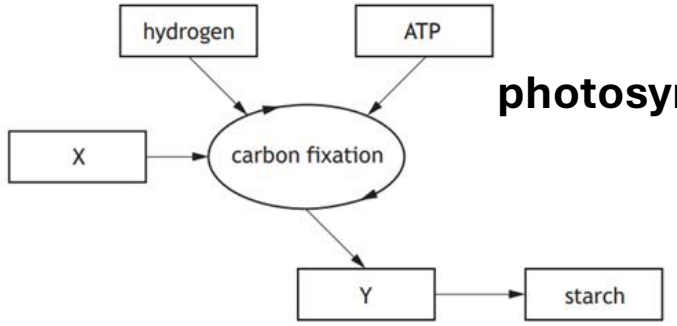
photosynthesis

1. The diagram below shows the carbon fixation stage of photosynthesis.



Which row in the table below identifies X and Y?

	X	Y
A	Sugar	Oxygen
B	Water	Carbon dioxide
C	Carbon dioxide	Sugar
D	Water	Oxygen

2. The light energy for photosynthesis is captured by

A water
B hydrogen
C chlorophyll
D oxygen.

3. Which row in the table describes a process in plants which requires sugar and a substance into which sugar is converted?

	Process	Substance
A	Photosynthesis	Cellulose
B	Respiration	Starch
C	Photosynthesis	Protein
D	Respiration	ATP

4. The light reaction include a step of

A Combining of water with carbon dioxide
B Use of water by chlorophyll to split light
C Release of energy from water using light energy
D Splitting of water using light energy

5. The raw materials for photosynthesis are

A carbon dioxide and water
B oxygen and water
C carbon dioxide and glucose
D oxygen and glucose.

6. ATP synthesised during the Light reaction provides the Carbon Fixation stage of photosynthesis with

A glucose
B carbon dioxide
C energy
D hydrogen

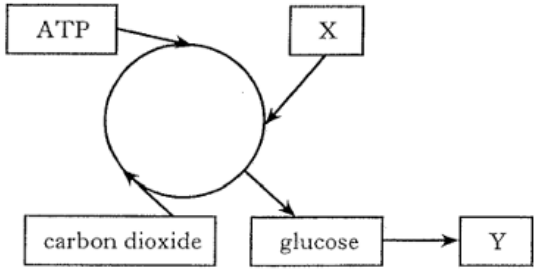
7. The word equation for photosynthesis is

A carbon dioxide + water → glucose + oxygen
B oxygen + water → glucose + carbon dioxide
C glucose + oxygen → carbon dioxide + water
D carbon dioxide + oxygen → glucose + water.

8. Products of the light reactions of photosynthesis needed for Carbon Fixation.

A glucose and hydrogen
B carbon dioxide and hydrogen
C water and oxygen
D hydrogen and ATP

9. The diagram below shows the carbon fixation stage of photosynthesis.



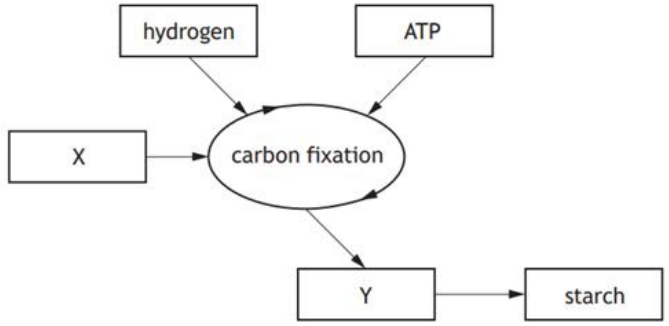
Which line in the table correctly identifies X and Y?

	X	Y
A	hydrogen	starch
B	starch	ADP
C	starch	oxygen
D	water	starch

10. Which line in the table below correctly identifies the use of starch and cellulose?

	Use of carbohydrate	
	Starch	*Cellulose*
A	structural	structural
B	structural	storage
C	storage	structural
D	storage	storage

1. The diagram below shows the carbon fixation stage of photosynthesis.



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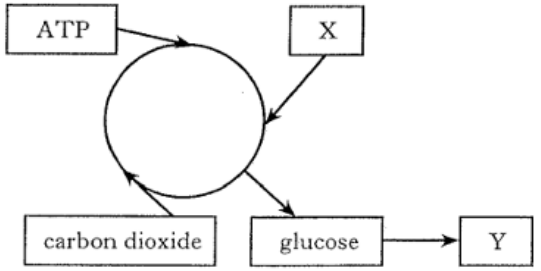
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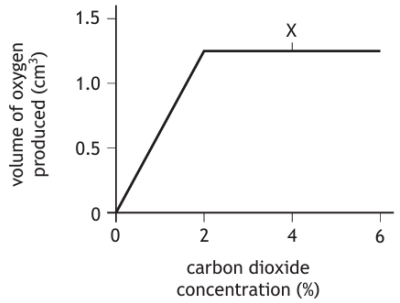
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10. Which line in the table below correctly identifies the use of starch and cellulose?

	Use of carbohydrate	
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B	structural	storage
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D	storage	storage

11. An experiment was set up to investigate the effect of changing carbon dioxide concentration on the rate of photosynthesis.

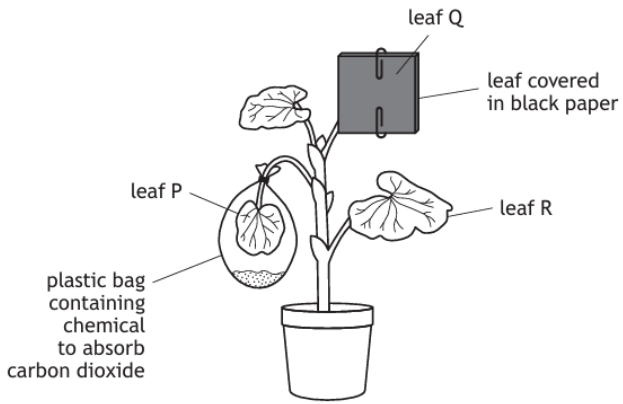
The results are shown in the graph.



Which of the following factors could be limiting the rate of photosynthesis at point X?

A Carbon dioxide concentration and light intensity
B Light intensity and temperature
C Temperature only
D Carbon dioxide concentration only

12. In an investigation into photosynthesis, a green plant was set up as shown and left in the light for 2 days.

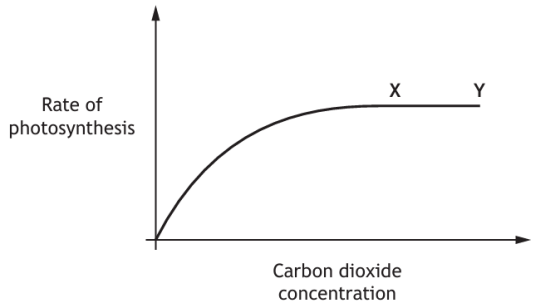


Leaves P, Q and R were then tested for the presence of starch.

In which of the leaves was starch present?

A Leaf P only
B Leaf R only
C Leaves P and R only
D Leaves P, Q and R

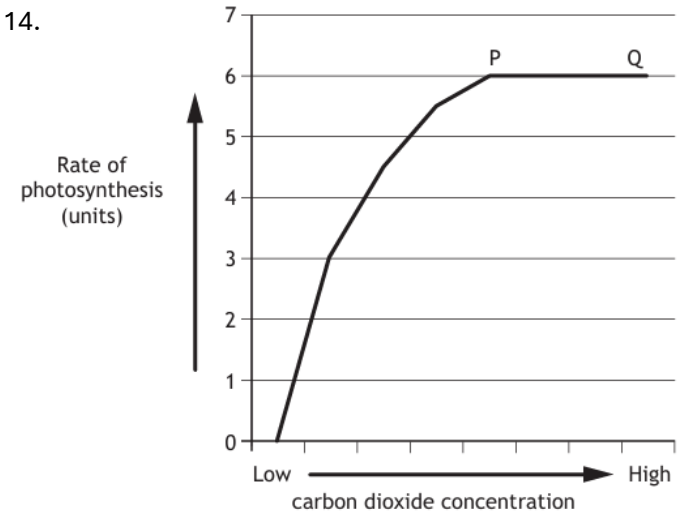
13. The graph shows the effect of increasing carbon dioxide concentration on the rate of photosynthesis.



Two factors which could be limiting the rate of photosynthesis between points **X** and **Y** on the graph are

A starch concentration and light intensity
B temperature and light intensity
C temperature and carbon dioxide concentration
D sugar concentration and carbon dioxide concentration.

14.



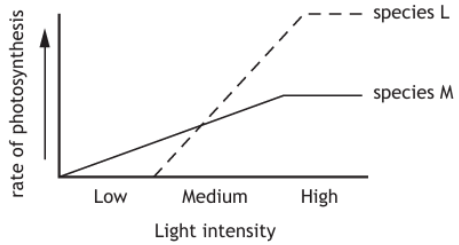
State two environmental factors which could limit the rate of photosynthesis between points P and Q. **1**

1 _____

2 _____

15. The effect of light intensity on the rate of photosynthesis was measured for two species of plants, L and M.

The results are shown in the graph below.

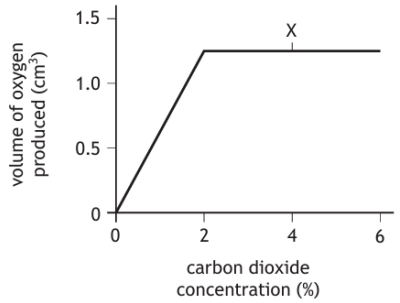


The rate of photosynthesis of species M is

A slower than L in low light intensities
B slower than L in high light intensities
C faster than L in medium light intensities
D faster than L in high light intensities.

11. An experiment was set up to investigate the effect of changing carbon dioxide concentration on the rate of photosynthesis.

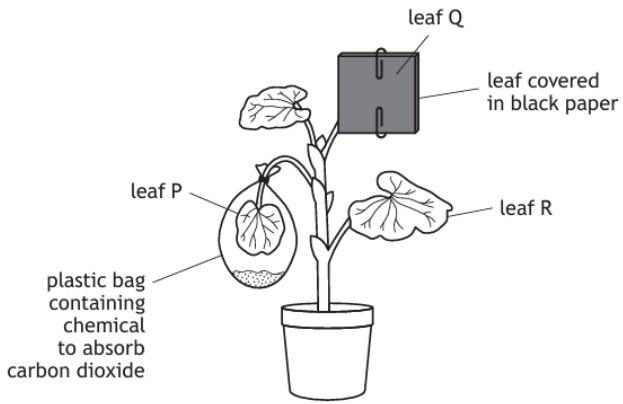
The results are shown in the graph.



Which of the following factors could be limiting the rate of photosynthesis at point X?

A Carbon dioxide concentration and light intensity
B Light intensity and temperature
C Temperature only
D Carbon dioxide concentration only

12. In an investigation into photosynthesis, a green plant was set up as shown and left in the light for 2 days.

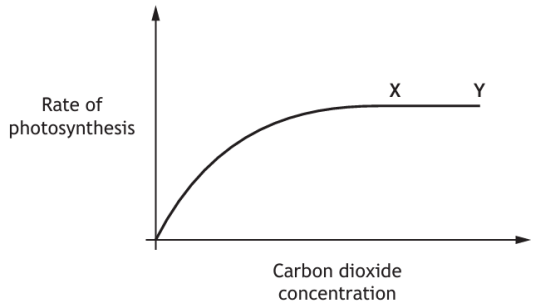


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In which of the leaves was starch present?

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C Leaves P and R only
D Leaves P, Q and R

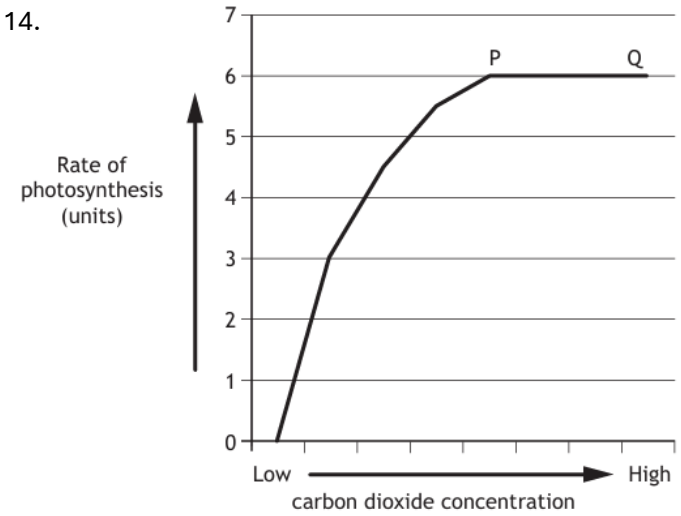
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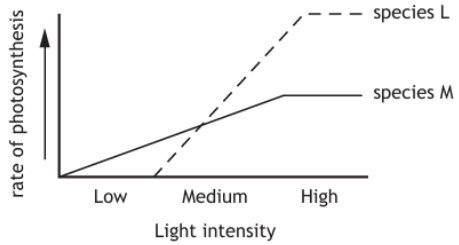
State two environmental factors which could limit the rate of photosynthesis between points P and Q. 1

1 temperature

2 Light intensity

15. The effect of light intensity on the rate of photosynthesis was measured for two species of plants, L and M.

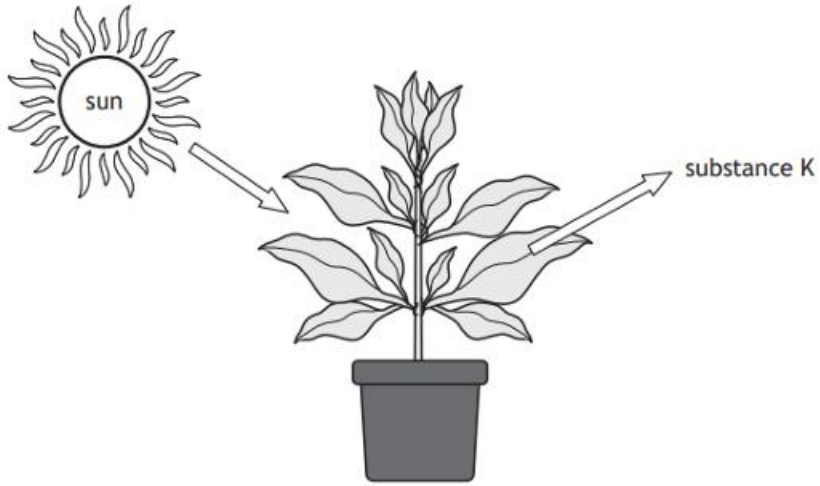
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The rate of photosynthesis of species M is

A slower than L in low light intensities
B slower than L in high light intensities
C faster than L in medium light intensities
D faster than L in high light intensities.

1 When light is absorbed by a plant, photosynthesis takes place and as a result substance K is released from the leaves.



(a) Name substance K. 1

(b) Describe the energy change that takes place during the first stage of photosynthesis. 1

2 Name the product of carbon fixation that is converted to starch. 1

3 Photosynthesis is a two-stage process that takes place in the leaves of green plants.

(a) State the source of energy for the first stage.

(b) (i) Name the process by which oxygen moves out of the leaf through stomata.

(ii) Name a substance that enters the leaf through stomata. 1

C (i) Describe how sugar is produced in the second stage of photosynthesis. 1

(ii) Name one substance that the sugar produced could be converted into. 1

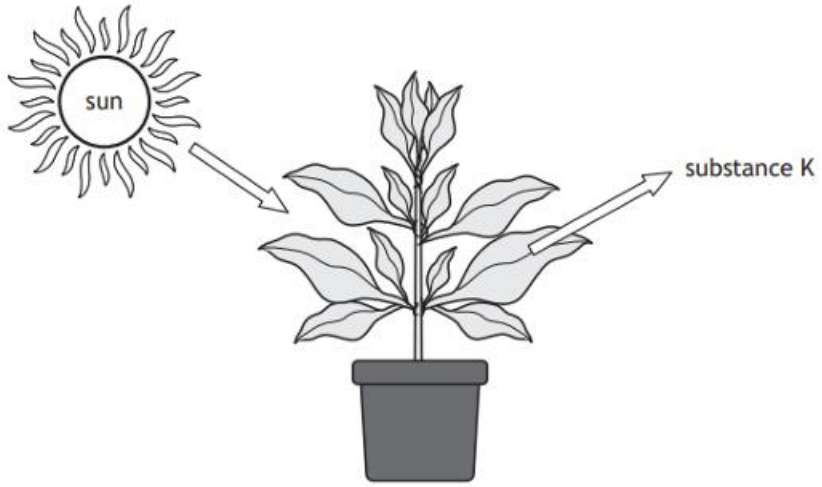
4 Plant cells convert glucose into other carbohydrates.

Complete the table below by naming two of these carbohydrates.

Role of carbohydrate in plant cells	*Name of carbohydrate*
Storage as an insoluble material	
Forms cell walls	

2

1 When light is absorbed by a plant, photosynthesis takes place and as a result substance K is released from the leaves.



(a) Name substance K.

oxygen

1

(b) Describe the energy change that takes place during the first stage of photosynthesis.

Light energy to chemical energy

1

2 Name the product of carbon fixation that is converted to starch.

glucose

1

3 Photosynthesis is a two-stage process that takes place in the leaves of green plants.

(a) State the source of energy for the first stage.

Light

(b) (i) Name the process by which oxygen moves out of the leaf through stomata.

diffusion

(ii) Name a substance that enters the leaf through stomata. 1

Carbon dioxide

C (i) Describe how sugar is produced in the second stage of photosynthesis. 1

Carbon dioxide combines with hydrogen in presence of ATP

(ii) Name one substance that the sugar produced could be converted into. 1

Starch/cellulose

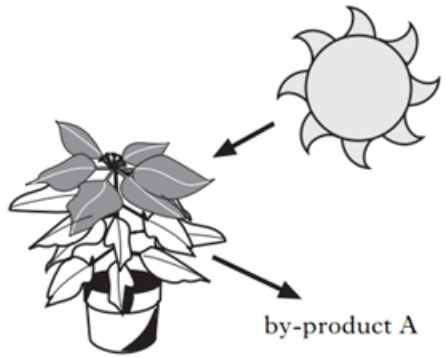
4 Plant cells convert glucose into other carbohydrates.

Complete the table below by naming two of these carbohydrates.

Role of carbohydrate in plant cells	*Name of carbohydrate*
Storage as an insoluble material	Starch
Forms cell walls	cellulose

2

5 Photosynthesis is the process by which green plants make glucose using energy from the sun.



(*a*) Name the by-product A released during photosynthesis.

_____ **1**

(*b*) Hydrogen and a high energy molecule are produced during the light reactions.

Name the high energy molecule.

_____ **1**

6 There are **two** reactions in photosynthesis. The first reaction is the light reactions.

(i) Name the two substances produced by the light reactions that are required for the second reaction.

Substance 1 _____

Substance 2 _____

(ii) Name the second reaction.

_____ **1**

7 a) During the first stage of photosynthesis, light energy is used.

(i) Where is light energy trapped in the cell?

_____ **1**

(ii) State **one** use of this light energy.

_____ **1**

b) (i) Name the second stage of photosynthesis.

_____ **1**

(ii) Name the carbohydrate produced during the second stage of photosynthesis.

_____ **1**

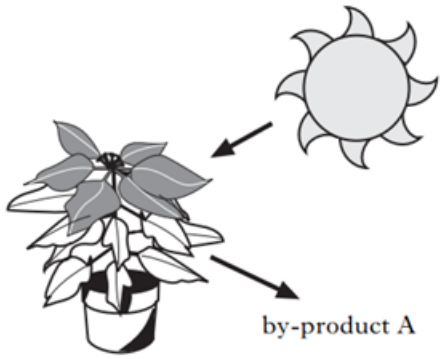
8a) Describe the use of hydrogen in carbon fixation.

_____ 1

(*b*) What substance traps the light energy required for photosynthesis?

_____

5 Photosynthesis is the process by which green plants make glucose using energy from the sun.



(a) Name the by-product A released during photosynthesis.

oxygen

1

(b) Hydrogen and a high energy molecule are produced during the light reactions.

Name the high energy molecule.

ATP

1

6 There are **two** reactions in photosynthesis. The first reaction is the light reactions.

(i) Name the two substances produced by the light reactions that are required for the second reaction.

Substance 1 hydrogen

Substance 2 ATP

(ii) Name the second reaction.

Carbon fixation

1

7 a) During the first stage of photosynthesis, light energy is used.

(i) Where is light energy trapped in the cell?

chlorophyll

1

(ii) State **one** use of this light energy.

Split water OR make ATP

1

b) (i) Name the second stage of photosynthesis.

Carbon fixation

1

(ii) Name the carbohydrate produced during the second stage of photosynthesis.

Glucose/sugar

1

8a) Describe the use of hydrogen in carbon fixation.

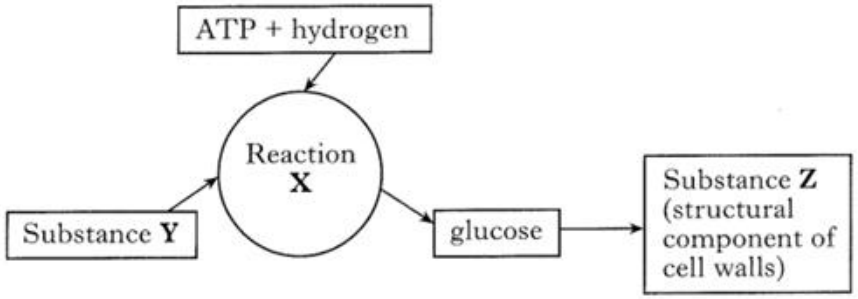
Combines with carbon dioxide to form glucose

1

(b) What substance traps the light energy required for photosynthesis?

chlorophyll

9. The diagram below represents a summary of part of the process of photosynthesis.



Name the following:

Reaction X _____

Substance Y _____

Substance Z _____

10. Hydrogen is a product of the light reactions and is required for carbon fixation.

Describe how this hydrogen is produced.

_____

_____

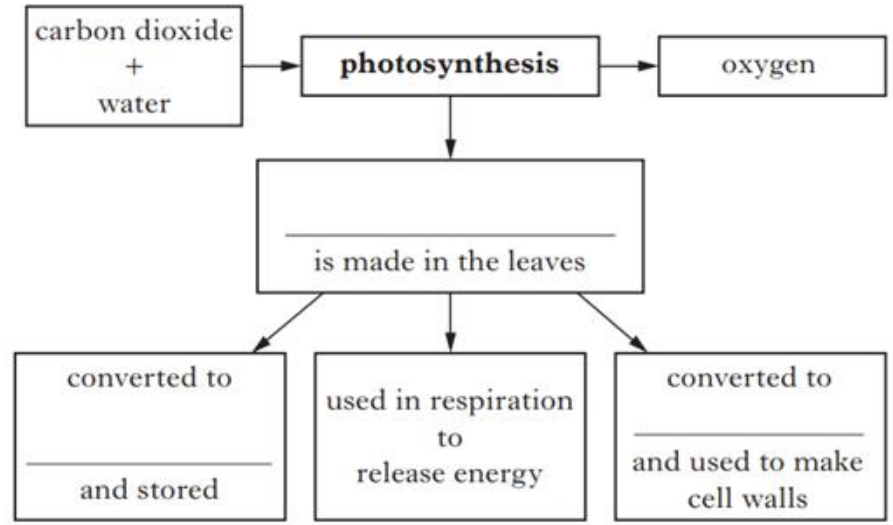
The sugar produced during the carbon fixation stage can be converted into other substances, such as starch.

Name one other substance sugar can be converted into and state its role in the cell. 2

Substance _____

Role _____

11 a) Complete the diagram below to show how the carbohydrate product of photosynthesis is used in a plant.



3

b) During photosynthesis, carbon dioxide is converted into glucose.

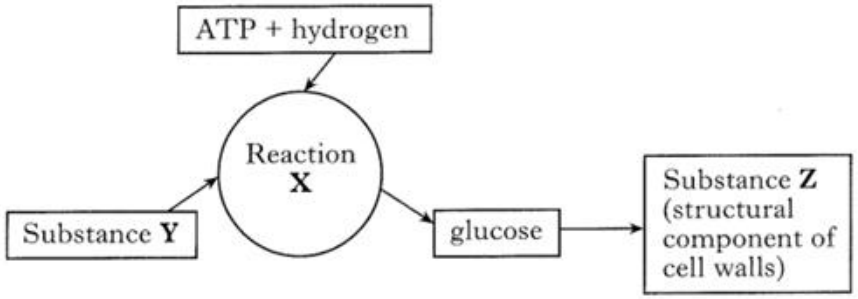
(i) Name the structural carbohydrate, formed from glucose, that is the main component of cell walls.

_____ 1

(ii) Give **one** use the plant makes of the glucose, other than the formation of structural materials.

_____ 1

9. The diagram below represents a summary of part of the process of photosynthesis.



Name the following:

Reaction X Carbon fixation

Substance Y Carbon dioxide

Substance Z cellulose

10. Hydrogen is a product of the light reactions and is required for carbon fixation.

Describe how this hydrogen is produced.

Water is split using light

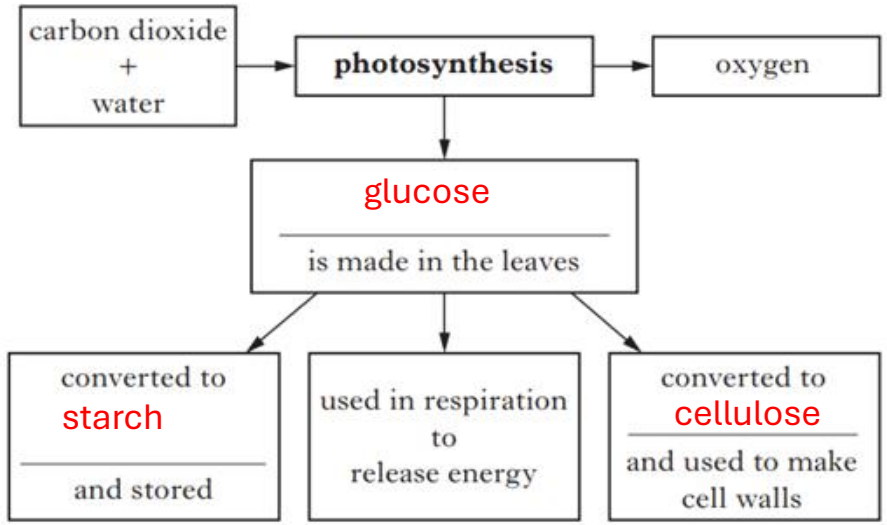
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Name one other substance sugar can be converted into and state its role in the cell. 2

Substance cellulose

Role Structural carbohydrate/part of plant cell wall

11 a) Complete the diagram below to show how the carbohydrate product of photosynthesis is used in a plant.



3

b) During photosynthesis, carbon dioxide is converted into glucose.

(i) Name the structural carbohydrate, formed from glucose, that is the main component of cell walls.

cellulose 1

(ii) Give **one** use the plant makes of the glucose, other than the formation of structural materials.

Starch/respiration 1

12 The diagram represents a stage in the process of photosynthesis that requires light energy.

Water

↓

Oxygen + Hydrogen

(i) Name the organelles present in leaf cells where this stage takes place. 1

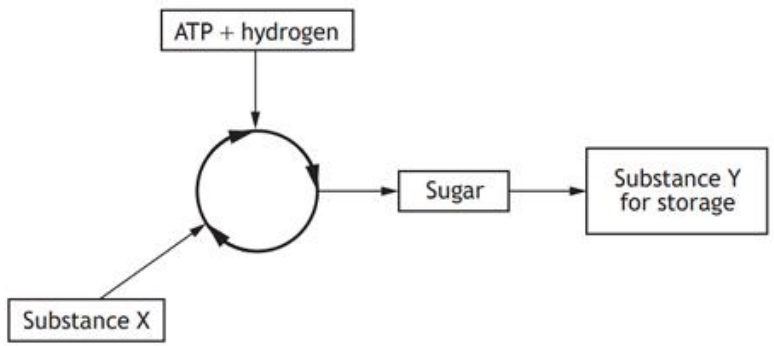
_____

(ii) Describe what happens to the oxygen and hydrogen produced during this stage. 2

Oxygen _____

Hydrogen _____

13. The diagram represents the second stage of photosynthesis.



Name substances X and Y. 2

X _____

Y _____

14. Photosynthesis is a two stage process.

Stage 1 — Light reactions

Stage 2 — Carbon fixation

The table below shows some statements about photosynthesis.

