy by burning them.

3. 2

Solar energy from the Sun is converted to light energy. The light is incident on the magnifying glass and is focused to a tiny spot of concentrated light. The concentrated light is of high intensity and is converted to heat that is adequate to cause a burn mark on the paper.

4. 1

Steam is able to drive a turbine to generate electricity. Coal is a fuel.

5. 2

Option 1: Incorrect. Energy is also created by wind and tidal waves.

Option 2: Correct.

Option 3: Incorrect. Solar energy also consists of thermal (heat) energy.

Option 4: Incorrect. The Sun is the main source of energy for all living things. Other than light energy, the Sun also provides heat energy.

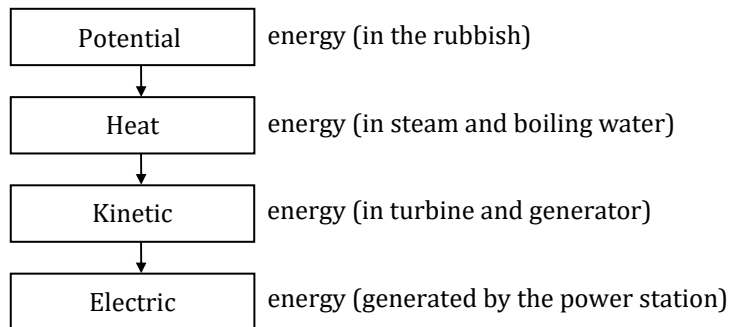


6. 2

- Option A: Correct. Fuel are sources of chemical potential energy which will be released when they are burnt.
- Option B: Correct. Solid fuel, petrol and liquid petroleum gas are examples of the three states.
- Option C: Incorrect. Only fossil fuel comes from organisms that are once alive.
- Option D: Incorrect. There are alternative sources of energy such as renewable energy like solar energy and wind energy.

7. 2

As the sluice gates are opened, the water which is at a higher level will flow to a lower level. When this happens, the potential energy possessed by the water at the higher level is converted into kinetic energy as the water flows to a lower level. The moving water then turns the turbines to generate electricity.

Solution 8Solution 9

- (a) The solar-powered car gets its energy from the sun and converts it to electrical energy and kinetic energy, allowing the car to move.

Additional notes

A solar cell is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect. Current, voltage or resistance vary when light is incident upon which, when exposed to light, can generate and support an electric current without being attached to any external voltage source.

- (b)
- (i) When the solar panel is bigger, there will be more light energy captured on the larger surface area of the panel to be converted to electrical energy and finally to kinetic energy to move the car.
- (ii) The amount of light.



Solution 10

- (a) At a higher ground, there will be more gravitational potential energy. When the water flows down the channel, more gravitational potential energy will be converted to kinetic energy for the water to flow at a faster speed and hence turning the turbines faster.
- (b) It is a renewable source of energy.
-

Solution 11

- (a) The sun heats up the absorption panel which in turn heats up the water in the tube passing through the absorption panel. The hot water moves through the tubes to the water tank. Heat from the hot water is then transferred to the water in the water tank.
- (b) Metal is a good conductor of heat. Heat can be transferred from the hot water in the tubes to the water in the water tank at a faster rate.
-