Complete the table to show which stage each statement refers to by placing a tick (✓) in the Stage 1 or Stage 2 box.

The first two statements have been completed for you. 2

Statement	*Stage 1*	*Stage 2*
Carbon dioxide required		✓
Light energy required	✓	
Water required		
Sugar produced		
ATP + Hydrogen required		
Oxygen produced		

15 Some carbon compounds found in plants are shown in the list below.

List

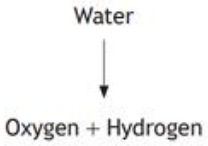
carbon dioxide
cellulose
glucose
starch

Complete the following table with the correct carbon compound for each of the functions.

Carbon compound	*Function*
	raw material for photosynthesis
	respiratory substrate
	storage carbohydrate

2

12 The diagram represents a stage in the process of photosynthesis that requires light energy.



(i) Name the organelles present in leaf cells where this stage takes place. 1

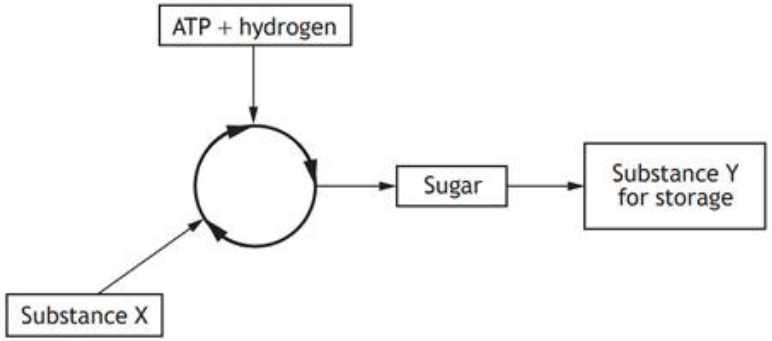
chloroplasts

(ii) Describe what happens to the oxygen and hydrogen produced during this stage. 2

Oxygen Diffuses out leaf

Hydrogen Goes to carbon fixation

13. The diagram represents the second stage of photosynthesis.



Name substances X and Y. 2

X Carbon dioxide

Y starch

14. Photosynthesis is a two stage process.

Stage 1 — Light reactions

Stage 2 — Carbon fixation

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Complete the table to show which stage each statement refers to by placing a tick (✓) in the Stage 1 or Stage 2 box.

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Statement	*Stage 1*	*Stage 2*
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Light energy required	✓	
Water required	X	
Sugar produced		X
ATP + Hydrogen required		X
Oxygen produced	X	

15 Some carbon compounds found in plants are shown in the list below.

List

carbon dioxide
cellulose
glucose
starch

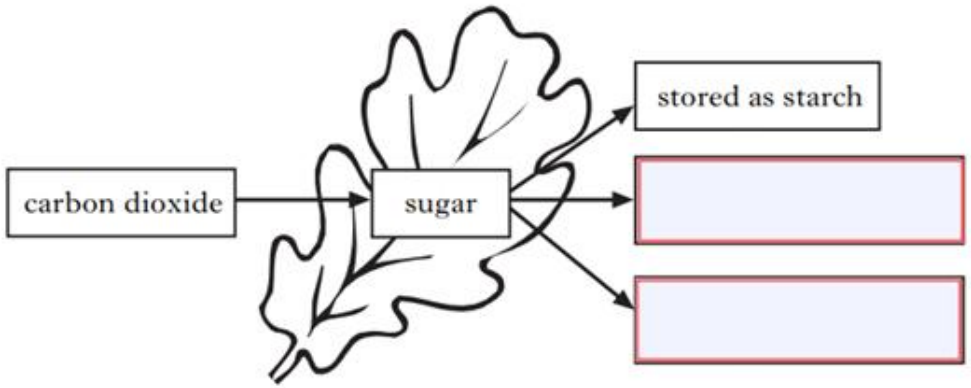
Complete the following table with the correct carbon compound for each of the functions.

Carbon compound	*Function*
Carbon dioxide	raw material for photosynthesis
glucose	respiratory substrate
starch	storage carbohydrate

2

Carbon dioxide is used during photosynthesis to produce sugar.

16. Complete the diagram below to show the fates of carbon dioxide after photosynthesis has taken place.



Photosynthesis uses carbon dioxide for the growth of plants.

(i) Name the stage of photosynthesis which uses carbon dioxide.

_____ 1

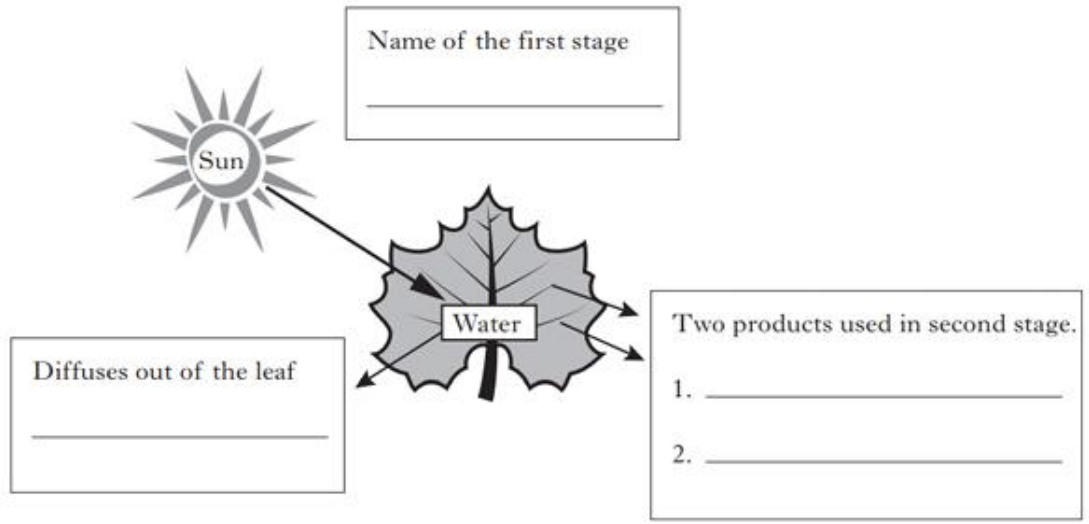
(ii) Name one other substance used in this stage.

_____ 1

18. The diagram below represents a summary of the first stage of photosynthesis.

Complete the diagram by filling in the three boxes, selecting terms from the list in the box below.

ATP	**carbon dioxide**		**carbon fixation**
glucose	**hydrogen**	**oxygen**	**photolysis**



19. Describe the second stage of photosynthesis.

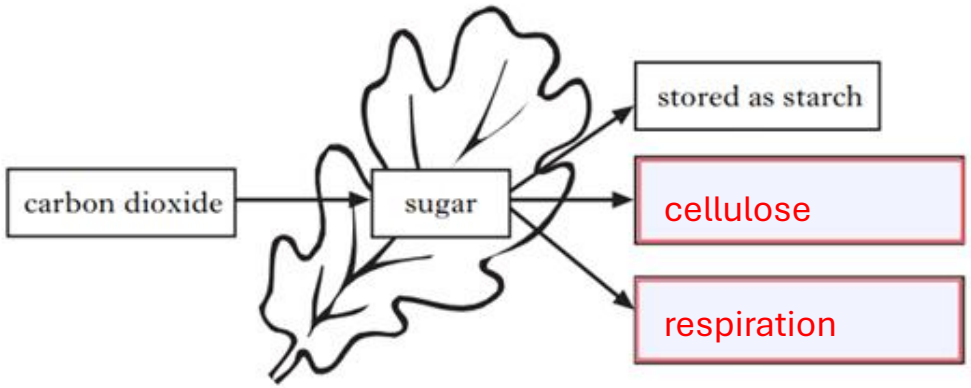
_____

_____

_____ 2

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Carbon fixation

1

(ii) Name one other substance used in this stage.

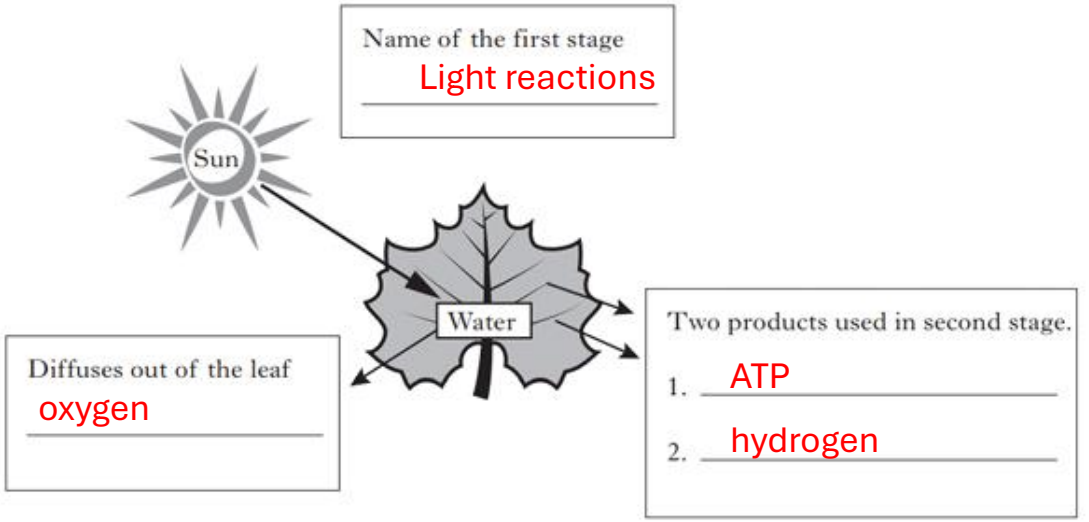
ATP/Hydrogen

1

18. The diagram below represents a summary of the first stage of photosynthesis.

Complete the diagram by filling in the three boxes, selecting terms from the list in the box below.

ATP	**carbon dioxide**		**carbon fixation**
glucose	**hydrogen**	**oxygen**	**photolysis**



19. Describe the second stage of photosynthesis.

Carbon dioxide combines with hydrogen in presence of ATP to produce glucose using enzymes.

2

20. (*a*) The sentences below give some information about photosynthesis.

Underline **one** option in each set of brackets to make the sentences correct.

Photosynthesis uses {carbon dioxide / oxygen} to allow {fungi / green plants} to make their own food.

Some of this food is converted to {cellulose / starch} for making cell walls.

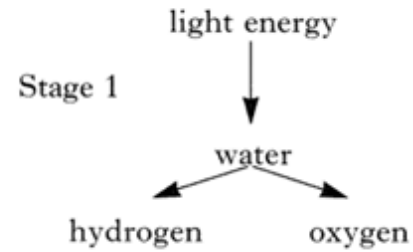
(*b*) Decide if each of the following statements about photosynthesis is **True** or **False**, and tick (✓) the appropriate box.

If the statement is **False**, write the correct word(s) in the **Correction** box to replace the word(s) underlined in the statement.

Statement	*True*	*False*	*Correction*
The first reaction in photosynthesis is called carbon fixation.			
Hydrogen is transferred from the first reaction to the second reaction.			
ADP is used as the energy source for the second reaction in photosynthesis.			

3

21. The diagram below shows the first stage in photosynthesis.



(i) Name the substance which captures the light energy needed at Stage 1.

_____ 1

(ii) The energy is used to split water molecules.
What name is given to this process?

_____ 1

(iii) The hydrogen then combines with carbon dioxide to form glucose.
Name this second stage in photosynthesis.

_____ 1

20. (*a*) The sentences below give some information about photosynthesis.

Underline **one** option in each set of brackets to make the sentences correct.

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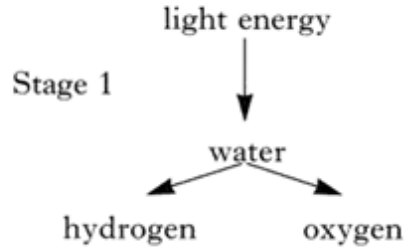
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Statement	*True*	*False*	*Correction*
The first reaction in photosynthesis is called carbon fixation.		x	light reactions
Hydrogen is transferred from the first reaction to the second reaction.	x		
ADP is used as the energy source for the second reaction in photosynthesis.		x	ATP

3

21. The diagram below shows the first stage in photosynthesis.



(i) Name the substance which captures the light energy needed at Stage 1.

chlorophyll 1

(ii) The energy is used to split water molecules.
What name is given to this process?

Light reactions 1

(iii) The hydrogen then combines with carbon dioxide to form glucose.
Name this second stage in photosynthesis.

Carbon fixation 1

22. The following word equation shows the first stage of photosynthesis.

$$\text{water} \xrightarrow{\text{light energy}} \text{oxygen} + \text{hydrogen} + \text{ATP}$$

(i) Name this stage of photosynthesis.

_____

(ii) Describe what happens to each of the products.

Oxygen _____

_____

Hydrogen _____

_____ 1

ATP _____

_____ 1

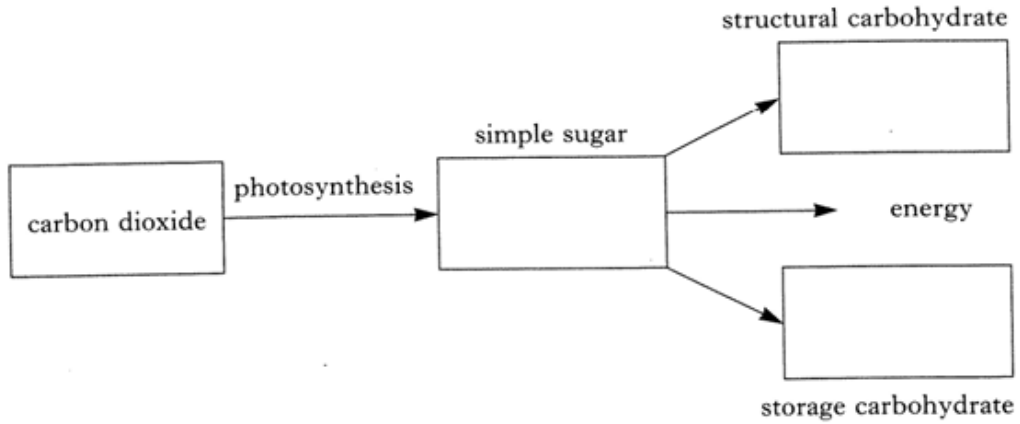
Explain why there is an increase in the rate of photosynthesis when there is an increase in the temperature from 20 °C to 35 °C. 2

_____

_____

_____

23 a) The diagram below shows the fate of the carbon dioxide used in photosynthesis. Complete the diagram by naming each of the carbohydrates described.



b) Air rich in carbon dioxide can be passed through these tunnels.

Explain how this would make the lettuces grow faster.

_____ 1

_____

Explain why high temperatures (above 50°C) would prevent the photosynthesis reactions from taking place. 2

_____

_____

_____

22. The following word equation shows the first stage of photosynthesis.

$$\text{water} \xrightarrow{\text{light energy}} \text{oxygen} + \text{hydrogen} + \text{ATP}$$

(i) Name this stage of photosynthesis.

Light reactions

(ii) Describe what happens to each of the products.

Oxygen — Diffuses out of leaf

Hydrogen — Goes to carbon fixation

ATP — Goes to carbon fixation

1

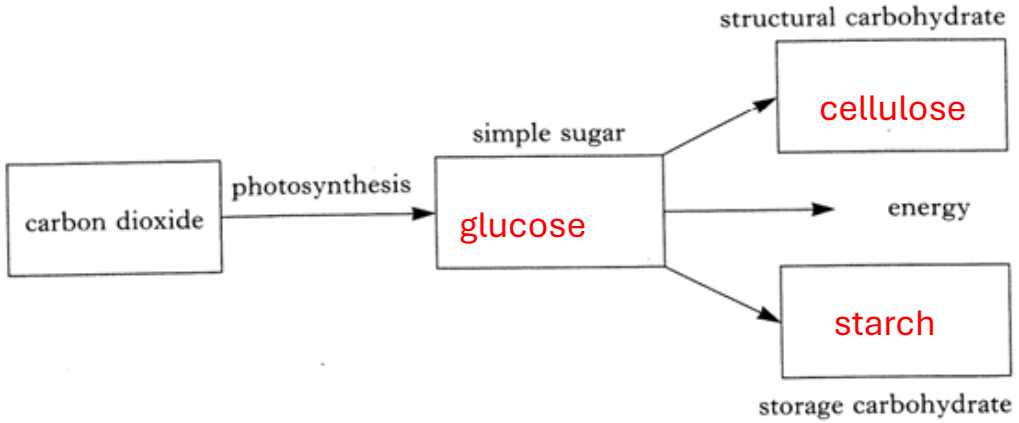
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2

Nearer enzyme optimum temperature

Photosynthesis requires enzymes

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1

b) Air rich in carbon dioxide can be passed through these tunnels.

Explain how this would make the lettuces grow faster.

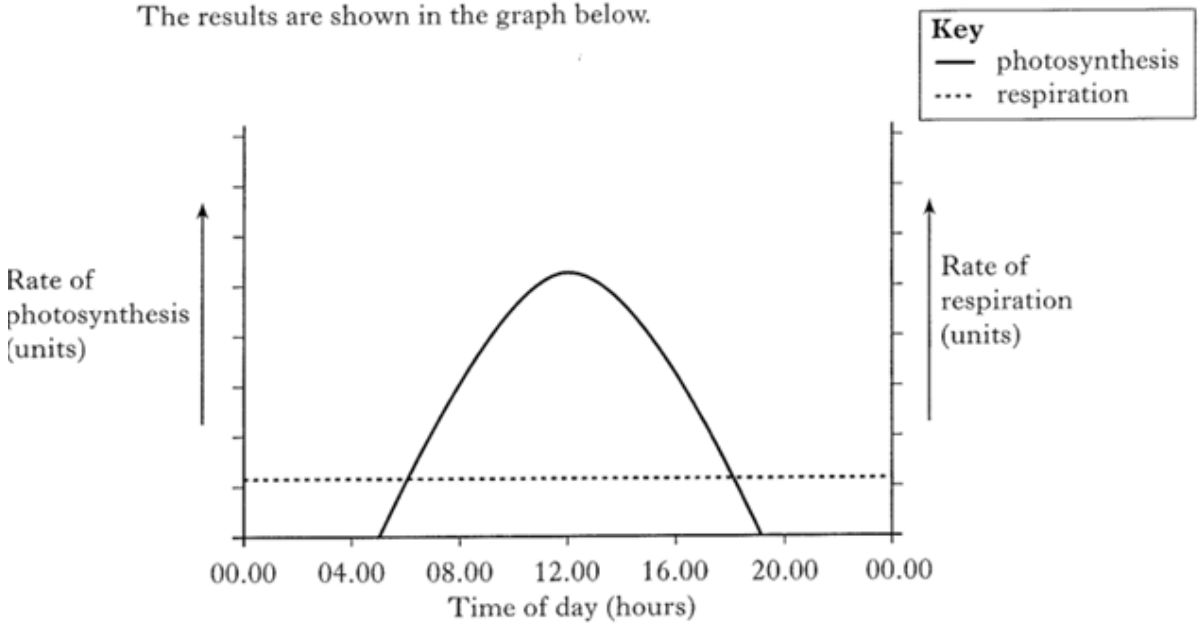
1

More carbon dioxide, more photosynthesis/carbon fixation

1

24. 'he rates of photosynthesis and respiration in a green plant were measured over a eriod of 24 hours.

The results are shown in the graph below.



(a) (i) At what time was the production of glucose at its maximum?

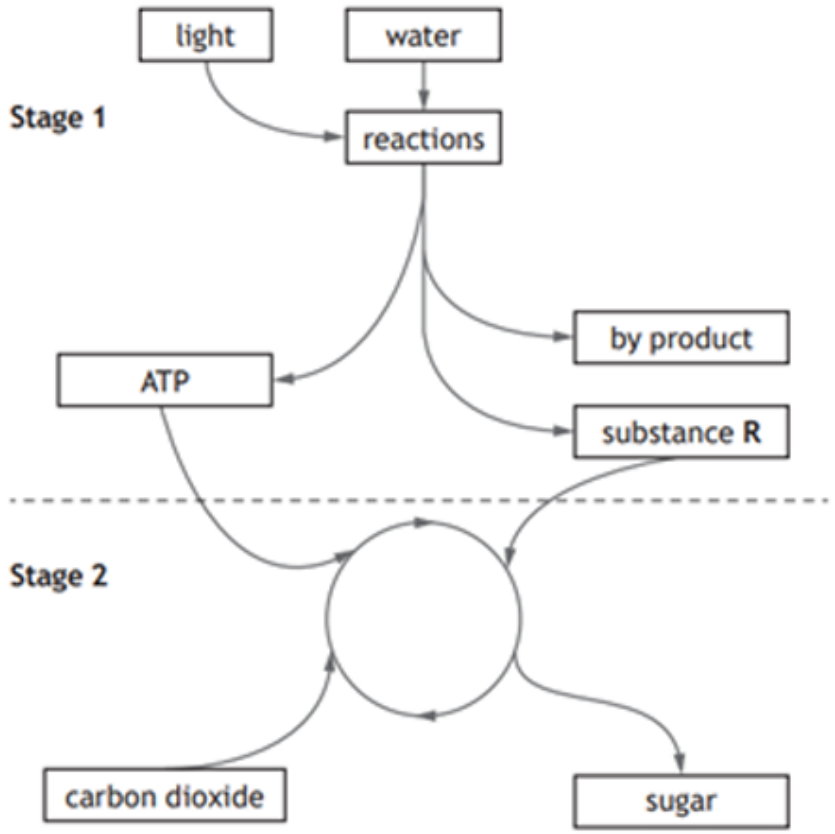
_____ 1

(ii) Between what two times was the plant producing more oxygen than it was using?

Between _____ and _____ hours 1

25 Photosynthesis is the process by which plants produce sugar using light

The flow diagram represents some stages of photosynthesis in a leaf.

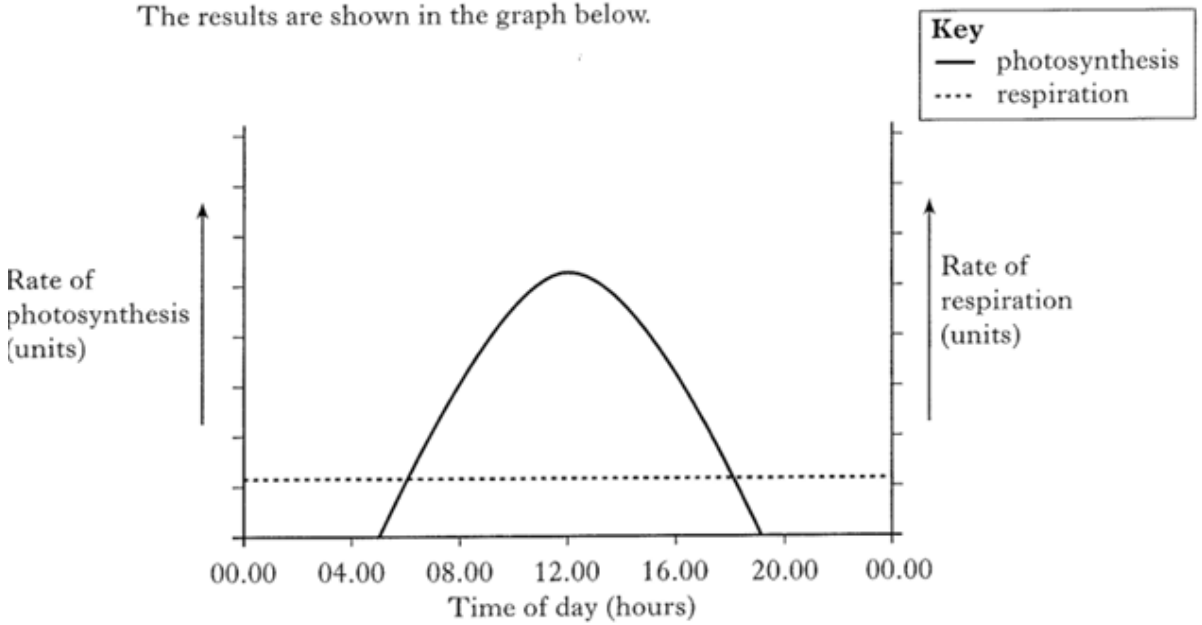


. Identify substance R. 1

_____

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12

1

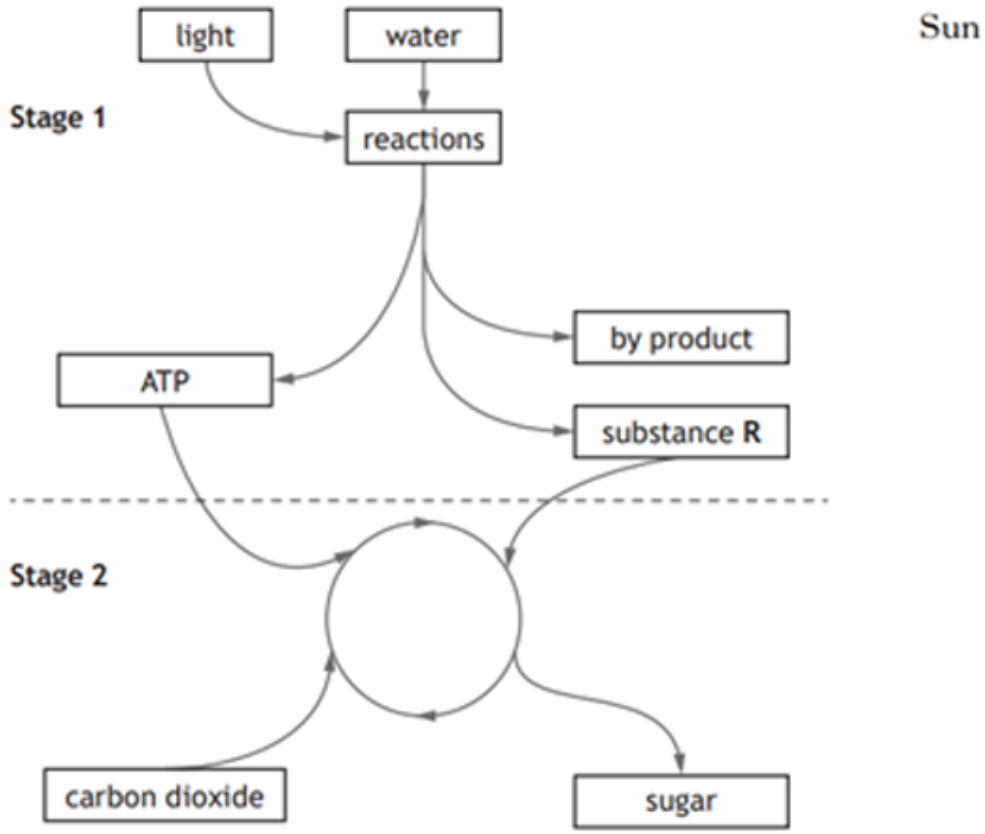
(ii) Between what two times was the plant producing more oxygen than it was using?

Between 0600 and 1800 hours

1

25 Photosynthesis is the process by which plants produce sugar using light

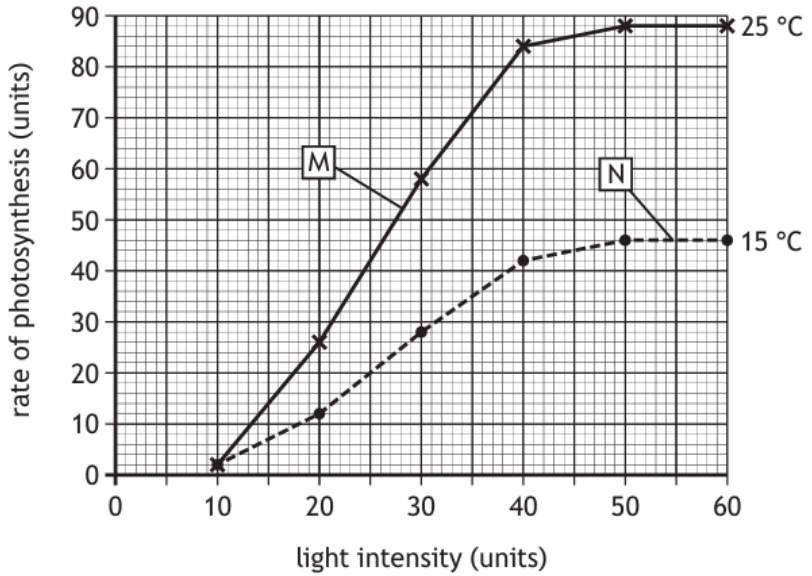
The flow diagram represents some stages of photosynthesis in a leaf.



Identify substance R. 1

hydrogen

26 The graph shows the effect of increasing light intensity on the rate of photosynthesis at two different temperatures. All other factors were kept constant.

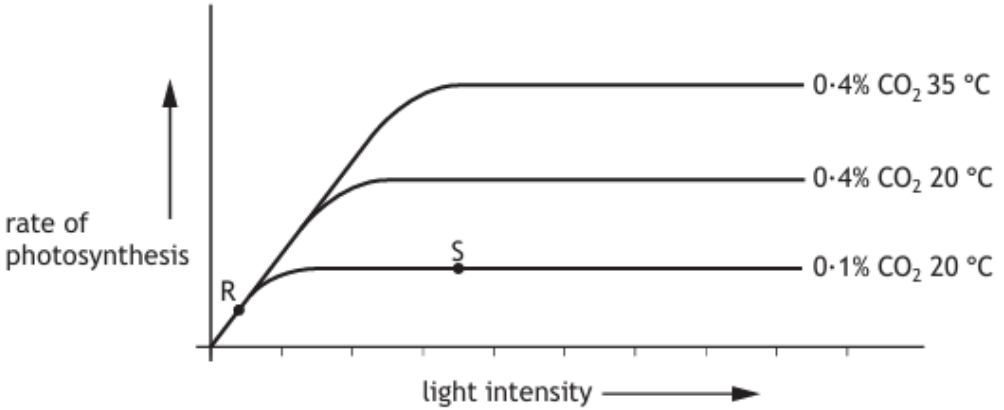


Identify the limiting factor at each of the points M and N. **2**

M _____

N _____

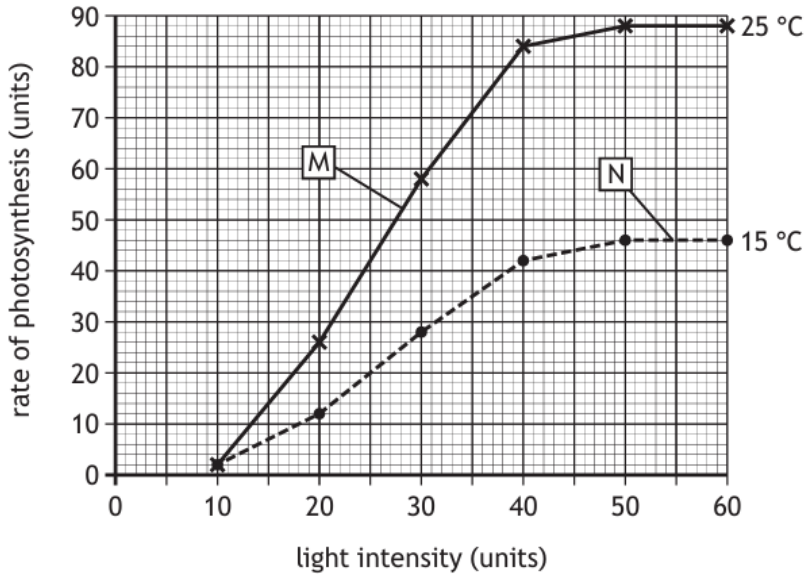
27 The graph shows the effect of three different factors on the rate of photosynthesis in a plant.



(i) **Tick one box in each row** of the table to indicate which factor is limiting photosynthesis at point R and point S.

	Limiting factor		
Point	**Temperature**	**Light intensity**	**Carbon dioxide concentration**
R			
S			

26 The graph shows the effect of increasing light intensity on the rate of photosynthesis at two different temperatures. All other factors were kept constant.

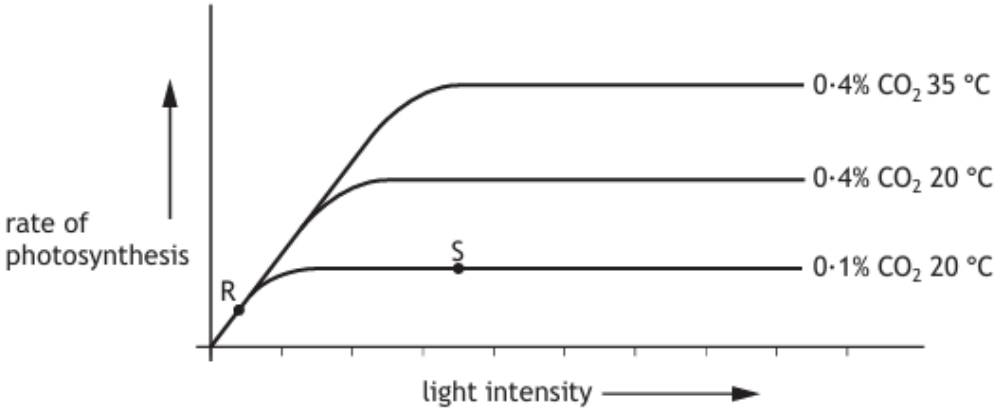


Identify the limiting factor at each of the points M and N. **2**

M Light intensity

N temperature

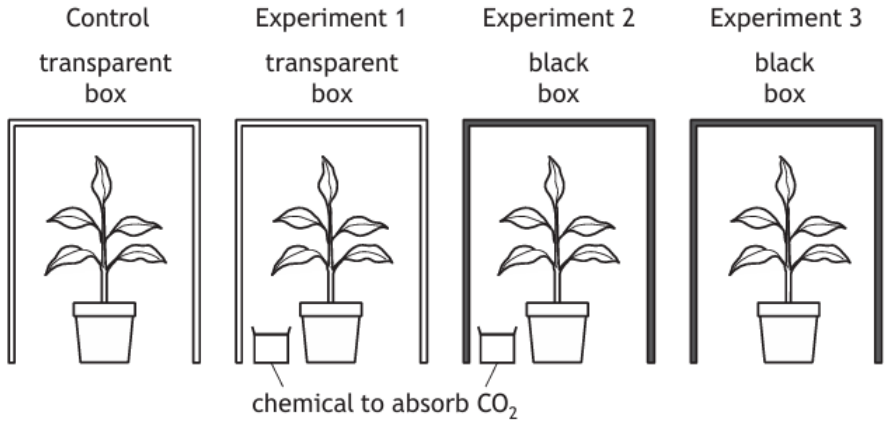
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(i) **Tick one box in each row** of the table to indicate which factor is limiting photosynthesis at point R and point S.

	Limiting factor		
Point	**Temperature**	**Light intensity**	**Carbon dioxide concentration**
R		x	
S			x

28



The leaves of each plant were then tested for the presence of starch.

(a) (i) Tick the box(es) to show in which of the following starch would be present after 48 hours. **1**

☐ Control ☐ Experiment 1

☐ Experiment 2 ☐ Experiment 3

(iv) State the factor that is being investigated in experiment 3. **1**

_____

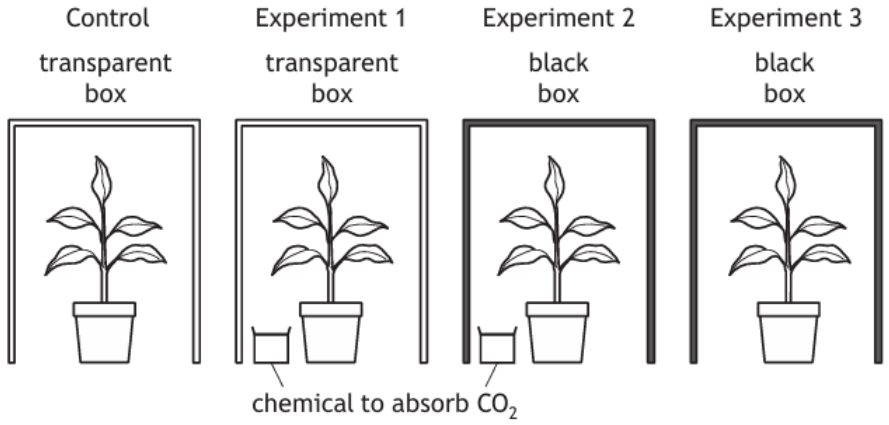
(b) Name the product of carbon fixation that is converted to starch. **1**

_____

c) State one factor, other than temperature, which can limit the rate of photosynthesis. **1**

_____

28



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(a) (i) Tick the box(es) to show in which of the following starch would be present after 48 hours. 1

[x] Control [ ] Experiment 1

[ ] Experiment 2 [ ] Experiment 3

(iv) State the factor that is being investigated in experiment 3. 1

Light

(b) Name the product of carbon fixation that is converted to starch. 1

glucose

c) State one factor, other than temperature, which can limit the rate of photosynthesis. 1

Light intensity/carbon dioxide concentration

Fertiliser & Pesticide PPQ

1. Which row in the table describes the changes that take place when fertiliser leaches into a river?

	Algal population	Light levels	Bacteria numbers	Oxygen concentration
A	increases	decrease	increase	decreases
B	increases	decrease	decrease	increases
C	decreases	increase	increase	decreases
D	decreases	increase	decrease	increases

2. Nematode worms can be used by farmers to decrease the number of insects that damage their crops.

   This describes the use of

   A GM crops
   B biological control
   C pesticides
   D fertilisers.

3. Which row in the table identifies the effects of an algal bloom in a freshwater loch?

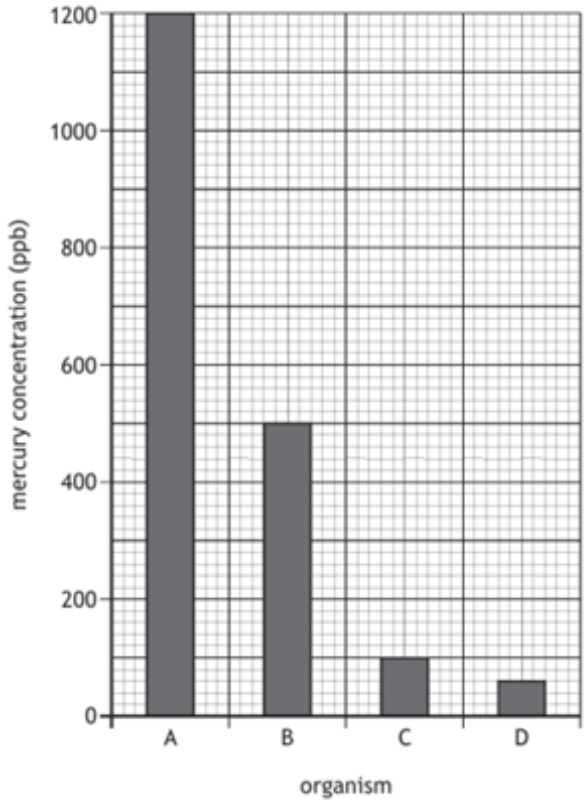
	Light levels	Number of bacteria	Oxygen levels	Variety of other species
A	increase	increase	increase	decrease
B	decrease	decrease	decrease	increase
C	increase	increase	decrease	decrease
D	decrease	increase	decrease	decrease

4. . Paints containing toxic mercury compounds were used to paint ships. As a result, mercury entered marine food chains.

   The concentration of mercury compounds in the tissues of the organisms in the following marine food chain was measured.

   plankton → aquatic insects → small fish → large fish

   Which bar on the graph represents the mercury concentration of the small fish?



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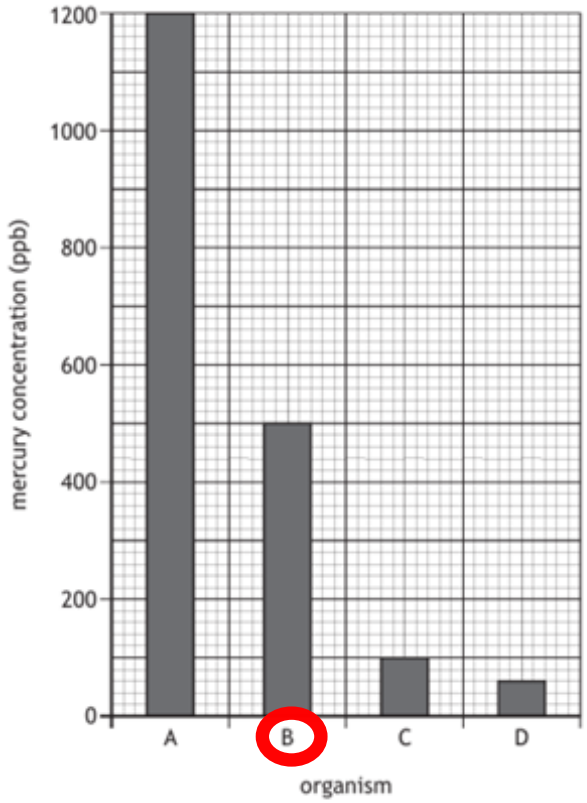
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5. A gardener decided to treat his crops with both fertiliser and pesticides.
The result of this would be

A a decrease in soil nitrates and an increase in crop yield
B an increase in soil nitrates and an increase in crop yield
C an increase in soil nitrates and a decrease in crop yield
D a decrease in soil nitrates and a decrease in crop yield.

6 Which of the following could occur as a result of fertiliser leaching into a fresh water pond?

	Algae population	Bacterial population	Oxygen concentration
A	increases	increases	increases
B	decreases	decreases	decreases
C	decreases	decreases	increases
D	increases	increases	decreases

7 Pesticides sprayed onto crops can get into food chains. The following statements refer to stages in this process.

J Pesticides are absorbed by plants.
K Pesticides build up in animals.
L Plants are eaten by animals.

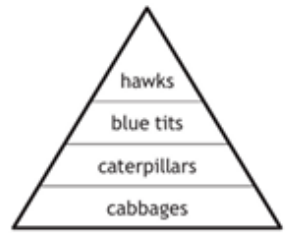
Identify the order of steps by which pesticides could reach lethal levels in the bodies of animals.

	Step 1	*Step 2*	*Step 3*
A	J	K	L
B	L	J	K
C	L	K	J
D	J	L	K

8 Which of the following statements describes the sequence of events when fertiliser leaches into a loch?

A Algal bloom develops → algae die → oxygen concentration increases
B Algal bloom develops → algae die → oxygen concentration decreases
C Oxygen concentration increases → algal bloom develops → algae die
D Algae die → oxygen concentration decreases → algal bloom develops

9 The diagram illustrates the energy content at different trophic levels of a food chain.



Pesticides are used to control caterpillar populations on cabbage crops.
Which of the following describes a possible bioaccumulation in this food chain after pesticide treatment of the cabbage crop?

A Decrease in energy content between caterpillars and blue tits
B Increase in concentration of pesticides between blue tits and hawks
C Increase in concentration of pesticides in caterpillars
D Increase in pesticide resistance in caterpillar populations

10

algae → water flea → stickleback → perch

Pesticides are known to run off from the land into rivers and enter the food chains.

Name the organism which would accumulate the greatest concentration of pesticides in its body over a period of time. 1

_____

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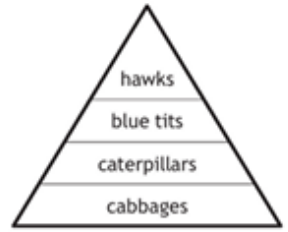
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Name the organism which would accumulate the greatest concentration of pesticides in its body over a period of time. 1

perch

1. (a) The increasing human population requires an increase in food production.

Name a chemical in fertilisers that helps to increase food yield.

_____

(b) Over time pesticides can build up in the cells of living organisms.

State the term given to this build-up of pesticides. **1**

_____

(c) Sometimes a predator of the pest species is used as an alternative to pesticides.

Name this method of reducing pest species. **1**

_____

2. A gardener treated the soil in the area where he planted vegetables with a chemical to increase the yield.

(a) (i) The chemical added to the soil by the gardener contained nitrates.

Give the general name for this type of chemical. **1**

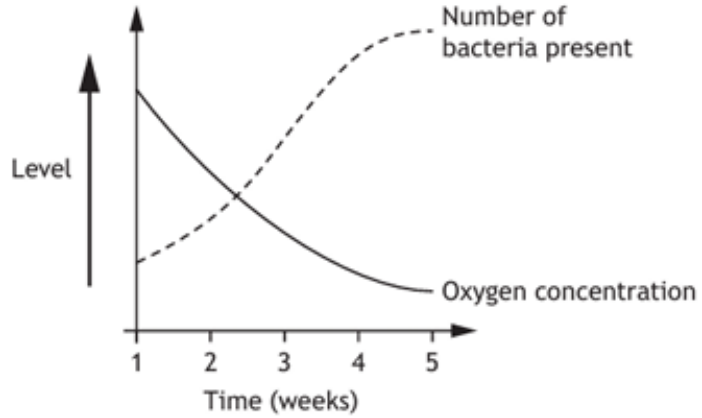
_____

(ii) Describe the use that plants make of nitrates. **1**

_____

(b) Later in the year the gardener noticed that the algae in his pond had increased and now covered the surface of the water. He sampled the pond water over 5 weeks and measured its oxygen concentration and number of bacteria present.

The results are shown in the graph.



(i) What name is given to the increased growth of algae in the pond? **1**

_____

(ii) Explain why the increased growth of algae resulted in an increase in the number of bacteria. **1**

_____

_____

(iii) Using the information in the graph, explain why the increase in number of bacteria resulted in the population of goldfish in the pond decreasing. **1**

_____

_____

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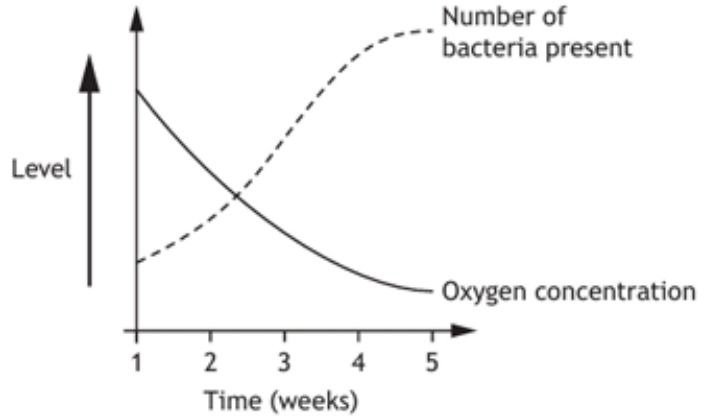
fertiliser

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To make protein

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Algae bloom

(ii) Explain why the increased growth of algae resulted in an increase in the number of bacteria. 1

Block light so kill aquatic plants which bacteria feed on

(iii) Using the information in the graph, explain why the increase in number of bacteria resulted in the population of goldfish in the pond decreasing. 1

Bacteria use up oxygen so none left for fish

3. (a) Plant growth can be improved if the soil has a suitable nitrate content.

Describe the use of nitrates in a plant. 1

_____

(b) Nitrates can leach from the soil into nearby rivers.

(i) Give the term that describes the increased growth of algae caused by leached nitrates. 1

_____

(ii) Explain how this increase in algae can cause aquatic plants in a river to die. 2

_____

_____

_____

4. In the fish farm the nitrates have to be removed from the water to prevent build-up. In some situations living organisms remove nitrates from the soil.

(a) (i) Name the type of organism which can absorb nitrates from the soil. 1

_____

(ii) Nitrates supply organisms with nitrogen.

State why nitrogen is required. 1

_____

(b) State the term which describes the use of a predator as an alternative to pesticides. 1

_____

5. Fresh water environments, such as Lake Malawi, can be affected by the overuse of fertilisers. This can impact on the organisms living in these environments.

The following statements show how this might occur, but not in the correct order.

1. Chemicals leach into water
2. Fish die
3. Overuse of fertilisers
4. Oxygen levels decrease
5. Algal bloom develops

Place a statement number in each box to complete the sequence of events. 1



6. Pesticides have been detected in the body tissues of bees.

State the term that describes the build-up of these substances in living organisms. 1

_____

7. Genetic engineering was used to develop the beetle-resistant variety of potato plant.

Before the development of genetic engineering, farmers used other methods to control the beetle numbers in their potato fields.

Name **one** of these methods. 1

_____

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To make protein

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Algae bloom

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Block light so aquatic plants cant do photosynthesis

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3	1	5	4	2

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Name **one** of these methods. 1

Pesticide/biological control

Mutation & Natural Selection

1. Which of the following statements describe the possible effects of a mutation on the survival of an organism?

   1. It has no effect
   2. It gives the organism an advantage
   3. It disadvantages the organism

   A 1 and 2 only
   B 1 and 3 only
   C 2 and 3 only
   D 1, 2 and 3

2. Which of the following is the only source of new alleles in a population?

   A Mutation
   B Natural selection
   C Isolation
   D Speciation

3. Antibiotic resistance in bacteria is an example of evolution. Which of the following shows the sequence of events leading to this?

   A Natural selection → mutation → use of antibiotic
   B Mutation → natural selection → use of antibiotic
   C Mutation → use of antibiotic → natural selection
   D Natural selection → use of antibiotic → mutation

4. Natural selection occurs when there are selection pressures.
   Which of the following could be a result of selection pressures?

   A Organisms with favourable alleles survive and reproduce.
   B Organisms with new alleles always have an advantage.
   C All alleles in a population increase in frequency.
   D All alleles in a population decrease in frequency.

5. Which of the following is a source of new alleles in a population?

   A Mutation
   B Isolation
   C Natural selection
   D Environmental conditions

6. Mutations result in changes to genetic material.
   Which of the following is **not** true of mutations?

   A Radiation can increase their rate.
   B They always have a harmful effect.
   C Genetic material is affected at random.
   D New alleles may be produced.

7. Survival of the fittest is also known as

   A selection pressure
   B natural selection
   C selective advantage
   D species selection.

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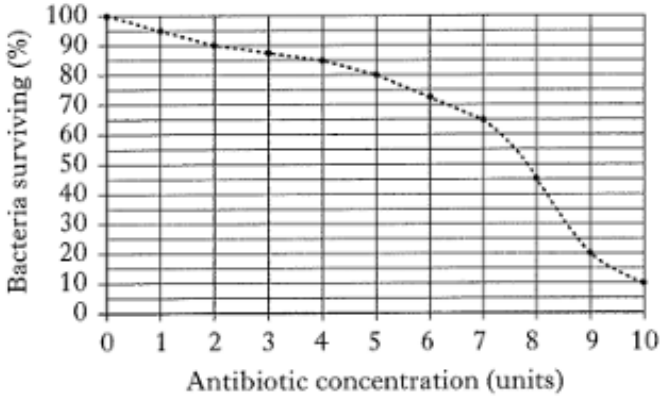
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7. The graph below shows the effect of increasing antibiotic concentrations on the percentage of bacteria surviving within a population. None of the bacteria had resistance to the antibiotic.



Another experiment was carried out with different bacteria, some of which had resistance to the antibiotic.

Which of the following **best** describes the effect on the bacteria surviving in this second experiment?

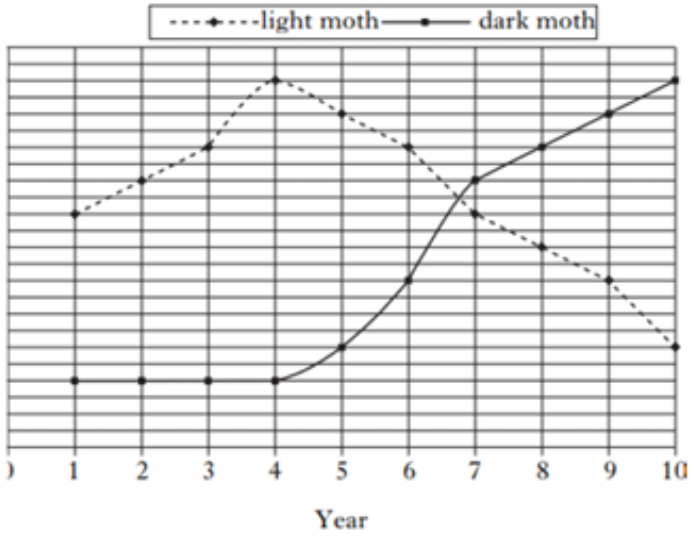
A The percentage of bacteria surviving would increase.

B The percentage of bacteria surviving would decrease.

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8 The graph below shows the average number of peppered moths, in a woodland, in June of each year over a 10 year period.

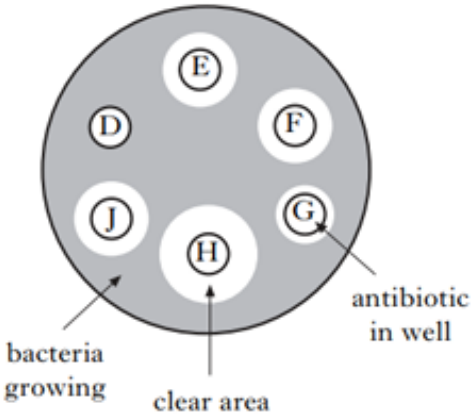


Studies have shown that an increase in the number of dark moths is related to an increase in the level of pollution in the atmosphere.

Which of the following best describes what would happen to the number of moths if measures were introduced to reduce air pollution in year 10?

	Light moth	*Dark moth*
A	decrease	increase
B	increase	decrease
C	increase	increase
D	decrease	decrease

9 The diagram below shows the results of an investigation into the effect of different antibiotics on a type of bacterium.



Which of the following conclusions can be drawn from these results?

A These bacteria are resistant to antibiotic H.

B Antibiotic D is the most effective antibiotic against this type of bacterium.

C These bacteria are resistant to antibiotic D.

D This type of bacterium is resistant to all of the antibiotics.

10. Which term refers to the process by which organisms that are better adapted to their environment survive and breed?

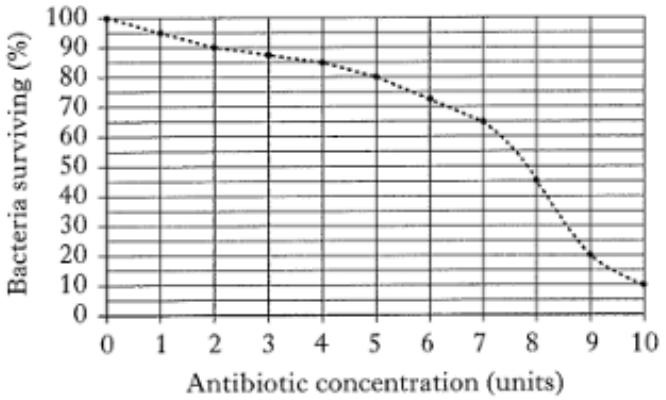
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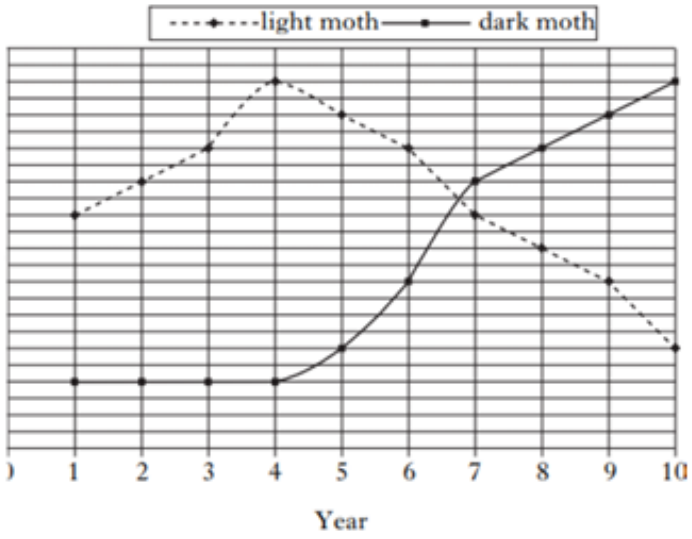
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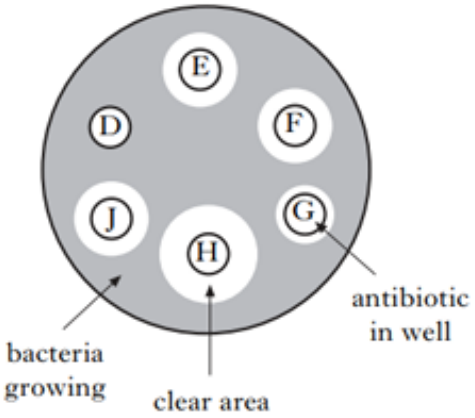


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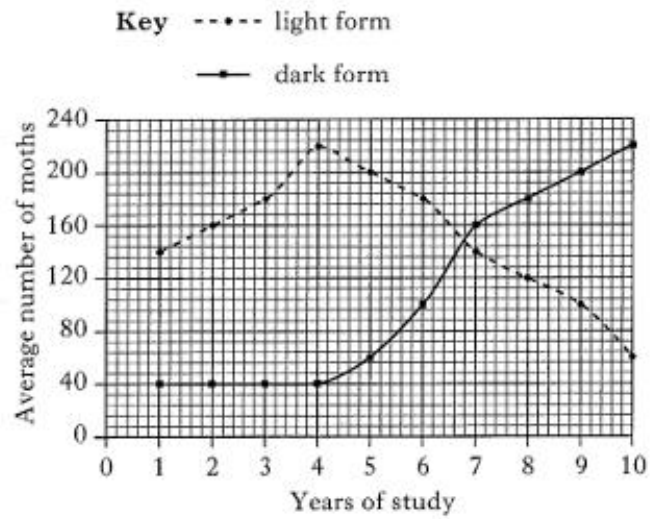
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Studies have shown that an increase in the number of dark moths is related to an increase in the level of pollution in the atmosphere.

Which of the following **best** describes what would happen to the number of moths if measures were introduced to reduce air pollution from year 7?

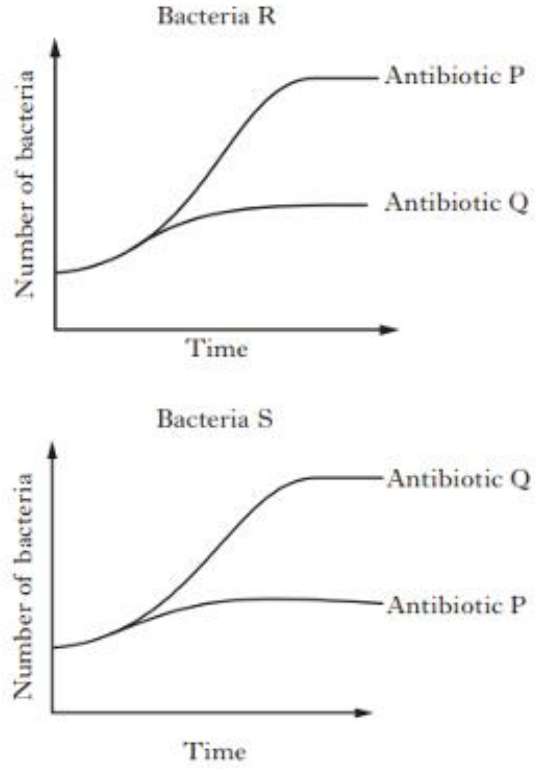
A Increase in dark moths and decrease in light moths

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12 The graphs below show the results of an investigation into the effects of different antibiotics (P and Q) on two different bacteria (R and S).



What conclusion can be drawn from these results?

A R is less resistant to P than Q

B R is more resistant to P than Q

C S is more resistant to P than Q

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13 The Peppered Moth is found in two distinct forms. One form is dark coloured and the other is light coloured. The moths rest on the trunks of trees.

Pale coloured tree-trunks in an area were darkened by pollution. What would happen to the numbers of the two forms of the Peppered Moth in that area?

A The numbers of each form would increase.

B The dark form would increase and the light form decrease.

C The numbers of each form would decrease.

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14 The dark variety of the peppered moth became common in industrial areas of Britain following the increase in production of soot during the Industrial Revolution.

The increase in the dark form was due to

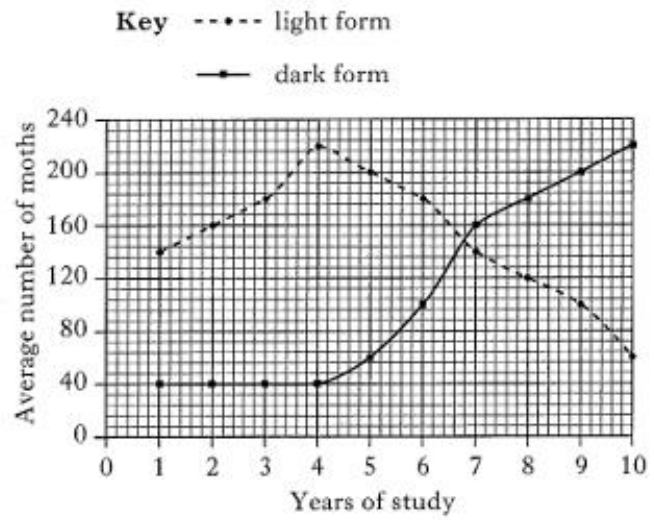
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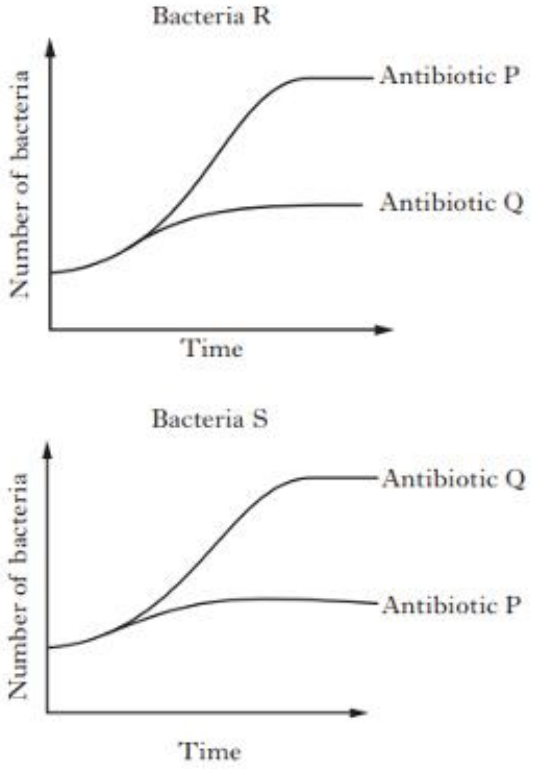
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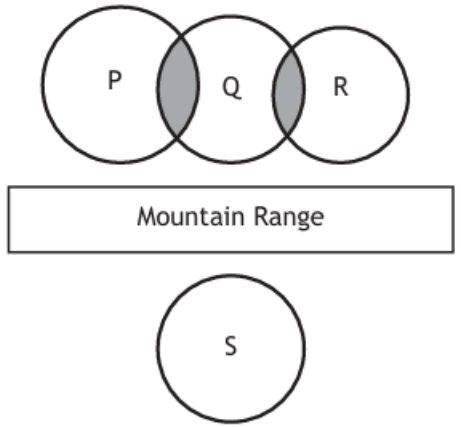
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How many species may evolve over time?

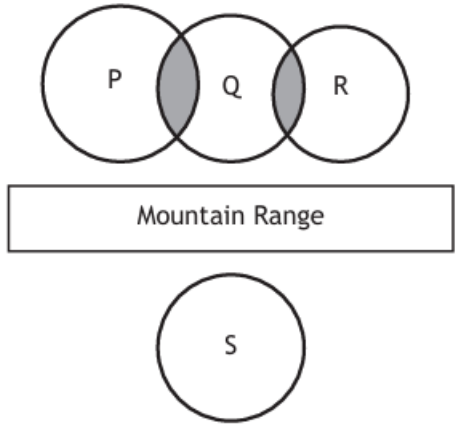
A 1

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A 1
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1 a) Different mutations occurred in each sub-population of honeycreepers after a population was split.

(i) Name the molecule within a cell in which mutations would occur. 1

_____

(ii) Name one environmental factor which increases the rate of mutation. 1

_____

(b) The mutated strain of bacteria arose from the original as a result of mutation.

Give the definition of the term mutation. 1

_____

_____

2.. State one environmental factor that can increase the rate of mutation. 1

_____

3. The shape of a crossbill's beak is a structural adaptation which is the result of a new allele being produced.

Name the process by which new alleles are produced. 1

_____

4. The overuse of antibiotics has caused populations of antibiotic-resistant bacteria to evolve. The stages in their evolution are described in the table.

Stage	Description
A	Random mutations in bacteria make some of the bacteria antibiotic-resistant
B	The next generation of bacteria are antibiotic-resistant
C	The surviving bacteria reproduce and pass on the alleles for antibiotic resistance to their offspring
D	Bacterial populations show genetic variation
E	When antibiotics are used, the non-resistant bacteria are killed and the resistant bacteria survive

(i) Place letters from the table in the boxes, to show the order of the stages describing how populations of bacteria become resistant to antibiotics. 1

The first stage has been completed.



(ii) Name the process by which the bacteria, best adapted to their environment, survive and reproduce. 1

_____

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DNA

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Chemicals/radiation

(b) The mutated strain of bacteria arose from the original as a result of mutation.

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Random change in genetic material

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D ⟹ A ⟹ E ⟹ C ⟹ B

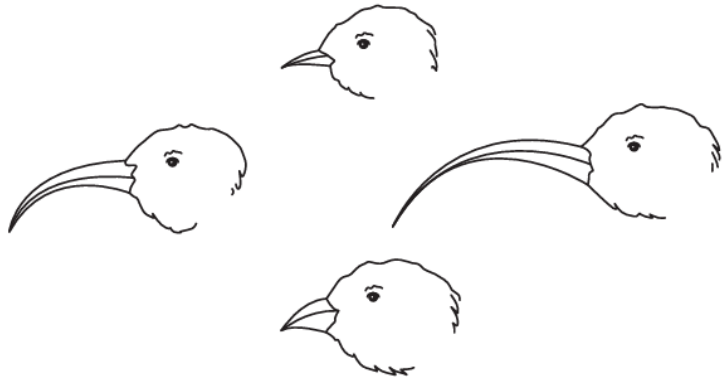
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Natural selection/survival of the fittest

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chemicals/radiation

5 Hawaiian honeycreepers are species of birds that have evolved from a single ancestor to have different shapes of beak. This is an example of speciation.



(a) For speciation to occur, a population must be split by an isolation barrier.

Name one type of isolation barrier. **1**

_____

(b) Different mutations occurred in each sub-population of honeycreepers after a population was split.

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_____

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_____

(c) Suggest the selection pressure that could have led to the differences in the honeycreepers shown in the diagram. **1**

_____

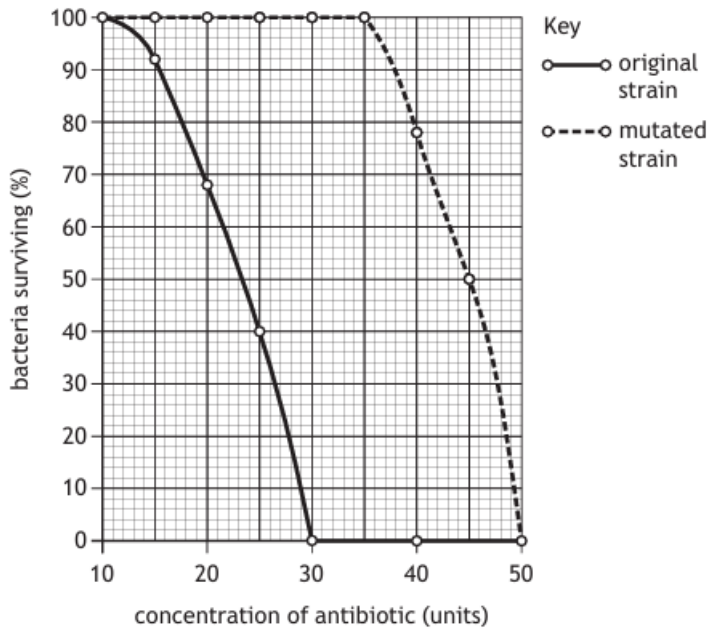
(d) Explain what is meant by the term species. **1**

_____

_____

6 An investigation was carried out into the effect of increasing antibiotic concentration on the survival of bacteria. Two different strains of bacteria were used, an original strain and a mutated strain.

The percentage of bacteria of each strain surviving after two days is shown in the graph.



(a) (i) Identify a concentration of antibiotic that has no effect on the survival of either strain of bacteria. **1**

_____ units

(ii) State the minimum concentration of antibiotic that would kill **all** of the bacteria. **1**

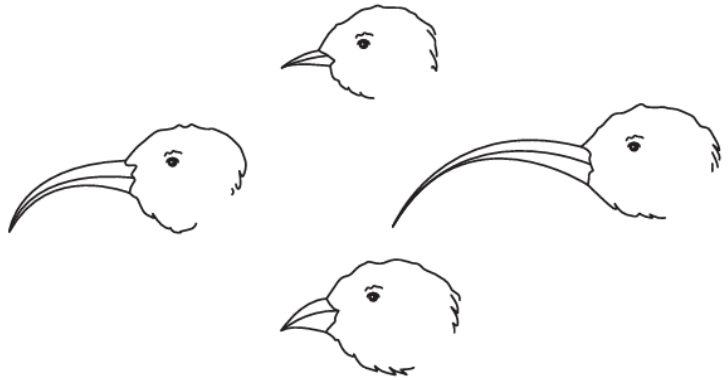
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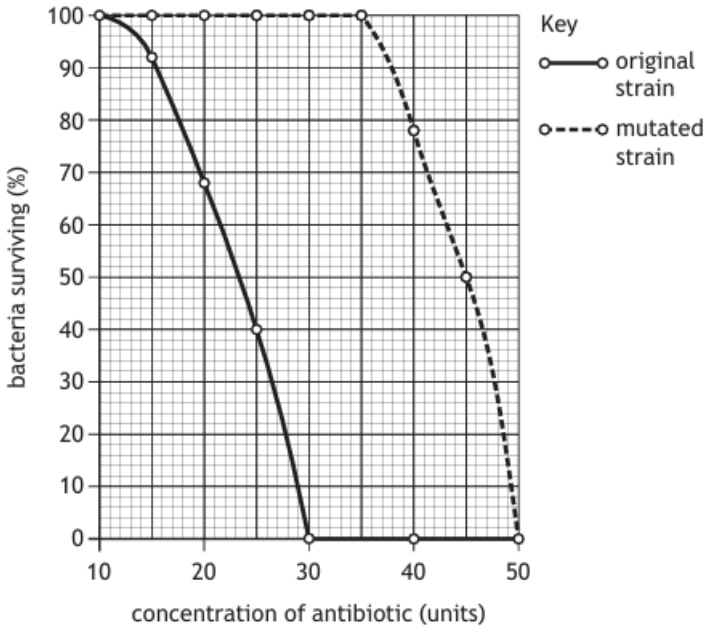
Different types of food

(d) Explain what is meant by the term species. 1

Can breed to produce fertile offspring.

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10 units

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50 units

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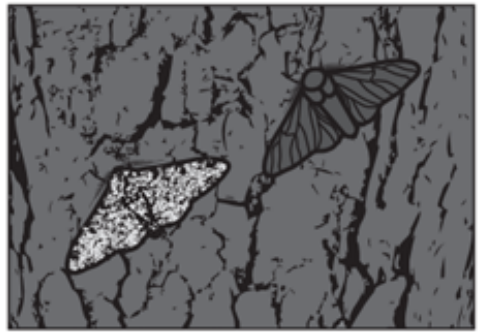
More resistant to the antibiotic

7 The diagrams below show the light and dark varieties of a moth which can be found in woodland areas. These moths rest on the bark of trees during the day and can be eaten by birds. Normally the bark of trees in the woodland is light coloured. However in industrial areas, pollutants cause the tree bark to darken.

Woodland area



Industrial area



(a) The dark variety of the moth is the result of a random change in the genetic information.

State the term used to describe this change. 1 **1**

_____

(ii) The woodland was in a non-industrial area.

Explain why the percentage of light moths recaptured was higher than dark moths. **1**

_____

_____

(iii) Name the process which results in the better adapted variety of moth being more likely to survive and reproduce. **1**

_____

(b) Name **one** factor which can increase the rate of mutation. **1**

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(c) Mutations are the only source of new alleles.

Explain why it is important that new alleles arise in a species. **1**

_____

_____

_____

8 Decide if each of the following statements about evolution is **True** or **False** and tick (✓) the appropriate box.

If the statement is **False**, write the correct word in the **Correction** box to replace the word underlined in the statement.

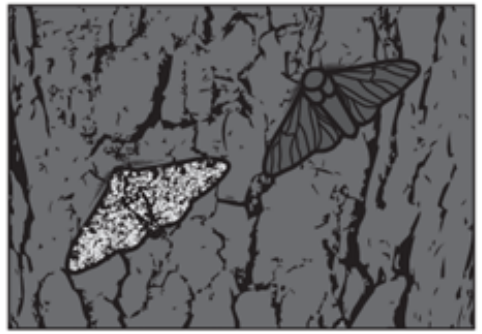
Statement	*True*	*False*	*Correction*
Genetic variation within a population allows the population to <u>adapt</u> in a changing environment.			
Isolation barriers can be geographical, <u>environmental</u> or reproductive.			
Sub-populations evolve until they become genetically <u>identical</u>.			

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Camoflaged from predators

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chemicals/radiation

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Makes species adaptable to changing environments.

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Isolation barriers can be geographical, <u>environmental</u> or reproductive.		x	ecological
Sub-populations evolve until they become genetically <u>identical</u>.		x	different

Sampling Biotic & Abiotic Factors

1. Which of the following is a biotic factor which could affect biodiversity?

A Soil moisture
B Temperature
C Grazing
D Carbon dioxide concentration

2 Which statement describes an abiotic factor?

A The spread of a disease.
B A period of very low temperatures.
C An increase in predation.
D An increase in competition for food.

3 The total variety of all living things on Earth is described as the

A biodiversity
B species
C community
D population.

4 An example of a biotic factor affecting a population of plants is

A a leaf disease reducing the growth of lettuce plants
B acidic soil preventing the growth of daisies
C shade from buildings causing a decrease in the growth of grass
D a cold winter causing a decrease in the growth of geranium plants.

5 Which of the following statements is true of predation?

A It is an abiotic factor and causes a decrease in prey numbers.
B It is an abiotic factor and causes an increase in prey numbers.
C It is a biotic factor and causes a decrease in prey numbers.
D It is a biotic factor and causes an increase in prey numbers.

6 Which row in the table identifies biotic and abiotic factors which can affect a population?

	Biotic factors	*Abiotic factors*
A	grazing and predation	pH and temperature
B	predation and temperature	pH and grazing
C	pH and temperature	grazing and predation
D	pH and grazing	predation and temperature

7 Which line in the table below identifies abiotic and biotic factors?

	Abiotic factor	*Biotic factor*
A	light intensity	pH
B	temperature	predation
C	grazing	light intensity
D	predation	grazing

8 Which row in the table identifies examples of biotic and abiotic factors?

	Biotic factor	*Abiotic factor*
A	Disease	Light intensity
B	Light intensity	Temperature
C	pH	Soil moisture
D	Predation	Food availability

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A an ecosystem
B biodiversity
C a community
D random assortment.

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C It is a biotic factor and causes a decrease in prey numbers.
D It is a biotic factor and causes an increase in prey numbers.

6 Which row in the table identifies biotic and abiotic factors which can affect a population?

	Biotic factors	*Abiotic factors*
A	grazing and predation	pH and temperature
B	predation and temperature	pH and grazing
C	pH and temperature	grazing and predation
D	pH and grazing	predation and temperature

7 Which line in the table below identifies abiotic and biotic factors?

	Abiotic factor	*Biotic factor*
A	light intensity	pH
B	temperature	predation
C	grazing	light intensity
D	predation	grazing

8 Which row in the table identifies examples of biotic and abiotic factors?

	Biotic factor	*Abiotic factor*
A	Disease	Light intensity
B	Light intensity	Temperature
C	pH	Soil moisture
D	Predation	Food availability

9 The total variety of all living things on Earth is described as

A an ecosystem
B biodiversity
C a community
D random assortment.

Sampling Biotic & Abiotic Factors

1 Students investigated the distribution of some organisms on a rocky shore.

Starting at the lowest tide level, quadrats were placed every two metres along a single transect line and the number of barnacles and mussels were counted.

The results are shown in the table.

Position on shore	Quadrat number	Number of barnacles	Number of mussels
Low tide level ↓	1	7	60
	2	13	58
	3	18	55
	4	15	50
	5	24	32
	6	41	30
	7	42	18
	8	47	13
	9	53	4
High tide level	10	54	0

Name the type of factors, such as pH, that can affect the distribution of organisms living in rock pools. 1

_____

2 Ivy is a climbing plant which produces stems that grow vertically up trees and walls. It can also produce horizontal stems allowing the ivy to spread out along the ground.



Variation is shown in the width of the leaves of the ivy plant.

A group of students carried out an investigation to find out if the difference in leaf width is linked to the height of the leaves from the ground.

The students wanted to find out what abiotic factors may have affected the width of the leaves from that plant.

Suggest **one** abiotic factor which they could have investigated. 1

_____

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abiotic

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The students wanted to find out what abiotic factors may have affected the width of the leaves from that plant.

Suggest **one** abiotic factor which they could have investigated. 1

Temperature/pH/light intensity/moisture levels

3 Students carried out an investigation into the effect of soil moisture on the percentage ground cover of moss in their school lawn.

A quadrat was used to estimate the percentage ground cover of moss at several sites. Soil moisture was also measured at each of the sites.

The results of the investigation are shown in the table.

Sample site	Average soil moisture (%)	Ground cover of moss (%)
1	18	86
2	14	70
3	15	80
4	11	58
5	13	65
6	12	60
7	22	98
8	30	99
9	35	100

The students also used a soil thermometer to gather data on soil temperature at each of the sample sites.

(i) Describe what the students should have done each time they used the soil thermometer, to ensure valid results. **1**

(ii) Soil moisture and temperature are examples of abiotic factors.

Name **one** other abiotic factor that can affect plant growth. **1**

4 The students also investigated the effect of soil moisture on the number of Scots pine seedlings growing on the woodland floor.

(i) The students recorded the soil moisture and number of seedlings at 10 sample sites in the woodland.

Suggest why 10 sample sites were used. **1**

(ii) The students used a moisture meter to measure the soil moisture.

Describe what the students should have done each time they used this apparatus to minimise error. **1**

5. Sampling techniques can be used to estimate the abundance of plants and animals.

In an investigation into ground-living animals in a woodland, a group of students collected and counted the animals they found.

(i) Name a sampling technique which could be used to collect the ground-living animals. **1**

(iii) It was decided that the samples were not fully representative of the area.

Suggest how the investigation could be improved. **1**

3 Students carried out an investigation into the effect of soil moisture on the percentage ground cover of moss in their school lawn.

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9	35	100

The students also used a soil thermometer to gather data on soil temperature at each of the sample sites.

(i) Describe what the students should have done each time they used the soil thermometer, to ensure valid results. 1

Place same depth in soil

(ii) Soil moisture and temperature are examples of abiotic factors.

Name **one** other abiotic factor that can affect plant growth. 1

pH/light intensity

4 The students also investigated the effect of soil moisture on the number of Scots pine seedlings growing on the woodland floor.

(i) The students recorded the soil moisture and number of seedlings at 10 sample sites in the woodland.

Suggest why 10 sample sites were used. 1

To improve reliability

(ii) The students used a moisture meter to measure the soil moisture.

Describe what the students should have done each time they used this apparatus to minimise error. 1

Wipe probe between uses

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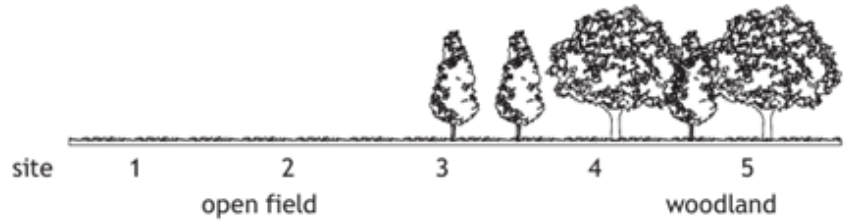
Pitfall trap

(iii) It was decided that the samples were not fully representative of the area.

Suggest how the investigation could be improved. 1

Do more samples in the same area.

6.a) Light intensity readings were taken at 5 sites along a transect line running from an open field to a woodland.



Name the apparatus used to measure light intensity and give one precaution that should be taken when using it to minimise error.

Apparatus _____

Precaution _____

_____

Three readings were taken at each site at the same time on different days. The results are shown in the table.

Site	Light intensity reading (lux)		
	Day 1	Day 2	Day 3
1	18 160	17 845	18 180
2	11 500	11 306	11 494
3	14 600	14 550	14 590
4	5300	4800	5275
5	3600	3200	3610

6.b) (i) Suggest a reason why the readings taken on day 2 were lower than the readings on days 1 and 3.

_____

_____

(ii) Explain why three readings were taken at each site. 1

_____

_____

(c) Light intensity is an example of an abiotic factor.

Name one other abiotic factor. 1

_____

7 The distribution of organisms may be affected by abiotic factors.

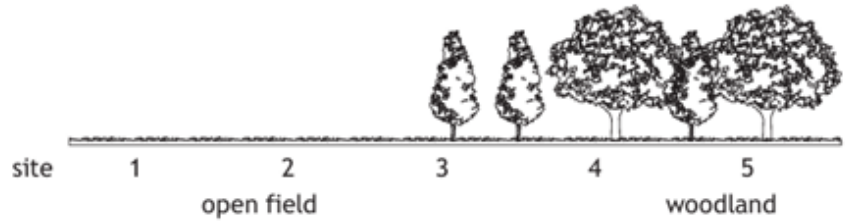
The table shows the results of a study into the effect of soil moisture levels on the distribution of three species of plant.

Sample site	*Soil moisture* (units)	*Number of plants*		
		Species E	*Species F*	*Species G*
1	20·2	11	15	12
2	23·4	13	14	11
3	22·1	12	16	10
4	24·5	15	17	15
5	26·6	18	13	12
6	28·4	19	15	14

State which species has its distribution most affected by the soil moisture levels. 1

Species _____

6.a) Light intensity readings were taken at 5 sites along a transect line running from an open field to a woodland.



Name the apparatus used to measure light intensity and give one precaution that should be taken when using it to minimise error.

Apparatus Light meter

Precaution Person measuring should not cast a shadow over meter

Three readings were taken at each site at the same time on different days. The results are shown in the table.

Site	Light intensity reading (lux)		
	Day 1	Day 2	Day 3
1	18 160	17 845	18 180
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4	5300	4800	5275
5	3600	3200	3610

6.b) (i) Suggest a reason why the readings taken on day 2 were lower than the readings on days 1 and 3.

Cloudier on day 2

(ii) Explain why three readings were taken at each site. 1

To improve reliability

(c) Light intensity is an example of an abiotic factor.

Name one other abiotic factor. 1

pH/temperature/moisture

7 The distribution of organisms may be affected by abiotic factors.

The table shows the results of a study into the effect of soil moisture levels on the distribution of three species of plant.

		Number of plants		
Sample site	*Soil moisture* (units)	*Species E*	*Species F*	*Species G*
1	20·2	11	15	12
2	23·4	13	14	11
3	22·1	12	16	10
4	24·5	15	17	15
5	26·6	18	13	12
6	28·4	19	15	14

State which species has its distribution most affected by the soil moisture levels. 1

Species E

8. The results are shown in the table.

Sample site	*Soil temperature* (°C)	*Soil moisture* (% saturation)	*Soil pH*	*Yellow Iris abundance*
1	12	15	5·4	0
2	13	39	5·5	3
3	11	56	5·6	9
4	12	78	5·5	21
5	11	90	5·4	25

(a) Describe the distribution of Yellow Iris along the transect line from sample site 1 to 5. **1**

_____

(b) Identify which abiotic factor had the greatest effect on the distribution of Yellow Iris. **1**

_____

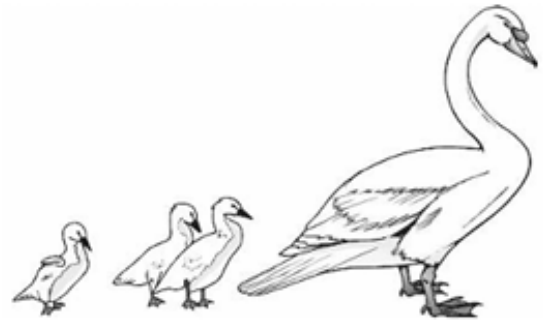
(c) Probes were used to measure the soil moisture and soil pH.

Describe a precaution that should be taken when using a probe to make sure that the measurements are valid. **1**

_____

_____

9.a) Swans and cygnets (young swans) live on the River Ayr. Foxes in the area kill and eat cygnets.



Dead adult swans were found throughout the year. It was discovered that the use of lead weights by anglers was poisoning the swans. Other animals in the river were also affected by the lead.

Suggest the effect of the lead on the biodiversity of a river ecosystem.

Explain your answer.

Effect _____

Explanation _____

_____ **1**

b) What term is used to describe the variety of species within an ecosystem? **1**

_____

8. The results are shown in the table.

Sample site	*Soil temperature* (°C)	*Soil moisture* (% saturation)	*Soil pH*	*Yellow Iris abundance*
1	12	15	5·4	0
2	13	39	5·5	3
3	11	56	5·6	9
4	12	78	5·5	21
5	11	90	5·4	25

(a) Describe the distribution of Yellow Iris along the transect line from sample site 1 to 5. 1

Yellow iris abundance increases

(b) Identify which abiotic factor had the greatest effect on the distribution of Yellow Iris. 1

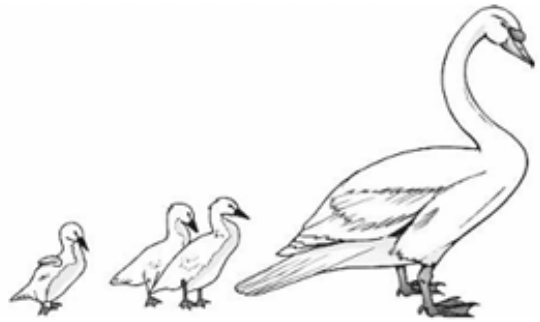
moisture

(c) Probes were used to measure the soil moisture and soil pH.

Describe a precaution that should be taken when using a probe to make sure that the measurements are valid. 1

Wipe between use

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Suggest the effect of the lead on the biodiversity of a river ecosystem.

Explain your answer. 1

Effect decreases

Explanation Swans were being poisoned 1

b) What term is used to describe the variety of species within an ecosystem? 1

Biodiversity

10. A group of students carried out a five year investigation into plant growth in an area of abandoned farmland.

They sampled the area using quadrats.

The results are shown in the table below.

	Average abundance of each plant		
Year	*Meadow grass*	*Ragwort*	*Pink campion*
2011	8	15	9
2012	16	14	7
2013	24	12	4
2014	25	8	2
2015	25	5	1

a) **Use information from the table** to suggest why the ragwort abundance decreased over the five-year period. **1**

b) The students also sampled invertebrates such as beetles and spiders.

Name a sampling technique they could have used and describe a possible source of error with this technique. **2**

Sampling technique _____

Source of error _____

11 During a woodland survey, a group of students measured some abiotic factors. Readings they took included the temperature of the soil and the air.

(a) Name one abiotic factor, other than temperature, which they could have measured in the woodland and describe the method of measuring this factor. **2**

Abiotic factor _____

Method _____

(b) (i) During the survey, the students sampled the leaf litter in the woodland using pitfall traps.

However, when they checked the pitfall traps four days after setting them up, the students discovered that they were all empty.

Describe an error the students might have made which would explain why there were no invertebrates in the traps. **1**

(c) The students saw a large number of butterflies in the woodland.

Give a reason why no butterflies were collected with the invertebrates. **1**

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2014	25	8	2
2015	25	5	1

a) **Use information from the table** to suggest why the ragwort abundance decreased over the five-year period. **1**

Due to competition from meadow grass for nutrients/space

b) The students also sampled invertebrates such as beetles and spiders.

Name a sampling technique they could have used and describe a possible source of error with this technique. **2**

Sampling technique Pitfall trap

Source of error Trap above ground OR not checked regularly

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(a) Name one abiotic factor, other than temperature, which they could have measured in the woodland and describe the method of measuring this factor. **2**

Abiotic factor Light meter

Method Point at maximum light

pH/moisture meter

Place probe in ground and take reading

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However, when they checked the pitfall traps four days after setting them up, the students discovered that they were all empty.

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Place trap above ground OR not checked regularly

(c) The students saw a large number of butterflies in the woodland.

Give a reason why no butterflies were collected with the invertebrates. **1**

Can fly out of trap

Indicator Species

1 Indicator species can provide information about

A numbers of organisms in a lake

B numbers of predators in a woodland

C levels of light in an ecosystem

D levels of pollution in a river.

2 Methylene blue can be used to compare oxygen levels in water samples.

As oxygen levels decrease, the colour of methylene blue changes from blue to colourless.

The table below shows the appearance of methylene blue after being added to four water samples.

Water sample	*Colour of Samples*			
	Start	*After 1 hour*	*After 3 days*	*After 5 days*
A	blue	blue	blue	light blue
B	blue	blue	light blue	colourless
C	blue	light blue	colourless	colourless
D	blue	blue	blue	blue

One sample was collected below a sewage pipe.

Which sample is this most likely to be?

3 A river was sampled at six points along its length. The numbers of different animals, the oxygen concentration and the pH were recorded for each sampling point.

The results are shown in the table below.

	Sampling points					
	1	2	3	4	5	6
Mayfly nymphs	0	0	0	5	6	132
Dragonfly nymphs	1	1	0	0	1	1
Chironimid fly larvae	0	1	1	2	231	36
Molluscs	0	0	0	0	46	73
Oxygen concentration (%)	88	80	75	71	30	63
pH	5·6	6·0	6·5	7·3	7·5	8·0

Using these results identify which of the following conclusions is **correct**.

A Chironimid fly larvae do not survive in water of a low oxygen concentration.

B Molluscs survive better in water of a lower pH.

C The distribution of Dragonfly nymphs is not affected by changes in the pH and oxygen concentration of the water.

D The distribution of Mayfly nymphs is not affected by the oxygen concentration of the water.

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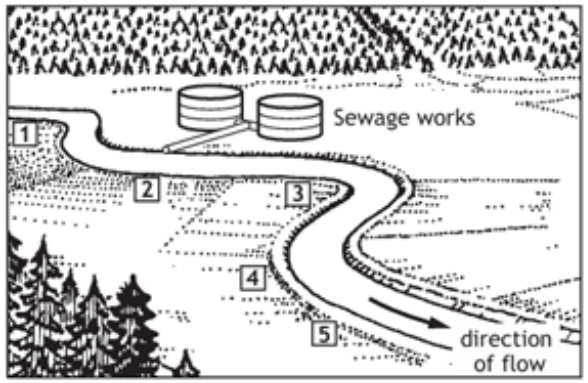
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D The distribution of Mayfly nymphs is not affected by the oxygen concentration of the water.

1 A river was sampled at five sites as shown in the diagram below.



The following tables show the results of analysing the samples at each site.

Table 1

Site	*Oxygen levels* (Units)	*Number of bacteria per 100ml*
1	1·2	500
2	0·04	150 000
3	0·40	12 680
4	0·54	3 400
5	1·12	1 250

Table 2

Organism Present	*Site 1*	*Site 2*	*Site 3*	*Site 4*	*Site 5*
Mayfly nymphs	23	0	0	0	8
Stonefly nymphs	42	0	0	0	21
Caddis fly larvae	18	0	0	10	15
Fresh water shrimp	2	0	0	1	1
Blood worms	1	5	24	7	1
Sludge worms	1	67	43	9	0

(a) Methylene blue is a chemical which can be used to compare oxygen levels in the water. The lower the oxygen level, the faster methylene blue changes from blue to colourless.

A sample of water from each of the five sites was tested.

Predict which sample would lose its blue colour fastest. 1

Sample from site number _____

(b) Use data from Tables 1 and 2 to answer the following questions.

(i) State which of the organisms in the samples would be found in areas of high oxygen content. 1

(a) _____

(ii) Sewage in the river is a form of water pollution.

Describe the effect this pollution has on the number of different types of organisms in this river. 1

_____

_____

(c) Some species are known as indicator species.

Explain what is meant by indicator species. 1

_____

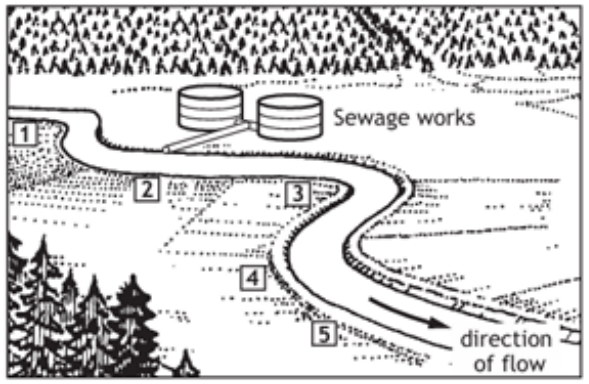
2 Another group of students conducted a study of 10 rock pools found along the transect.

To provide information about the levels of water pollution, samples of water were taken from these rock pools and examined for the presence or absence of certain species.

What name is given to these species? 1

_____

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Mayfly/stonefly nymphs

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Describe the effect this pollution has on the number of different types of organisms in this river. 1

Decreases number of organisms

_____

_____

(c) Some species are known as indicator species.

Explain what is meant by indicator species. 1

Presence or absence shows level of pollution

_____

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What name is given to these species? 1

indicator

_____

3 Levels of air pollution can be estimated by the presence or absence of organisms called lichens.

Air pollution level	*Most common type of lichen present*
Low	Shrubby
Medium	Leafy
High	Crusty

Environmental scientists carried out a study on lichen species at four different sites and obtained the results shown in the table below.

	Number of lichen species present		
Site	*Shrubby*	*Leafy*	*Crusty*
A	0	5	19
B	3	2	0
C	16	3	0
D	7	14	2

(a) Site A had the highest levels of air pollution.

Using information from **both tables**, describe the evidence supporting this statement. **1**

_____

_____ **2**

(b) State the name given to species, such as lichen, which are used estimate levels of pollution.

_____

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5	13	65
6	12	60
7	22	98
8	30	99
9	35	100

(i) The students observed a species of lichen growing on some of the damper parts of the lawn.

Lichens are indicator species.

State what is meant by the term 'indicator species'. **1**

_____

_____

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Site	*Shrubby*	*Leafy*	*Crusty*
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C	16	3	0
D	7	14	2

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Using information from **both tables**, describe the evidence supporting this statement. 1

Site A had the most crusty lichen which shows High levels of air pollution

2

(b) State the name given to species, such as lichen, which are used estimate levels of pollution.

indicator

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Lichens are indicator species.

State what is meant by the term 'indicator species'. 1

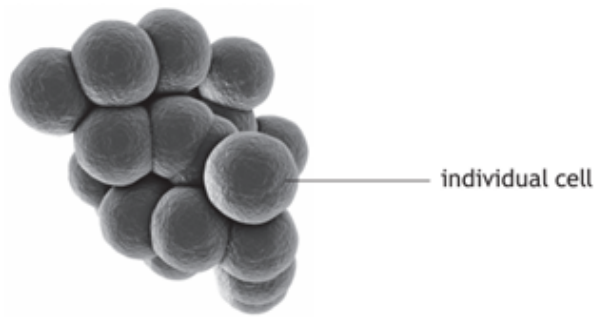
Presence or absence shows level of pollution

Selecting from Paired Keys

1. The following key can be used to identify bacteria.

1	Individual cells are spherical in shape	go to 2
	Individual cells are rod-shaped	go to 3
2	Cells are arranged in a single chain	*Streptococcus*
	Cells are not arranged in a single chain	go to 4
3	Cells are arranged in a single chain	*Streptobacillus*
	Cells are not arranged in a single chain	*Clostridium*
4	Cells are arranged in pairs	*Diplococcus*
	Cells are arranged in groups	*Staphylococcus*

Use the key to identify the bacteria shown.



A *Clostridium*

B *Staphylococcus*

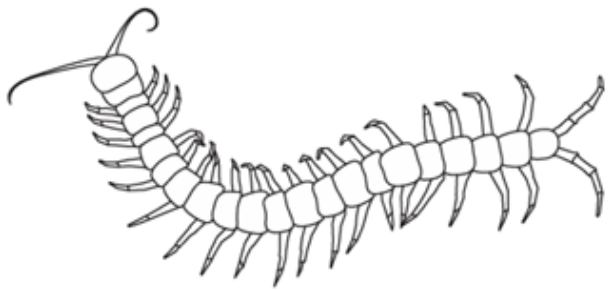
C *Diplococcus*

D *Streptococcus*

2. The following paired statement key can be used to identify invertebrate groups.

1. Six legs..... *Hexapoda*
   More than six legs..... go to 2
2. 8 legs..... go to 3
   More than 8 legs..... go to 4
3. Curved sting..... *Dromopoda*
   No curved sting..... *Arachnida*
4. 1 pair of legs per body segment..... *Chilopoda*
   2 pairs of legs per body segment..... *Diplopoda*

Use the key to identify the invertebrate group to which the following organism belongs.



A Dromopoda

B Arachnida

C Chilopoda

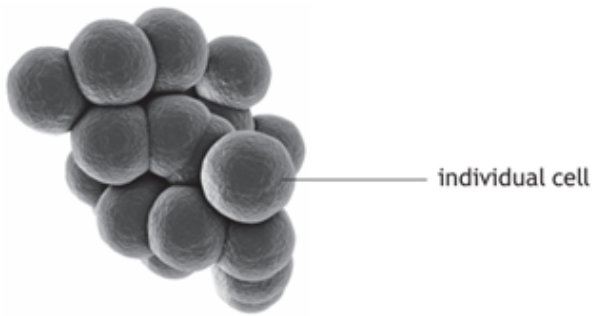
D Diplopoda

Selecting from Paired Keys

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	Cells are not arranged in a single chain	*Clostridium*
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	Cells are arranged in groups	*Staphylococcus*

Use the key to identify the bacteria shown.

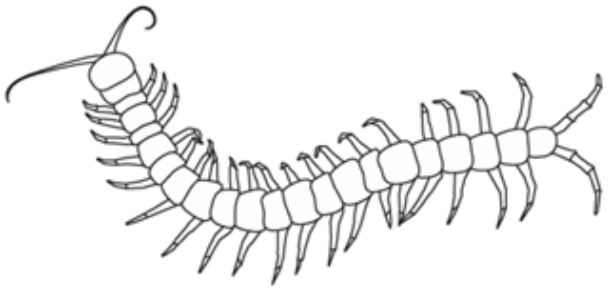


A *Clostridium*
B *Staphylococcus*
C *Diplococcus*
D *Streptococcus*

2. The following paired statement key can be used to identify invertebrate groups.

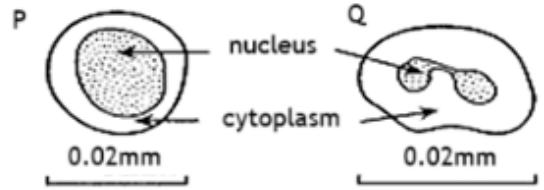
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   No curved sting..... *Arachnida*
4. 1 pair of legs per body segment..... *Chilopoda*
   2 pairs of legs per body segment..... *Diplopoda*

Use the key to identify the invertebrate group to which the following organism belongs.



A Dromopoda
B Arachnida
C Chilopoda
D Diplopoda

3. The paired key below can be used to identify four components of the blood P, Q, R and S





1. Nucleus present ..... go to 2
   Nucleus absent..... go to 3

2. Large volume of cytoplasm..... macrophage
   Small volume of cytoplasm ..... lymphocyte

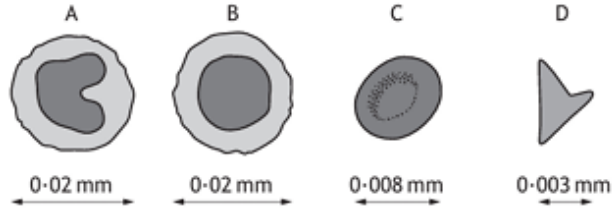
3. Diameter greater than 0.05mm..... red blood cell
   Diameter less than 0.05mm.....platelet

	Cell P	Cell Q	Cell R	Cell S
A	lymphocyte	red blood cell	platelet	macrophage
B	macrophage	lymphocyte	red blood cell	platelet
C	platelet	macrophage	red blood cell	lymphocyte
D	lymphocyte	macrophage	red blood cell	platelet

4. The following key can be used to identify the different components of blood.

1.	Nucleus absent	go to 2
	Nucleus present	go to 3
2.	Diameter greater than 0·005 mm	**red blood cell**
	Diameter less than 0·005 mm	**platelet**
3.	Nucleus is circular	**lymphocyte**
	Nucleus is not circular	**macrophage**

Use the key above to identify which of the diagrams represents a platelet.



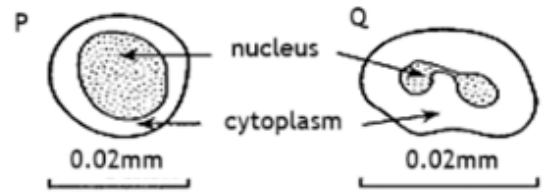
5. The following paired statement key can be used to identify some birds.

1. Has webbed feet ..... go to 2
   Does not have webbed feet ..... go to 3
2. Has a black head ..... puffin
   Has a white head ..... swan
3. Has a curved beak ..... go to 4
   Has a straight beak ..... rook
4. Has a brown head ..... curlew
   Has a black head ..... avocet

Use the information in the key to identify two features of a curlew.

A Curved beak and a brown head
B Straight beak and a white head
C Brown head and webbed feet
D Straight beak and webbed feet

3. The paired key below can be used to identify four components of the blood P, Q, R and S





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   Nucleus absent..... go to 3

2. Large volume of cytoplasm..... macrophage
   Small volume of cytoplasm ..... lymphocyte

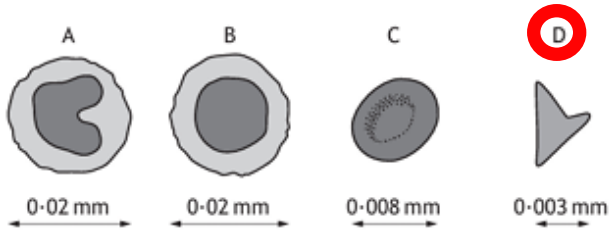
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   Diameter less than 0.05mm.....platelet

	Cell P	Cell Q	Cell R	Cell S
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B	macrophage	lymphocyte	red blood cell	platelet
C	platelet	macrophage	red blood cell	lymphocyte
D	lymphocyte	macrophage	red blood cell	platelet

4. The following key can be used to identify the different components of blood.

1.	Nucleus absent	go to 2
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	Diameter less than 0·005 mm	**platelet**
3.	Nucleus is circular	**lymphocyte**
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Use the key above to identify which of the diagrams represents a platelet.



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A Curved beak and a brown head
B Straight beak and a white head
C Brown head and webbed feet
D Straight beak and webbed feet

Creating Paired Keys

1. Students surveyed an area of woodland and recorded the tree species growing there.

The table shows some features that can be used to identify the trees.

Tree	Needle colour	Needle arrangement	Cones
Scots pine	blue-green	in pairs	point outwards from stem tip
Norway spruce	green underside	around the branch	point downwards
Douglas fir	grey underside	around the branch	point downwards
Larch	light green	in clusters	point outwards along the stem
Yew	green	in two rows along the branch	absent

Use the information in the table to complete the key. **3**

1. Cones are absent — Yew
   Cones are present — go to 2
2. Cones point downwards — _____
   Cones do not point downwards — go to 4
3. Underside of the needle is grey — _____
   Underside of the needle is green — Norway spruce
4. Needles arranged in pairs — Scots pine
   _____ — Larch

2. The following table gives information about some of the flowering plants found in the area.

Plant	*Height range* (cm)	*Flower colour*	*Flowering period* (months)
Pink Campion	30–90	pink	6
Ragwort	30–200	yellow	6
Meadow Grass	30–70	green	3
Buttercup	5–90	yellow	5

Using the information in the table, complete the three boxes in the paired statement key below. **3**

1. Flower colour is yellow — go to 2
   Flower colour is not yellow — _____
2. Height of plant can be over 100 cm — Ragwort
   Height of plant is under 100 cm — _____
3. Flowering period lasts only 3 months — Meadow Grass
   Flowering period is longer than 3 months — _____

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2. Height of plant can be over 100 cm — Ragwort
   Height of plant is under 100 cm — Buttercup
3. Flowering period lasts only 3 months — Meadow Grass
   Flowering period is longer than 3 months — Pink Campion

3. The table below describes the feature of fluid which leads to the diagnosis of several joint abnormalities.

Feature of synovial fluid	Diagnosis of Joint			
	Normal	Inflammation	Infection	Blood leakage
Viscosity	high	Low	Low	intermediate
Cloudiness	zero	Slight	High	high
Colour	light yellow	dark yellow	dark yellow	pink

Using the information in the table, complete the three boxes in the paired statement key below. 3

1. Fluid pink — Blood leakage

   Fluid not pink — go to 2

2. Low viscosity — [ ]

   High viscosity — [ ]

3. [ ] — Infection

   Slight cloudiness — [ ]

4. The table below contains information about four species of Tit birds found in Scotland.

Species	Crown of Head	Black breast stripe	Tail Length
Coal Tit	Black	Absent	Shorter than body
Blue Tit	Blue	Absent	Shorter than body
Long tailed Tit	Grey	Absent	Longer than body
Great Tit	black	present	Shorter than body

Use the information in the table to complete the key.

1. Crown of head black — go to 2

   [ ] — [ ]

2. Black breast stripe absent — [ ]

   Black breast stripe present — Great Tit

3. Tail length shorter than body — [ ]

   [ ] — Long tailed Tit

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1. Fluid pink — Blood leakage

   Fluid not pink — go to 2

2. Low viscosity — go to 3

   High viscosity — normal

3. High cloudiness — Infection

   Slight cloudiness — inflammation

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Use the information in the table to complete the key.

1. Crown of head black — go to 2

   Crown of head not black — go to 3

2. Black breast stripe absent — Coal tit

   Black breast stripe present — Great Tit

3. Tail length shorter than body — Blue tit

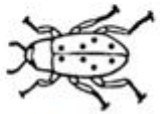
   Tail length longer than body — Long tailed Tit

5. The diagram below shows the invertebrates collected by the pupils.


Earthworm


Snail


Spider


Beetle


Woodlouse

Complete the following keys using information from the diagrams.

1. Legs — Go to 2

   No legs — _____

2. 12 legs or more — Woodlouse

   Fewer than 12 legs — Go to 3

3. Spots on body — Beetle

   No spots on body — _____

4. Shell — Snail

   _____ — _____

(ii) Give two features of the beetle mentioned in the key.

1. _____

2. _____

6. The table shows some features of five British butterflies

Butterfly Species	Wing Shading	Wing Tip	Wing spots
Large White	pale	black	yes
Orange Tip	pale	orange	no
Peacock	dark	blue	yes
Red Admiral	dark	white	yes
Wood White	pale	black	no

Complete the key using the information given in the table.

1. Pale wing shading — go to 2

   Dark wing shading — _____

2 _____ — _____

   Orange wing tip — Orange Tip

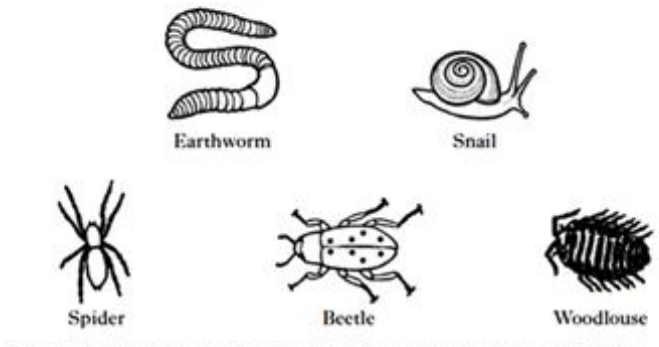
3. Spots on wings — Large White

   No spots on wings — _____

4. Blue wing tip — Peacock

   _____ — _____

5. The diagram below shows the invertebrates collected by the pupils.



Complete the following keys using information from the diagrams.

1. Legs	Go to 2	
No legs		Go to 4
2. 12 legs or more	Woodlouse	
Fewer than 12 legs	Go to 3	
3. Spots on body	Beetle	
No spots on body		Spider
4. Shell	Snail	
No shell		Earthworm

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1. Pale wing shading	go to 2	
Dark wing shading		go to 4
2 Black wing tip		go to 3
Orange wing tip	Orange Tip	
3. Spots on wings	Large White	
No spots on wings		Wood White
4. Blue wing tip	Peacock	
White wing tip		Red Admiral

7. The table contains information about several species of butterflyfish.

Butterfly Species	Pelvic fin	White spot below fin	Number of dark bars at top of fin	Size of spot on body
A	light	no	zero	small
Q	dark	yes	zero	no spot
R	dark	no	two	no spot
K	dark	no	one	no spot
E	light	no	zero	large

a) Use the information in the table to complete the paired key for butterfly fish.

1. Pelvic fin dark — go to 2

   Pelvic fin light — [ ]

2. No white spot below fin — Species Q

   [ ] — [ ]

3. One dark bar at top of fin — [ ]

   [ ] — Species R

4 [ ] — [ ]

   Small spot on body — [ ]

b) Describe the difference that would allow a person to identify butterfly species R from Species K.

_____

_____

c) Identify a feature which A and Q have in common

_____

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R	dark	no	two	no spot
K	dark	no	one	no spot
E	light	no	zero	large

b) Describe the difference that would allow a person to identify butterfly species R from Species K.

R has 1 dark bar & K has 2 dark bars at top of fin.

c) Identify a feature which A and Q have in common

Both do not have a dark bar at top of fin

1. Pelvic fin dark — go to 2

   Pelvic fin light — Go to 4

2. white spot below fin — Species Q

   No white spot below fin — Go to 3

3. One dark bar at top of fin — Species K

   Two dark bars at top of fin — Species R

4 Large spot on body — Species E

   Small spot on body — Species A

8. The table shows some features of common seaweeds. MAR

Seaweed	*Colour*	*Shape*	*Bladders*
Bladder wrack	brown	branched	present in pairs
Cladophora	green	long and thin	absent
Spiral wrack	brown	twisted	present in pairs
Channel wrack	brown	grooved edges	absent
Egg wrack	brown	branched	present along its length
Sea lettuce	green	flat	absent
Serrated wrack	brown	saw-toothed edge	absent

(a) Use the information in the table to complete the key. :

1. Green seaweed — go to 2
   Brown seaweed — go to 3
2. Flat — Sea lettuce
   [ ] — Cladophora
3. Bladders present — go to 4
   Bladders absent — go to 6
4. Bladders along its length — [ ]
   Bladders in pairs — go to 5
5. Twisted — Spiral wrack
   Branched — [ ]
6. Grooved edge — Channel wrack
   Saw-toothed edge — Serrated wrack

(b) Describe the difference that would allow a person to identify a piece of seaweed as Egg wrack or Bladder wrack. **1**

_____

_____

(c) Identify a feature which Cladophora and Serrated wrack have in common. **1**

_____

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Serrated wrack	brown	saw-toothed edge	absent

1. Green seaweed — go to 2
   Brown seaweed — go to 3
2. Flat — Sea lettuce
   Long & Thin — Cladophora
3. Bladders present — go to 4
   Bladders absent — go to 6
4. Bladders along its length — Egg Wrack
   Bladders in pairs — go to 5
5. Twisted — Spiral wrack
   Branched — go to 6
6. Grooved edge — Channel wrack
   Saw-toothed edge — Serrated wrack

(b) Describe the difference that would allow a person to identify a piece of seaweed as Egg wrack or Bladder wrack. 1

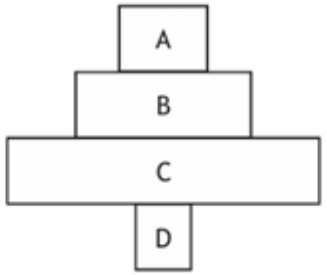
Bladders present in pairs bladder wrack whereas along its length in Egg wrack

(c) Identify a feature which Cladophora and Serrated wrack have in common. 1

Both have bladders absent

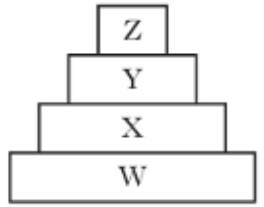
Food Chains & Pyramids

1. The diagram below shows a pyramid of numbers.



Which letter represents the producer?

2. The diagram below shows a pyramid



X represents the total mass of

A producers

B primary consumers

C predators

D secondary consumers.

3. Identify the pyramid of energy that would represent the following food chain.

Oak tree ⟶ squirrel ⟶ fox

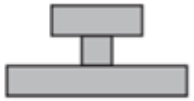
A



B



C



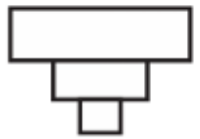
D



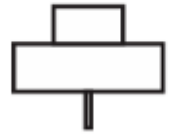
4. Beech tree ⟶ greenfly ⟶ ladybirds

Which of the following diagrams represents the pyramid of numbers for the above food chain?

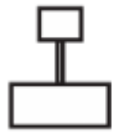
A



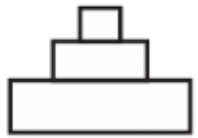
B



C

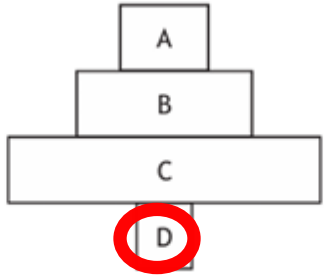


D



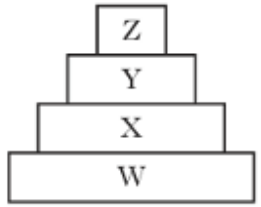
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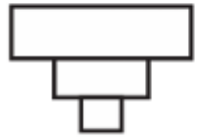
D



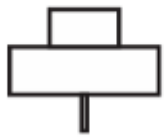
4. Beech tree ⟶ greenfly ⟶ ladybirds

Which of the following diagrams represents the pyramid of numbers for the above food chain?

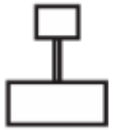
A



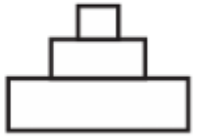
B



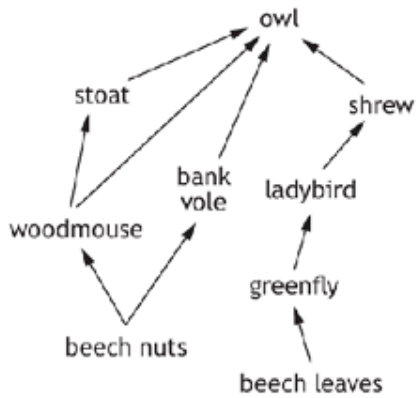
C



D



5. The diagram represents part of a woodland food web.



Which statement is true for the organisms in the food web?

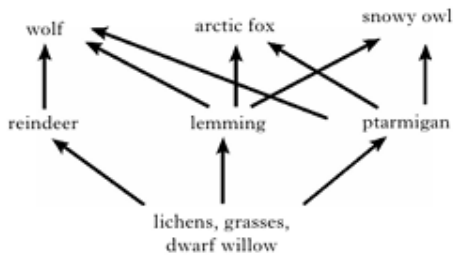
A Owl and stoat are in intraspecific competition.

B Bank vole and shrew are in interspecific competition.

C Ladybird is both predator and prey.

D Greenfly is a producer.

6. The diagram below shows part of a food chain in the Arctic tundra.



A population in this food web is all the

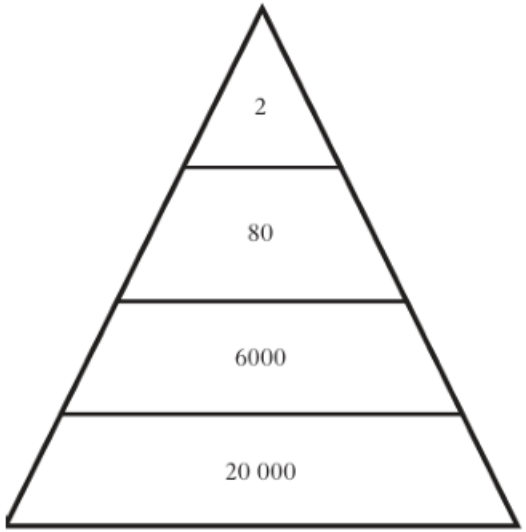
A plants

B reindeer

C animals

D living organisms.

7. The diagram below shows the number of organisms at each level in a pyramid of numbers.



How many organisms are consumers?

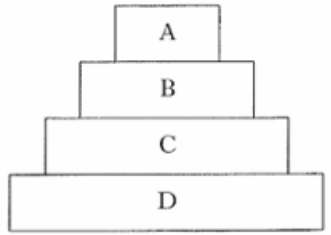
A 2

B 82

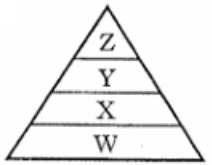
C 6000

D 6082

8 The following diagram shows a pyramid of energy. Which level is the result of the energy from the sun being converted into chemical energy?



9 The diagram below shows a pyramid



W represents the total mass of

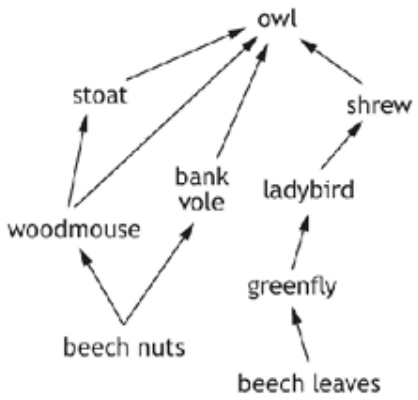
A producers

B prey

C predators

D herbivores.

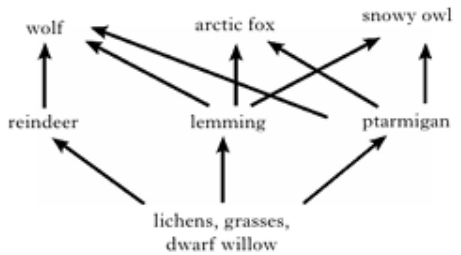
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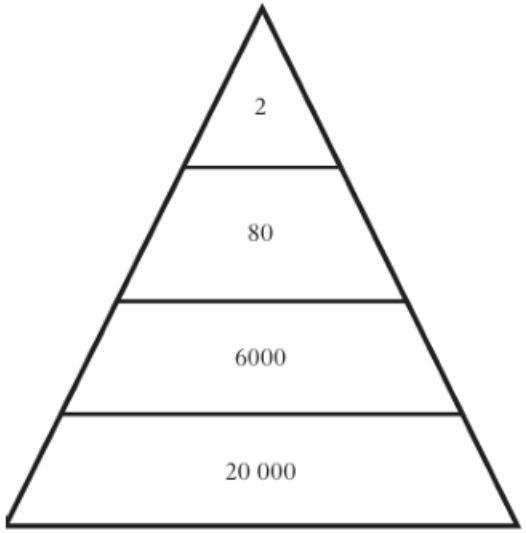
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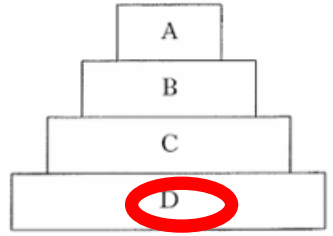
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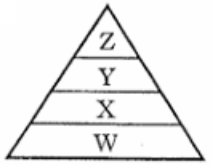
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9 A marine food chain is shown.

plankton → cod → seal → killer whale

The quantity of energy available to the killer whale is the energy that the seal used for

A swimming
B keeping warm
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D catching cod.

10 Plants convert 1% of the light energy they receive into new plant material.

In the food chain below, primroses receive 100 000 units of light energy.

Primrose → vole → weasel → owl

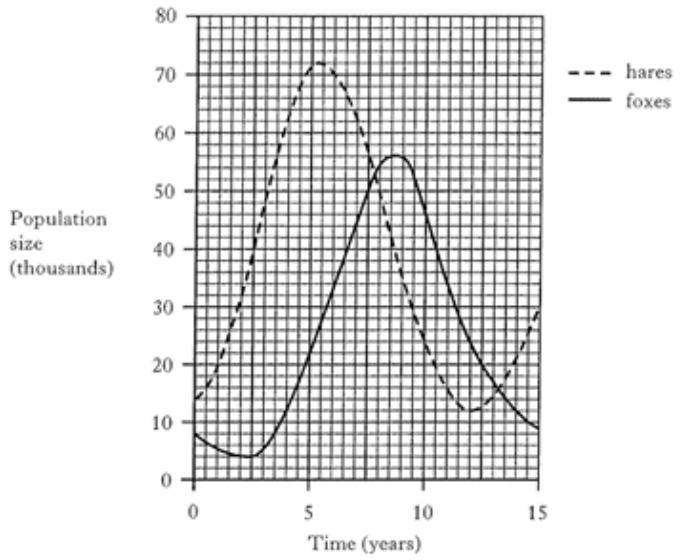
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11 Which term describes an animal that eats other animals in a food web?

A Prey
B Predator
C Producer
D Primary consumer

12 The graph shows the variations in the populations of arctic hares and their predators, foxes, in an are



What could be the reason for the decline in number of foxes after 9 years?

A The food available decreased.
B The numbers of prey increased.
C There is less disease in both populations.
D The food available increased.

13 On average, 90% of energy is lost at each energy transfer in a food chain.

Which of the following is a cause of this energy loss?

A Digested material
B Cell repair
C Movement
D Growth

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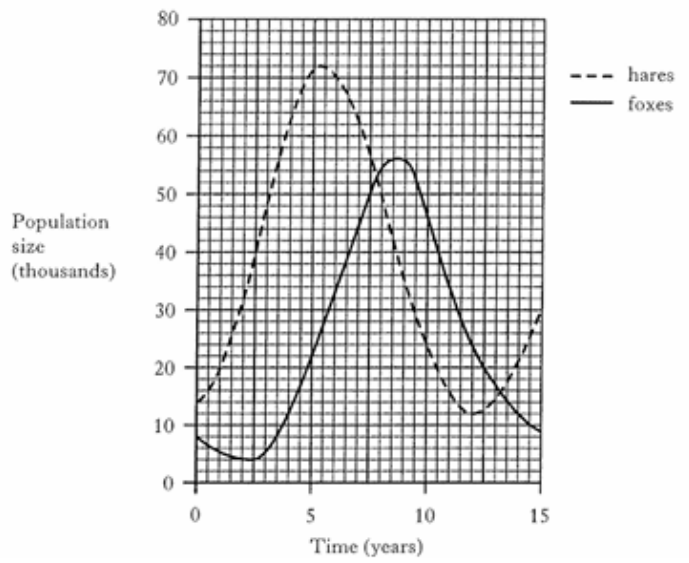
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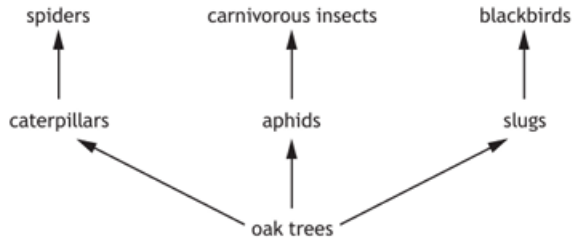
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14. The diagram shows part of a food web in an oak woodland.

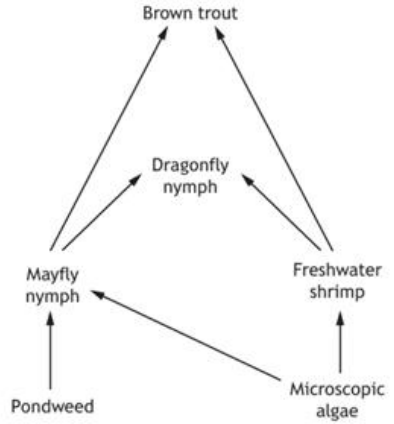


The use of pesticides in a nearby field resulted in the death of most aphids and caterpillars.

Which row in the table identifies the effect on the numbers of slugs and carnivorous insects?

	Number of slugs	*Number of carnivorous insects*
A	decreases	stays the same
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15 The diagram below represents a freshwater food web.

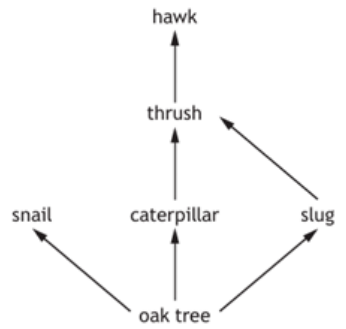


The number of freshwater shrimps was found to have decreased dramatically.

Predict the effect this will have on the numbers of dragonfly nymphs and microscopic algae.

A Both populations would decrease.
B Both populations would increase.
C Microscopic algae would decrease and dragonfly nymphs would increase.
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16 3. The diagram shows part of a food web.

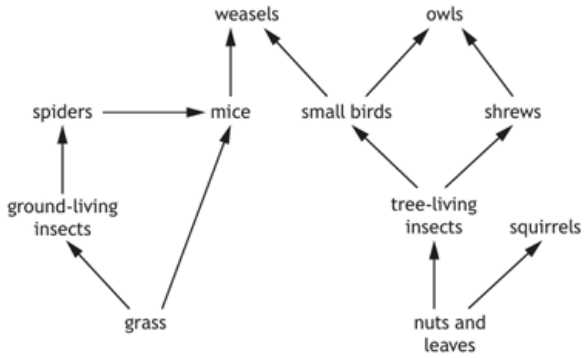


A chemical was used to control the number of slugs.

Which of the following could be a result of a large decrease in slug numbers?

A An increase in snails.
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17. Some feeding relationships of organisms in a woodland ecosystem are shown in the food web.

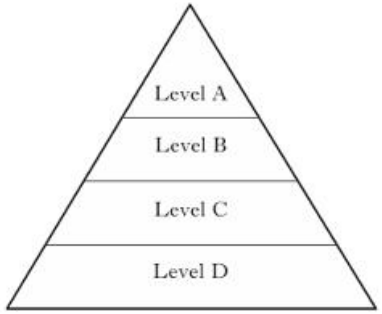


Due to extreme weather conditions, the populations of tree-living and ground-living insects were greatly reduced.

This could lead to:

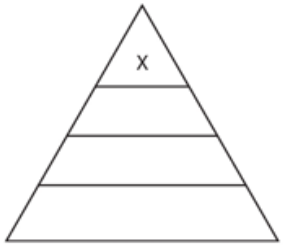
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18. The diagram below shows the levels in a pyramid of numbers.



Which level in the pyramid contains primary consumers?

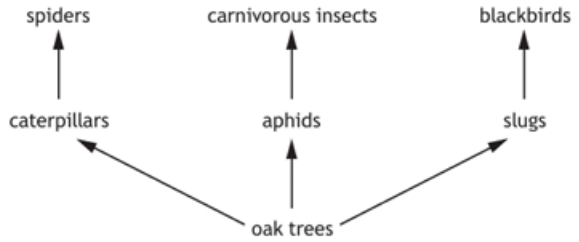
19. The diagram represents a pyramid of energy.



There is less energy at level X in the pyramid because

A there are fewer organisms at each level in the food chain
B the organisms at level X are very small
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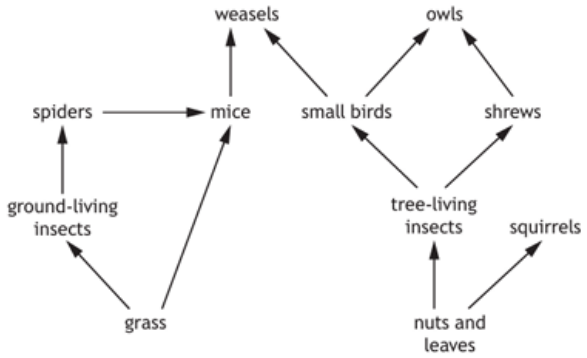


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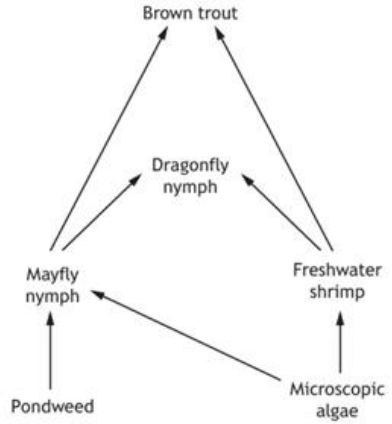


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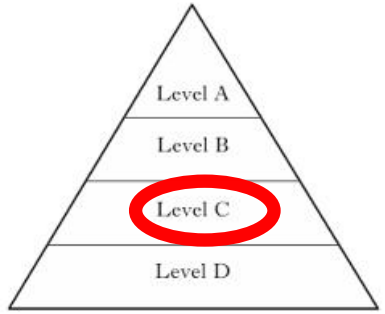


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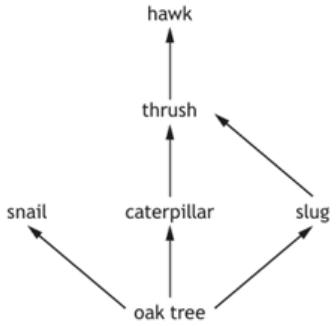
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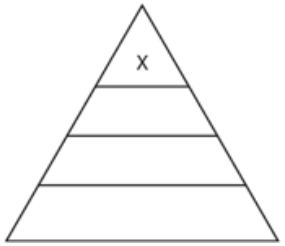


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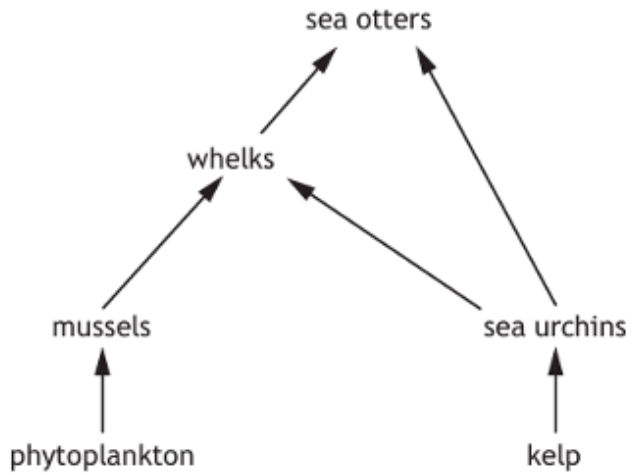
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1. . The food web represents a marine ecosystem in the west coast of Scotland.



(a) Give an ecological term that describes the sea urchins.

_____

Pine martens are omnivores found in the Caledonian forest.



(i) Give the definition of the term omnivore.

_____

2. The diagram shows a pyramid of energy for a typical food chain.



Explain why a pyramid of energy always has this shape.

_____

_____

Tick one box to identify which of the fates allows energy to be passed onto the next level in the food chain shown. 1

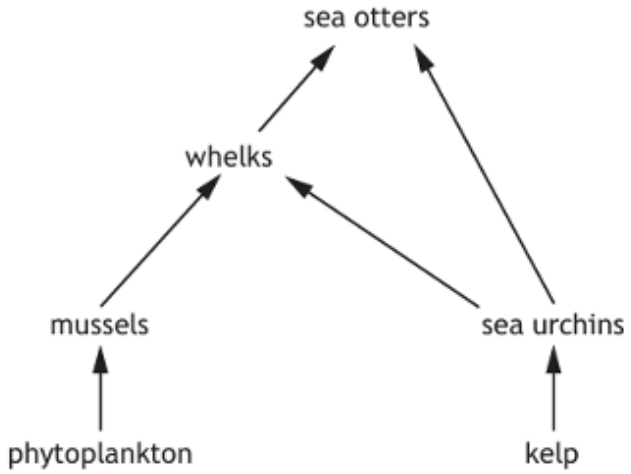
☐ Heat and movement ☐ Growth ☐ Faeces

The diagram represents positions of organisms in a food chain.

Tick one of the boxes to show the position cress would occupy in the food chain. 1

☐ → ☐ → ☐ → ☐

1. . The food web represents a marine ecosystem in the west coast of Scotland.



(a) Give an ecological term that describes the sea urchins.

Primary consumer/herbivore/prey

Pine martens are omnivores found in the Caledonian forest.



(i) Give the definition of the term omnivore.

Eats animals and plants

2. The diagram shows a pyramid of energy for a typical food chain.



Explain why a pyramid of energy always has this shape.

Energy is lost between each stage of the food chain

Tick one box to identify which of the fates allows energy to be passed onto the next level in the food chain shown. 1

☐	Heat and movement	X	Growth	☐	Faeces

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√ →	☐ →	☐ →	☐

3. A food chain from a river is shown below.

algae → water flea → stickleback → perch

Using the information in the food chain, answer the following questions.

(a) (i) Identify an organism which is **both** predator and prey. 1

_____

(b) State **one** way in which energy may be lost between stages in a food chain.

_____

A curlew gains an average of 165 kilojoules (kJ) of energy daily, by feeding on lugworms.

Select, from the following list, the value of the energy which is used for growth each day by the curlew.

Tick (✓) the correct box. 1

165 kJ ☐

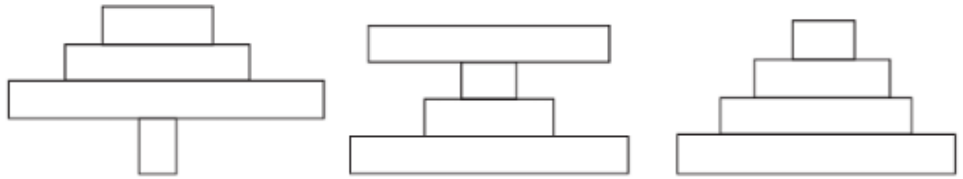
148·5 kJ ☐

16·5 kJ ☐

0 kJ ☐

4. (a) A food chain is shown along with three pyramids of numbers.

grass → zebra → lion → flea



Pyramid K Pyramid L Pyramid M

Identify the pyramid which represents the food chain shown. 1

Pyramid _____

(b) This food chain can also be represented by a pyramid of energy.

State the meaning of the term pyramid of energy. 1

_____

_____

(c) State one way in which energy may be lost between stages in a food chain. 1

_____

3. A food chain from a river is shown below.

algae ⟶ water flea ⟶ stickleback ⟶ perch

Using the information in the food chain, answer the following questions.

(a) (i) Identify an organism which is **both** predator and prey. 1

stickleback

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Heat/movement/undigested material

A curlew gains an average of 165 kilojoules (kJ) of energy daily, by feeding on lugworms.

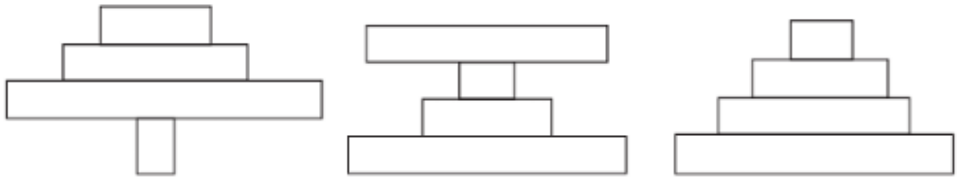
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- 165 kJ ☐
- 148·5 kJ ☐
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- 0 kJ ☐

4. (a) A food chain is shown along with three pyramids of numbers.

grass ⟶ zebra ⟶ lion ⟶ flea



Pyramid K Pyramid L Pyramid M

Identify the pyramid which represents the food chain shown. 1

Pyramid L

(b) This food chain can also be represented by a pyramid of energy.

State the meaning of the term pyramid of energy. 1

Total energy at each stage of a food chain

(c) State one way in which energy may be lost between stages in a food chain. 1

Heat/movement/undigested material

5. A natural pine forest provides excellent habitats for many different organisms.



One of these organisms is a large bird called the capercaillie which nests in the deep vegetation on the forest floor. In summertime it eats berries, leaves and stems of the blaeberry and other forest plants. In winter it eats Scots pine needles and cones.

The capercaillie's natural predators are the fox and the wild cat. Crows eat their eggs.

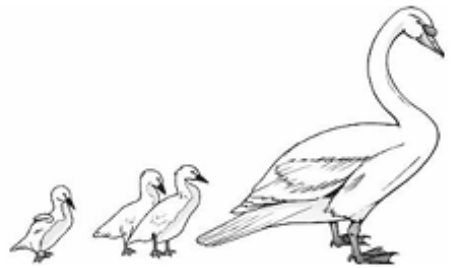
Use information from the passage to answer the following questions.

(i) Complete the boxes below to show a food chain.



1

Swans and cygnets (young swans) live on the River Ayr. Foxes in the area kill and eat cygnets.

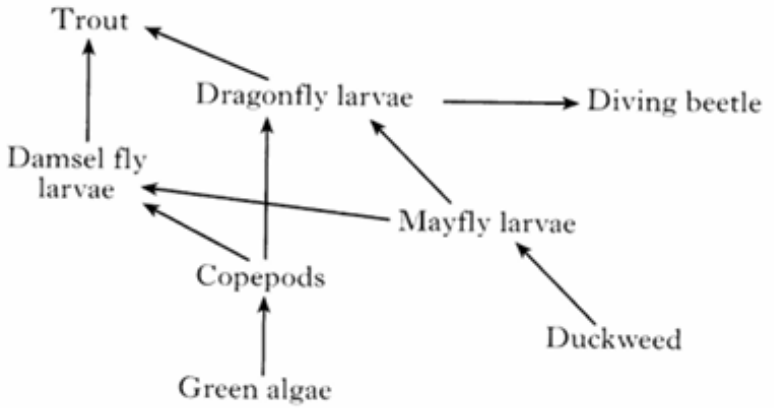


6. Underline **one** option in each set of brackets to make the following sentences correct.

Cygnets are the { predators / prey } of foxes.

The foxes are { primary / secondary } consumers. 1

7. The diagram below shows part of a food web in a freshwater ecosystem.



(i) Use **four** organisms from the food web to construct a food chain below.

_____ → _____ → _____ → _____ 1

(ii) Identify **all** the primary consumers in this food web.

_____ 1

(iii) Draw and label a pyramid of numbers from the food web.

1

(*b*) What is meant by the term omnivore?

_____ 1

5. A natural pine forest provides excellent habitats for many different organisms.



One of these organisms is a large bird called the capercaillie which nests in the deep vegetation on the forest floor. In summertime it eats berries, leaves and stems of the blaeberry and other forest plants. In winter it eats Scots pine needles and cones.

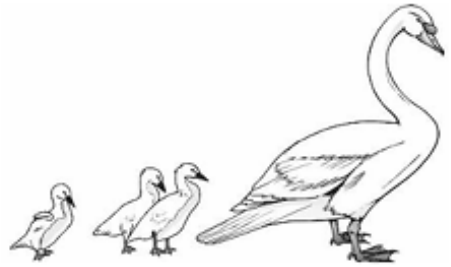
The capercaillie's natural predators are the fox and the wild cat. Crows eat their eggs.

Use information from the passage to answer the following questions.

(i) Complete the boxes below to show a food chain.

blaeberry → capercaille → Fox/wild cat 1

Swans and cygnets (young swans) live on the River Ayr. Foxes in the area kill and eat cygnets.

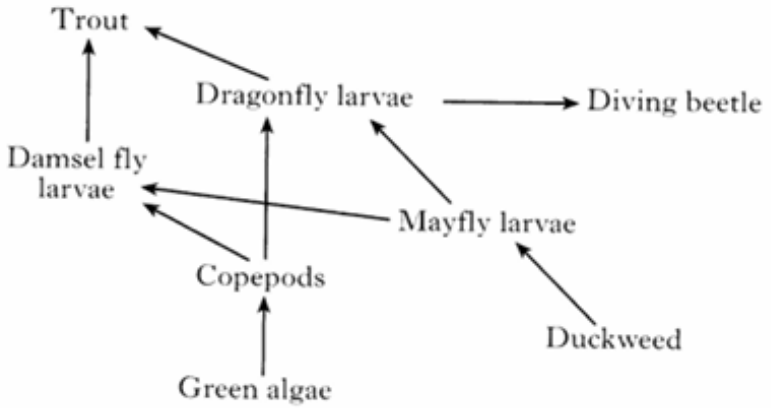


6. Underline **one** option in each set of brackets to make the following sentences correct.

Cygnets are the { predators / prey } of foxes.

The foxes are { primary / secondary } consumers. 1

7. The diagram below shows part of a food web in a freshwater ecosystem.



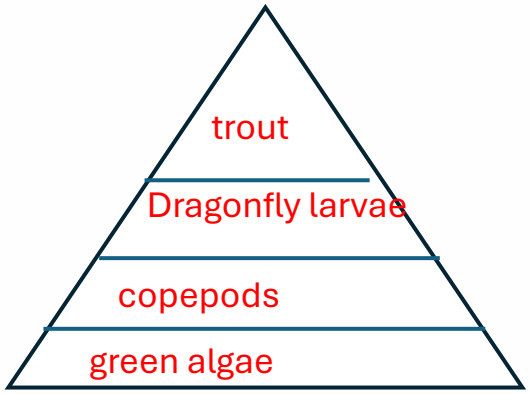
(i) Use **four** organisms from the food web to construct a food chain below.

duckweed → mayfly → dragonfly → trout 1

(ii) Identify **all** the primary consumers in this food web.

Copepods/mayfly larvae 1

(iii) Draw and label a pyramid of numbers from the food web.

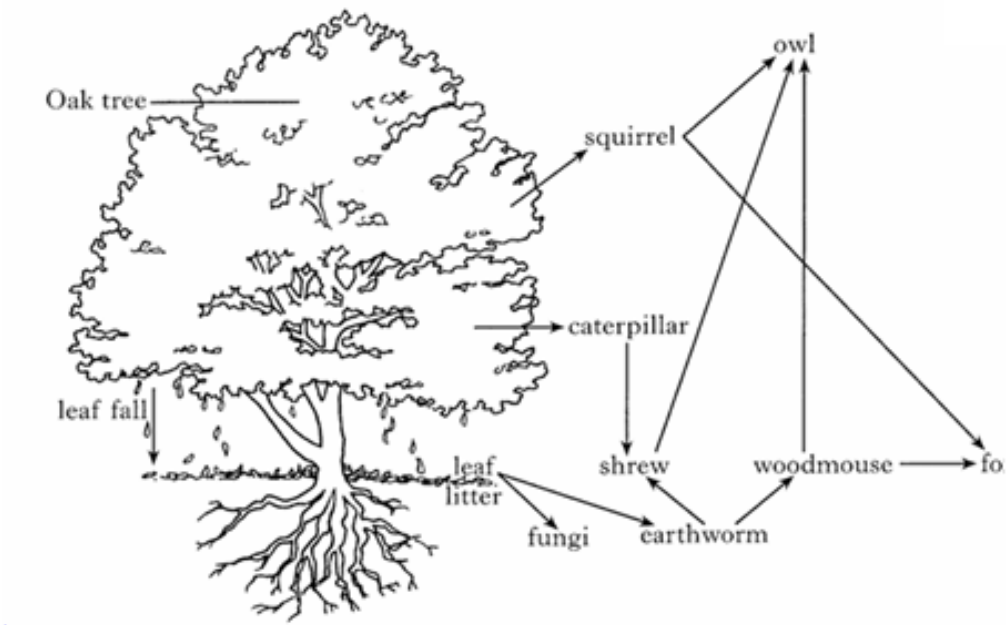


1

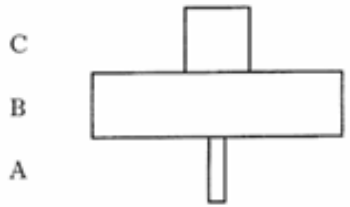
(b) What is meant by the term omnivore?

Eats both plants and animals 1

6.



(ii) The diagram below shows a **pyramid of numbers** taken from the food web above. Suggest a food chain, from the woodland web, which would give this pyramid.



A _____ → B _____ → C _____ **1**

(iii) Draw and label the pyramid of energy for the following food chain.

leaf litter → earthworm → woodmouse → fox

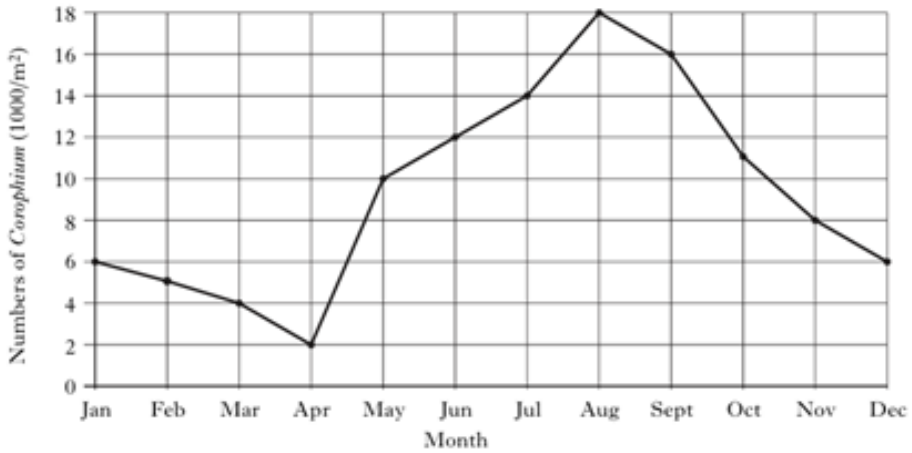
7. The small burrowing invertebrate, *Corophium*, is found in the mud of Scottish estuaries.

Corophium (magnified × 6)



Corophium is the major prey of many species of migratory wading birds. These birds are present in large numbers from August to April.

The graph below shows the results of a one year survey on the numbers of *Corophium* taken on the first day of each month.



(c) Using all the information given, explain why there are high numbers of *Corophium* on 1st August.

_____

_____ **1**

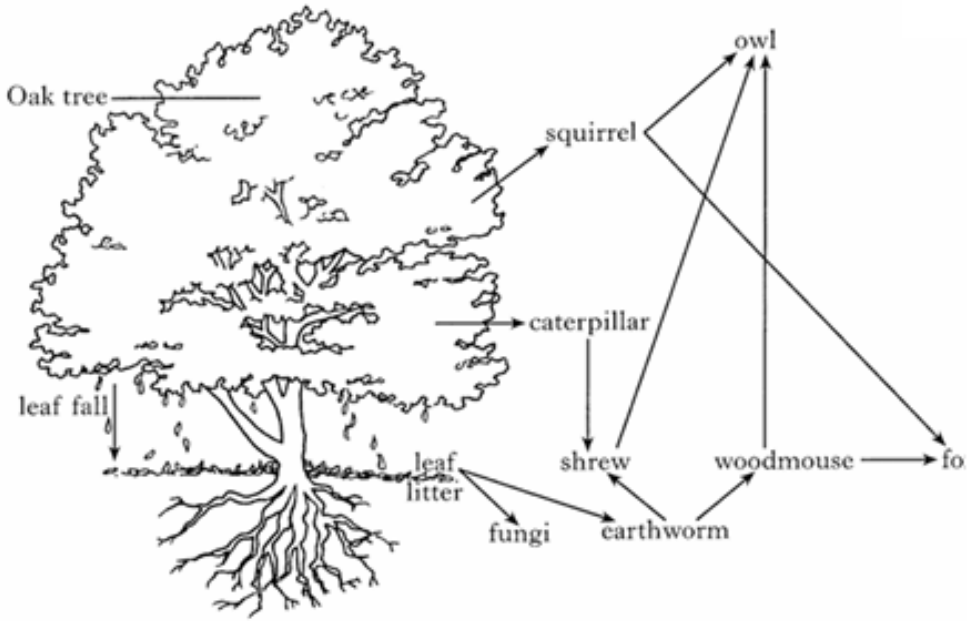
(d) Predict what would happen to the biodiversity of this estuary if the wading birds stayed all year. Explain your answer.

Prediction _____ **1**

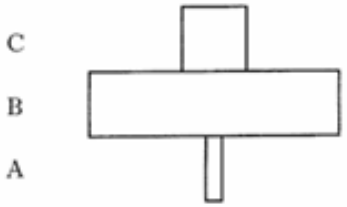
Explanation _____

_____ **1**

6.



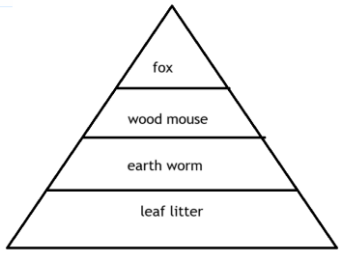
(ii) The diagram below shows a **pyramid of numbers** taken from the food web above. Suggest a food chain, from the woodland web, which would give this pyramid.



A oaktree → B squirrel → C owl

(iii) Draw and label the pyramid of energy for the following

leaf litter → earthworm → woodmouse → fox



7.

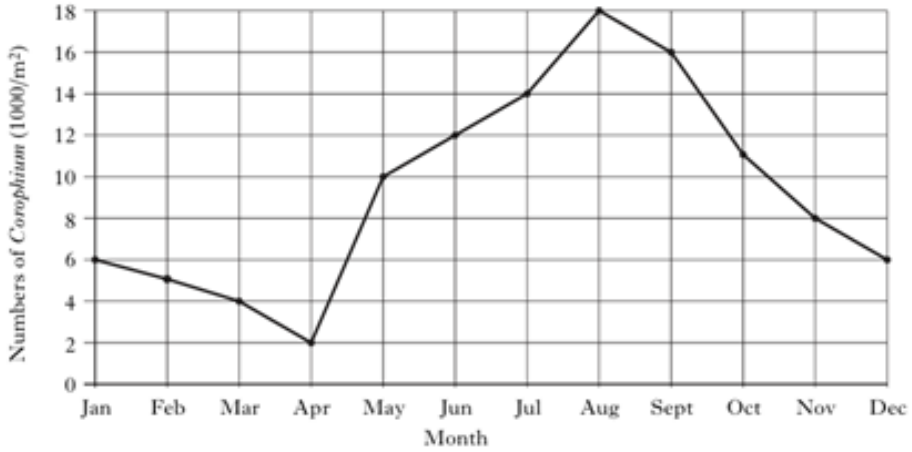
The small burrowing invertebrate, *Corophium*, is found in the mud of Scottish estuaries.

Corophium (magnified × 6)



Corophium is the major prey of many species of migratory wading birds. These birds are present in large numbers from August to April.

The graph below shows the results of a one year survey on the numbers of *Corophium* taken on the first day of each month.



(c) Using all the information given, explain why there are high numbers of *Corophium* on 1st August.

Fewer birds from April to August 1

(d) Predict what would happen to the biodiversity of this estuary if the wading birds stayed all year. Explain your answer.

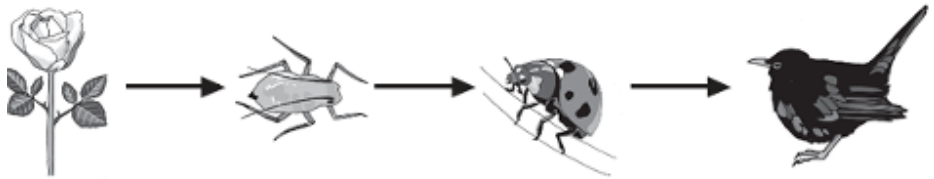
Prediction decreases 1

Explanation Reduced corphium means wading birds decrease as less food to eat. 1

8.

5. (*a*) The diagram below represents a food chain in a garden.

(*The organisms are not to scale.*)

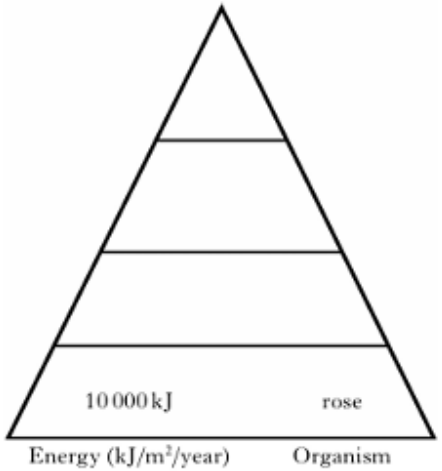


(i) What term describes the greenfly in this food chain?

_____ **1**

(ii) A rose bush contains 10 000 kJ/m²/year of energy and only 10% of this energy is passed on at each stage of the food chain.

Use this information to complete the pyramid of energy below for this food chain.

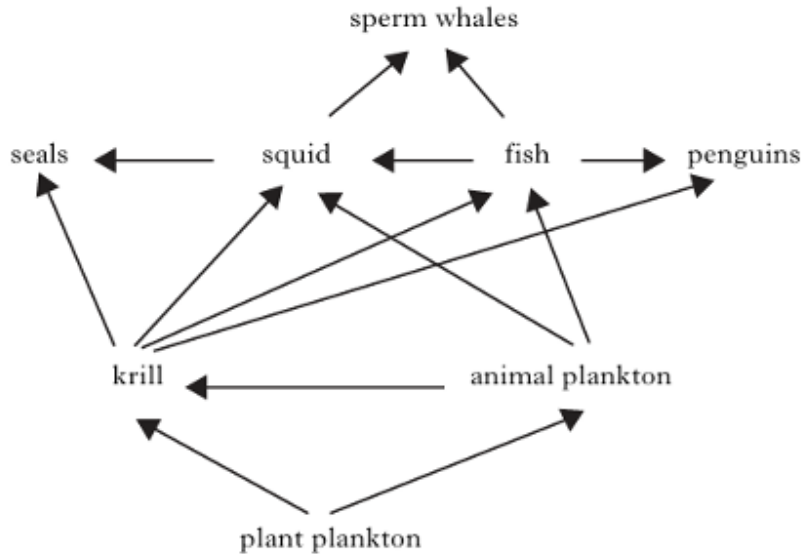


2

(iii) What happens to the energy that is **not** passed on at each stage of the food chain?

_____ **1**

9. The diagram below shows part of an Antarctic food web.



(*b*) Decide if each of the following statements is **True** or **False**, and tick (✓) the appropriate box.

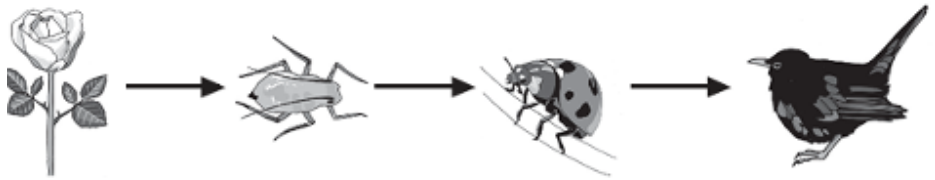
If the statement is **False**, write the correct word in the **Correction box** to replace the word(s) <u>underlined</u> in the statement.

Statement	*True*	*False*	*Correction*
In this food web, krill are <u>herbivores</u>.			
The population of <u>sperm whales</u> has the highest numbers.			

8.

5. (*a*) The diagram below represents a food chain in a garden.

(*The organisms are not to scale.*)



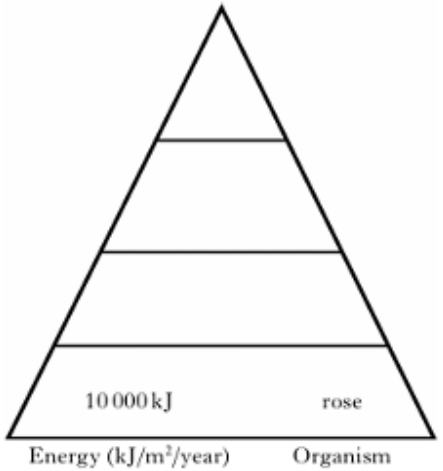
(i) What term describes the greenfly in this food chain?

Prey/primary consumer/herbivore

1

(ii) A rose bush contains 10 000 kJ/m²/year of energy and only 10% of this energy is passed on at each stage of the food chain.

Use this information to complete the pyramid of energy below for this food chain.



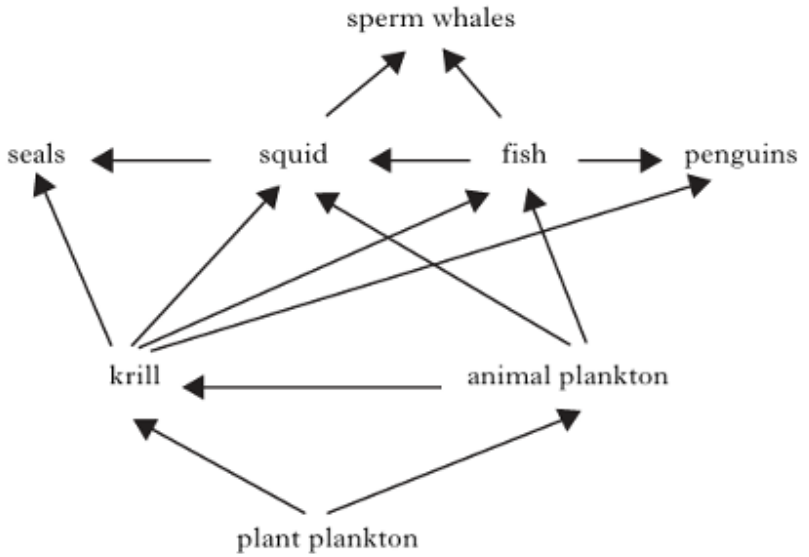
2

(iii) What happens to the energy that is **not** passed on at each stage of the food chain?

Lost as movement/heat/undigested material

1

9. The diagram below shows part of an Antarctic food web.



(*b*) Decide if each of the following statements is **True** or **False**, and tick (✓) the appropriate box.

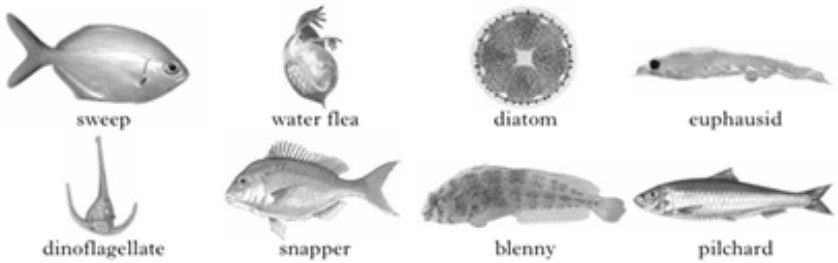
If the statement is **False**, write the correct word in the **Correction box** to replace the word(s) underlined in the statement.

Statement	*True*	*False*	*Correction*
In this food web, krill are herbivores.	X		
The population of sperm whales has the highest numbers.		X	Plant plankton

2

10. The pictures show some organisms from a marine ecosystem.

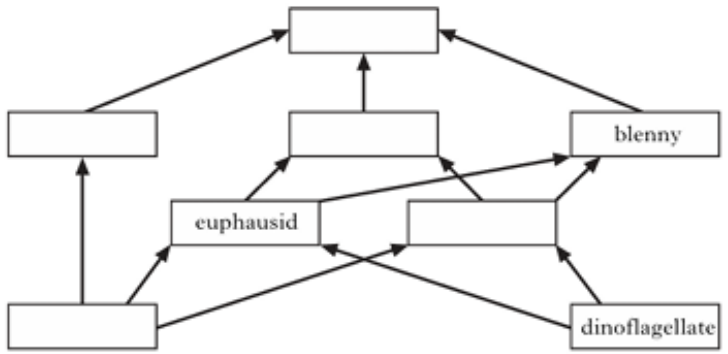
The pictures are not to scale.



The table below shows information about the feeding relationships in the marine ecosystem.

Organism	*Food eaten*
euphasid	dinoflagellate, diatom
dinoflagellate	none
sweep	diatom
snapper	sweep, pilchard, blenny
pilchard	water flea, euphausid
blenny	water flea, euphausid
diatom	none
water flea	diatom, dinoflagellate

(*a*) (i) Use the information in the table to complete the food web below.



2

(ii) What term is used to describe the snapper in this ecosystem?

11. Scottish wildcat (*Felis sylvestris grampia*) is under threat of extinction with around 400 pure-bred cats in the wild.



Wildcats live in conifer forests, dense woodland or rocky areas. They are carnivores that feed on herbivores such as rabbits, mice and voles. Although their young are eaten by pine martens and foxes, the main threat to their existence is interbreeding with the domestic cat.

(*a*) (i) Using information from the passage, complete the boxes below to show a food chain.



1

(ii) Complete the table below using named examples from the passage.

Term	*Named example*
habitat	
carnivore	
prey	

2

Each food chain starts with a producer.

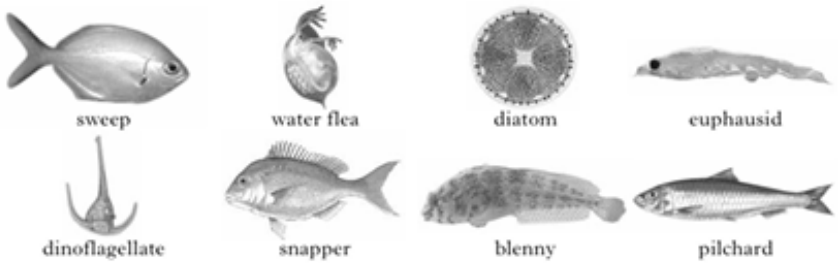
(i) State the meaning of the term producer. 1

_____

_____

10. The pictures show some organisms from a marine ecosystem.

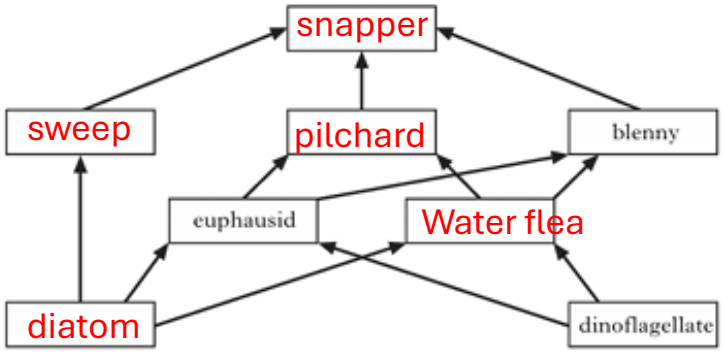
The pictures are not to scale.



The table below shows information about the feeding relationships in the marine ecosystem.

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dinoflagellate	none
sweep	diatom
snapper	sweep, pilchard, blenny
pilchard	water flea, euphausid
blenny	water flea, euphausid
diatom	none
water flea	diatom, dinoflagellate

(*a*) (i) Use the information in the table to complete the food web below.



2

(ii) What term is used to describe the snapper in this ecosystem?

Consumer/predator/carnivore

11. Scottish wildcat (*Felis sylvestris grampia*) is under threat of extinction with around 400 pure-bred cats in the wild.



Wildcats live in conifer forests, dense woodland or rocky areas. They are carnivores that feed on herbivores such as rabbits, mice and voles. Although their young are eaten by pine martens and foxes, the main threat to their existence is interbreeding with the domestic cat.

(*a*) (i) Using information from the passage, complete the boxes below to show a food chain.

Green plants → Rabbits/mice /voles → wildcats → Pinemartin/fox

1

(ii) Complete the table below using named examples from the passage.

Term	*Named example*
habitat	Where an animal lives
carnivore	Eats only animals
prey	animal which is hunted

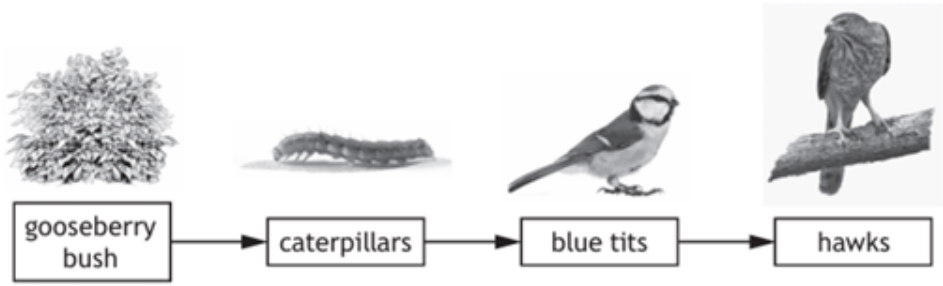
2

Each food chain starts with a producer.

(i) State the meaning of the term producer. 1

Can make its own food.

12. . (a) The food chain represents the transfer of energy from organisr organism.



(i) Name the process carried out by the gooseberry bush that allows energy to enter the food chain. 1

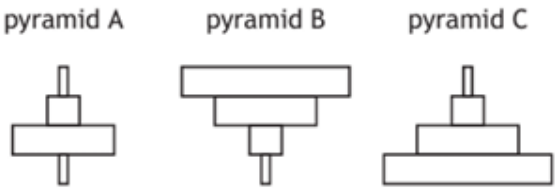
_____

(ii) The blue tits are consumers.

Give another ecological term that describes the role of the blue tits in this food chain. 1

_____

(iii) A food chain can be shown as a pyramid of numbers.



Identify which pyramid would be used to represent the food chain shown above. 1

Pyramid _____

13. In an investigation, students estimated the population and biomass of some organisms found on part of a rocky shore.

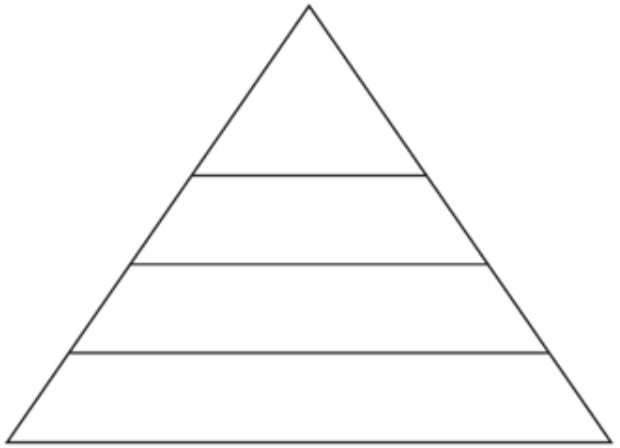
The table below shows the results.

Organism	*Population*	*Average mass of one organism* (g)	*Biomass of population* (g)
Seaweed	220	500	110 000
Limpet	1 100		33 000
Crab	100	90	9 000
Gull	5	700	3 500

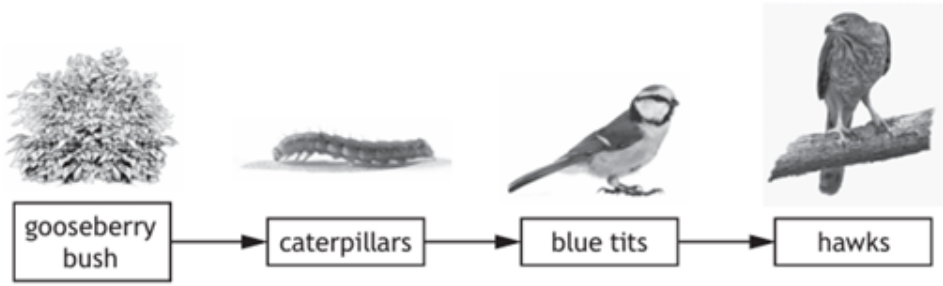
(ii) The total mass of living material decreases at each level in the food chain. This can be shown as a pyramid of biomass.

Complete the diagram below by entering the names of the organisms from the table into the appropriate section. 1

(An additional diagram, if required, can be found on *page 26*)



12. . (a) The food chain represents the transfer of energy from organisr organism.



(i) Name the process carried out by the gooseberry bush that allows energy to enter the food chain. 1

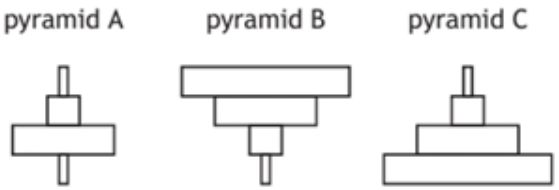
photosynthesis

(ii) The blue tits are consumers.

Give another ecological term that describes the role of the blue tits in this food chain. 1

predator/prey/carnivore

(iii) A food chain can be shown as a pyramid of numbers.



Identify which pyramid would be used to represent the food chain shown above. 1

Pyramid A

13. In an investigation, students estimated the population and biomass of some organisms found on part of a rocky shore.

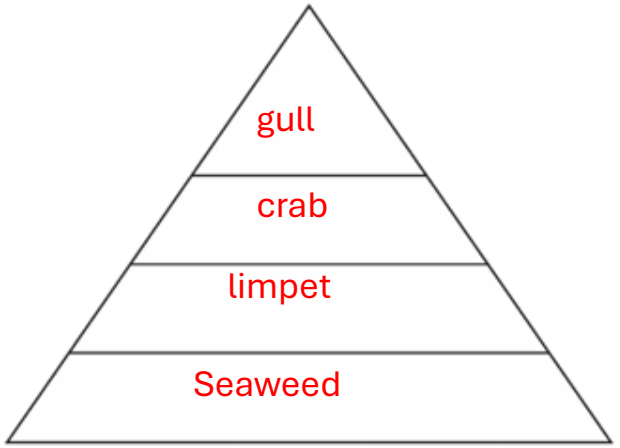
The table below shows the results.

Organism	*Population*	*Average mass of one organism* (g)	*Biomass of population* (g)
Seaweed	220	500	110 000
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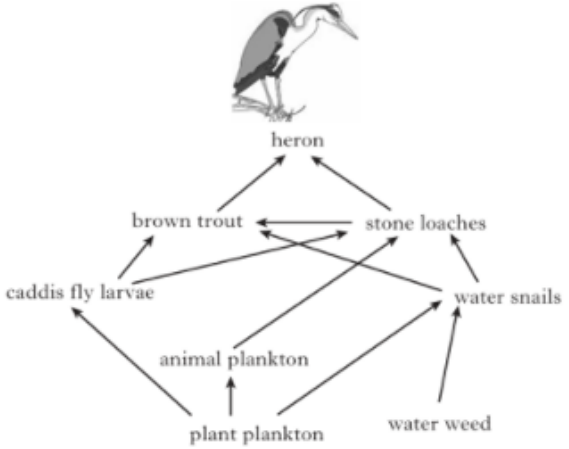
(ii) The total mass of living material decreases at each level in the food chain. This can be shown as a pyramid of biomass.

Complete the diagram below by entering the names of the organisms from the table into the appropriate section. 1

(An additional diagram, if required, can be found on *page 26*)



14. The diagram below represents a food web from a Scottish river ecosystem.



(*a*) Decide if each of the following statements about this food web is **True** or **False**, and tick (✓) the appropriate box.

If the statement is **False**, write the correct word in the **Correction** box to replace the word underlined in the statement.

Statement	*True*	*False*	*Correction*
The stone loaches are the predators of the brown trout.			
There are three producers in this food web.			
The caddis fly larvae are herbivores.			

3

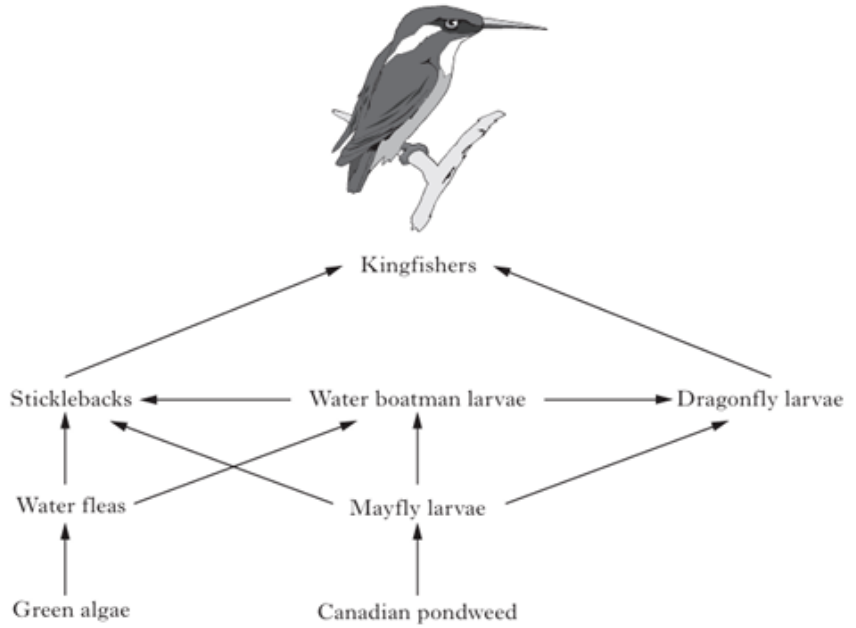
(*b*) (i) Complete the food chain below with four organisms from this food web.

water weed → _____ → _____ → _____ → _____ **1**

(ii) What do the arrows in the food chain represent?

_____ **1**

15. The diagram below represents a food web in a freshwater ecosystem.



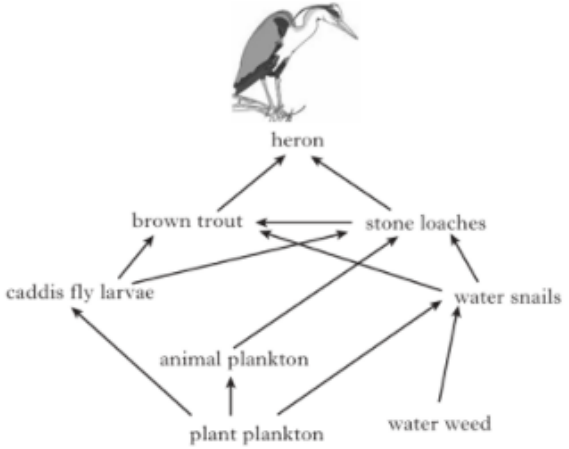
(*a*) Select organisms from the food web to complete the food chain below.

Canadian Pondweed → _____ → _____ → _____ **1**

(*b*) Name **all** the secondary consumers in this food web.

_____

14. The diagram below represents a food web from a Scottish river ecosystem.



(a) Decide if each of the following statements about this food web is **True** or **False**, and tick (✓) the appropriate box.

If the statement is **False**, write the correct word in the **Correction** box to replace the word underlined in the statement.

Statement	*True*	*False*	*Correction*
The stone loaches are the predators of the brown trout.		x	prey
There are three producers in this food web.		x	two
The caddis fly larvae are herbivores.	x		

3

(b) (i) Complete the food chain below with four organisms from this food web.

water weed → Water snail → Stone loach → Brown trout → heron

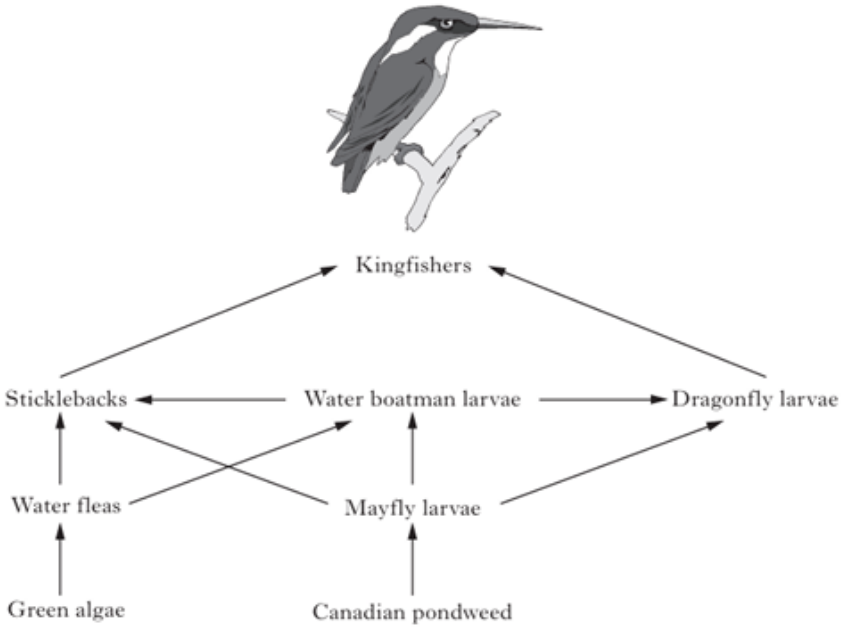
1

(ii) What do the arrows in the food chain represent?

Direction of energy flow.

1

15. The diagram below represents a food web in a freshwater ecosystem.



(a) Select organisms from the food web to complete the food chain below.

Canadian Pondweed → mayfly → Stickleback → kingfisher

1

(b) Name **all** the secondary consumers in this food web.

Stickleback + waterboatman larvae + dragonfly larvae

16. The song thrush feeds on snails which it finds by sight in a variety of habita
Snails are herbivores and feed only on grasses.

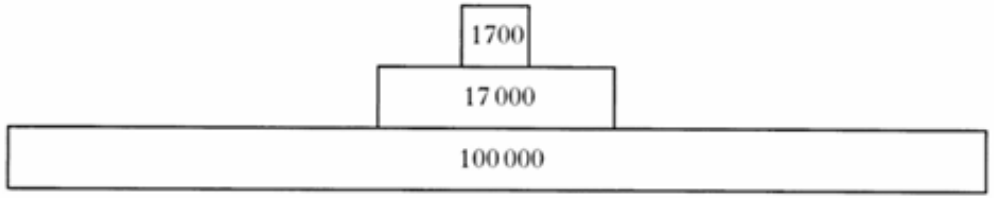
(*a*) (i) Present this feeding relationship as a food chain.

(ii) Use the information above to complete the table below.

Term	*Organism*
primary consumer	snail
predator	
prey	
producer	

17. The following diagram shows a pyramid of energy for part of the rocky shore ecosystem.

The energy values are given in kJ/m^2/year.



(i) Why does the energy value decrease from one level to the next?

_____

_____ 1

16.

The song thrush feeds on snails which it finds by sight in a variety of habita

Snails are herbivores and feed only on grasses.

(a) (i) Present this feeding relationship as a food chain.

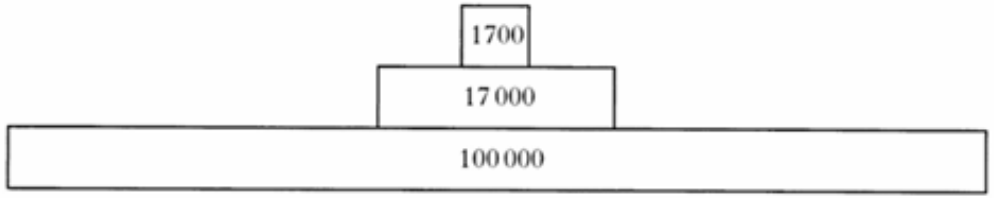
Grass → snail → song thrush

(ii) Use the information above to complete the table below.

Term	*Organism*
primary consumer	snail
predator	Song thrush
prey	snail
producer	grass

17. The following diagram shows a pyramid of energy for part of the rocky shore ecosystem.

The energy values are given in kJ/m^2/year.



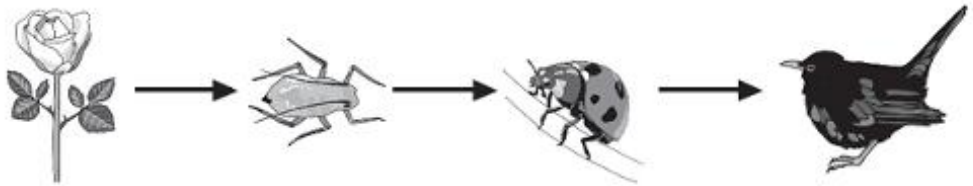
(i) Why does the energy value decrease from one level to the next?

Energy is lost at each stage of a food chain as heat/movement etc.

1

18. (*a*) The diagram below represents a food chain in a garden.

(*The organisms are not to scale.*)

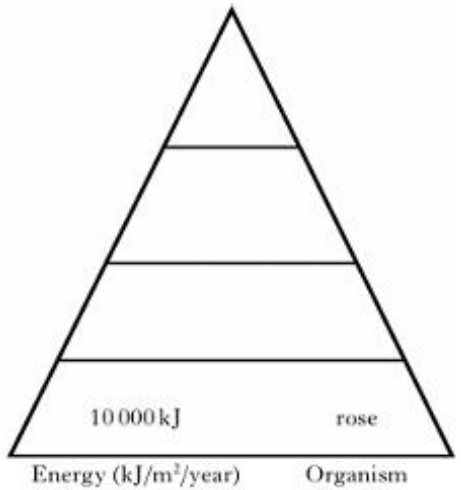


(i) What term describes the greenfly in this food chain?

_____ **1**

(ii) A rose bush contains 10 000 kJ/m^2/year of energy and only 10% of this energy is passed on at each stage of the food chain.

Use this information to complete the pyramid of energy below for this food chain.



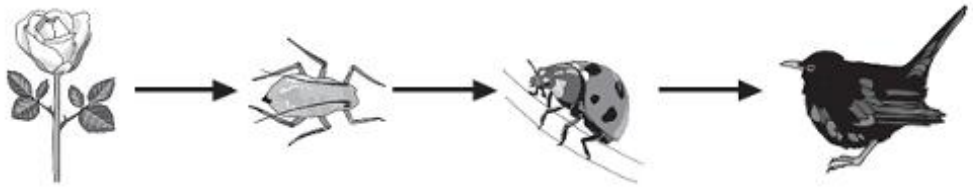
2

(iii) What happens to the energy that is **not** passed on at each stage of the food chain?

_____ **1**

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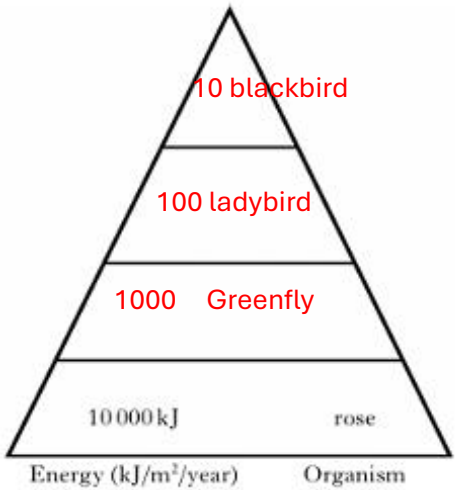
(i) What term describes the greenfly in this food chain?

Consumer/herbivore/prey

1

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Use this information to complete the pyramid of energy below for this food chain.



2

(iii) What happens to the energy that is **not** passed on at each stage of the food chain?

Lost as heat/movement/undigested material

1

Competition & Niche Past Papers

1. Which of the following statements best describes a niche?

   A A living factor which affects biodiversity in an ecosystem.
   B A region of our planet as distinguished by its climate, fauna and flora.
   C All the organisms in an area and their habitat.
   D The role that an organism plays within a community.

2. Which row in the table describes a type of competition and a matching example?

	Type of competition	*Example*
A	Interspecific	Two birch trees growing close together in a wood
B	Interspecific	Lions and hyenas feeding on zebra
C	Intraspecific	Seals and dolphins feeding on small fish
D	Intraspecific	Buttercups and daisies growing in the same field

3. In an investigation into density of planting, it was found that a lower mass of grain was harvested per plant when the density of wheat plants was at its highest.
   This was due to

   A less disease
   B more nutrients available
   C less space for weeds
   D more competition for light and nutrients.

4. Competition occurs when required resources are in short supply.
   Interspecific competition occurs when individuals of

   A the same species compete for a few of the same resources
   B different species compete for a few of the same resources
   C the same species compete for all the same resources
   D different species compete for all the same resources.

5. A rabbit feeds on grass, is eaten by foxes and is a habitat for fleas.
   The statement above describes the rabbit's

   A ecosystem
   B community
   C niche
   D prey.

6. In which of the following would competition **not** occur?

   A Rabbits grazing in a field
   B Owls and foxes hunting for mice
   C Daisies and dandelions growing in a lawn
   D Algae and fish in a loch

7. In an ecosystem, a niche is defined as the

   A place where an organism lives
   B total number of one species living in a community
   C role an organism plays within a community
   D total number and variety of organisms.

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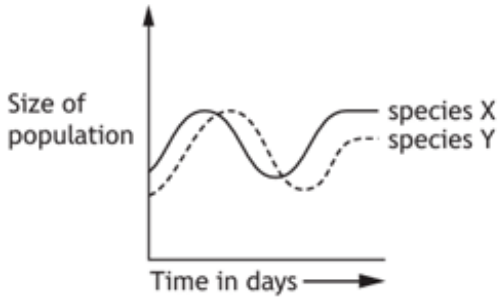
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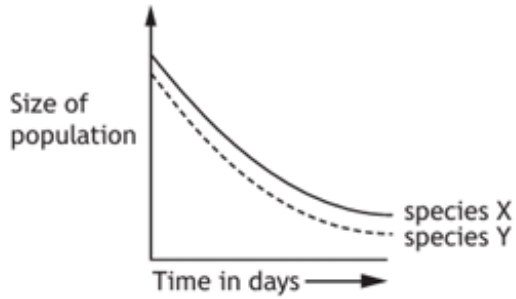
A place where an organism lives
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8. Which of the following graphs shows the effects of competition for the same food between a successful species and an unsuccessful species?

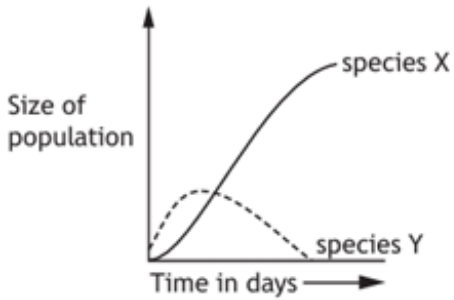
A



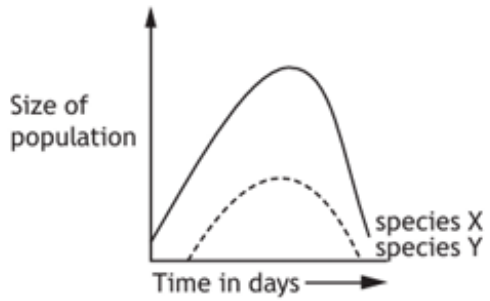
B



C



D



9. Which of the following describes correctly a niche?

A The place where an organism lives

B Organisms and their environments

C A population of organisms in an ecosystem

D The role of an organism in an ecosystem

10. Which of the following describes interspecific competition?

A Individuals of different species requiring different resources.

B Individuals of different species requiring similar resources.

C Individuals of the same species requiring different resources.

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11. The Treecreeper is a bird which feeds on small insects on the bark of trees during the day.

What is the correct description of the Treecreeper's niche?

A The place where it lives

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12. Plants compete mainly for

A water, light and soil nutrients

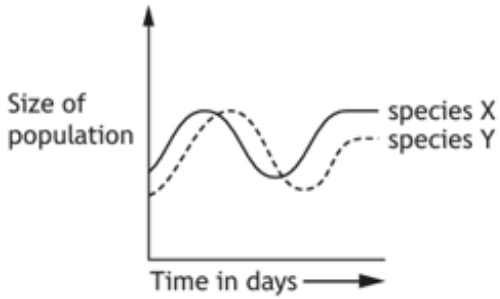
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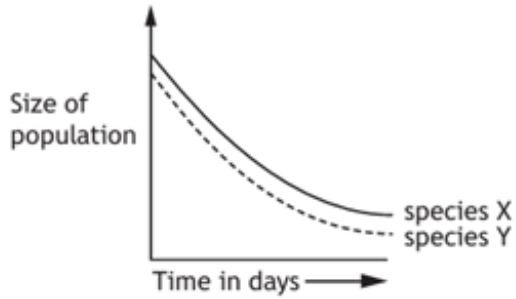
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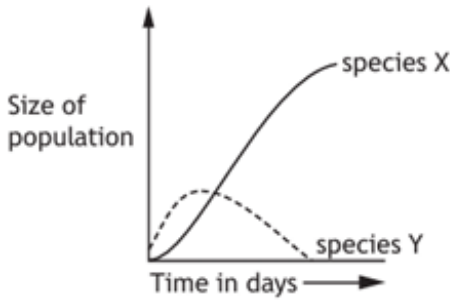
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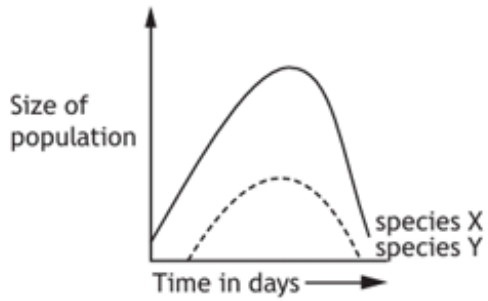
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13. The information below refers to some woodland birds.

Bird species	*Common food eaten*	*Nest location*
Lesser spotted woodpecker	insects	dead trees
Green woodpecker	ants, other insects	live trees
Greater spotted woodpecker	insects, nuts, seeds	live trees
Treecreeper	insects, spiders, seeds	dead trees

Between which two bird species will competition for food and nest location be greatest?

A Lesser spotted woodpecker and treecreeper

B Greater spotted woodpecker and lesser spotted woodpecker

C Lesser spotted woodpecker and green woodpecker

D Greater spotted woodpecker and treecreeper

14. The table below shows the relationship between planting density and the mass of seed harvested for a trial cereal crop.

Planting density (number of plants per square metre)	*Mass of seed harvested (grammes per square metre)*
4	60
8	86
16	104
32	77
128	22

The reason a low mass of seed was harvested when the planting density was 128 plants per square metre was

A less disease at high planting densities

B more nutrients available

C more competition for light and nutrients

D less space for weeds.

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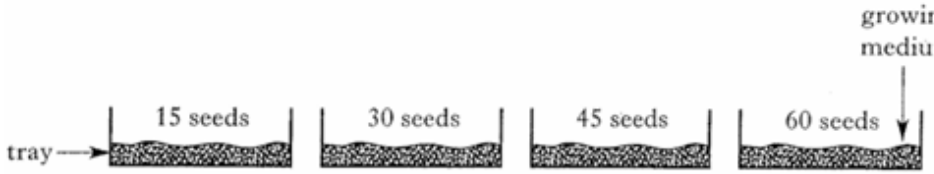
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1. (*a*) Groups of students carried out an investigation into the effects of competition.

Trays containing seeds were set up as shown below.



The trays were watered regularly to allow germination to take place.

After several days the seedlings were observed and the number with healthy green leaves was noted.

The results are shown in the table below.

Number of seeds in each tray	*Number of seedlings with healthy green leaves*	*Percentage of seedlings with healthy green leaves*
15	12	80
30	18	60
45	23	51
60	24	40

State **two** factors for which the seedlings could be competing in this investigation.

1 _____

2 _____ **1**

2. The leaves of black walnut trees produce a chemical which is released into the soil when the leaves fall. This chemical prevents the germination (growth) of other plant seeds. The chemical can be extracted from the leaves.

(*a*) Explain why producing this chemical is an advantage to the black walnut trees.

_____

_____ **1**

(*b*) State the term used to describe the role of an organism within an ecosystem.

_____ **1**

3. In African grasslands impala, giraffe and zebra feed on *Acacia* trees. Impala and zebra also graze on grasses.

Acacia



impala



giraffe



zebra



(*a*) State one way that competition for food is reduced between zebras and giraffes.

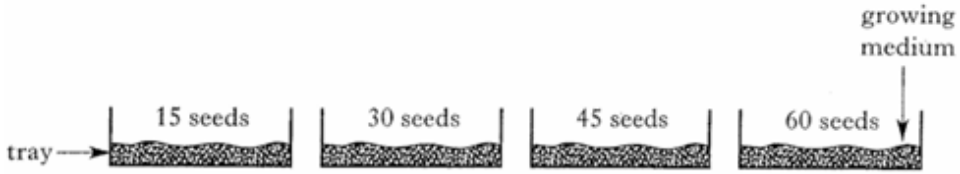
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(*b*) Name **one** requirement, other than water, for which plants may be in competition.

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Prevents germination/growth of other plant seeds. 1

(*b*) State the term used to describe the role of an organism within an ecosystem.

niche 1

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Acacia impala giraffe zebra



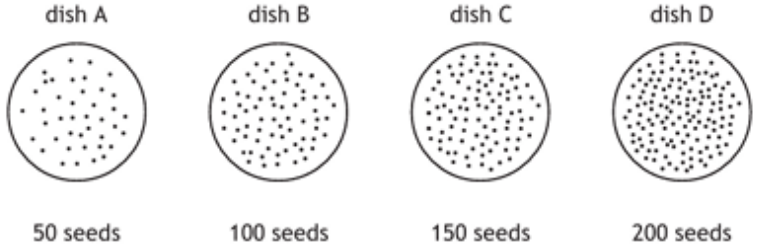
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Giraffe fed on trees whereas zebra feed on grass 1

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Nutrients/space/light 1

4. A student set up four Petri dishes of equal size to investigate competition in cress seeds of the same species. The seeds were scattered on moist filter paper and left to germinate (grow) in the dark.



The number of seeds germinating in each dish was counted.

The table shows the results.

Dish	Seeds per dish	Number of germinating seeds	Germinating seeds (%)
A	50	45	90
B	100	80	80
C	150	90	60
D	200	60	30

(a) Competition was greatest in dish D.

Explain why this conclusion was drawn. **1**

(b) Name the type of competition that occurs among these germinating seeds. **1**

(c) Explain why competition in ecosystems occurs. **1**

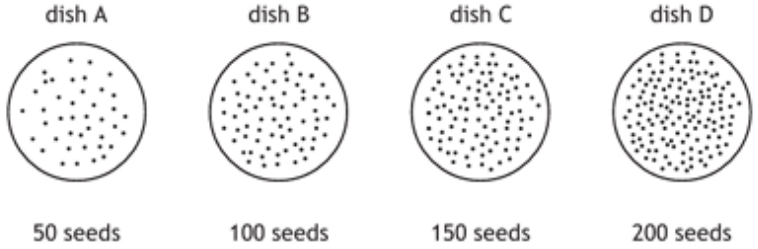
5. Pine martens are omnivores found in the Caledonian forest.



Scottish wildcats compete with pine martens for resources.

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(a) Competition was greatest in dish D.

Explain why this conclusion was drawn. 1

Lowest percent of germinating seeds

(b) Name the type of competition that occurs among these germinating seeds. 1

intraspecific

(c) Explain why competition in ecosystems occurs. 1

Limited resources

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Name this type of competition. 1

interspecific

6. A group of students carried out a five year investigation into plant growth in an area of abandoned farmland.

They sampled the area using quadrats.

The results are shown in the table below.

	Average abundance of each plant		
Year	*Meadow grass*	*Ragwort*	*Pink campion*
2011	8	15	9
2012	16	14	7
2013	24	12	4
2014	25	8	2
2015	25	5	1

(a) **Use information from the table** to suggest why the ragwort abundance decreased over the five-year period. **1**

_____

_____

_____

(b) During the investigation the students found four different species of periwinkles at different positions on the rocky shore.



The highest position that the sea water reaches on the shore is called the high tide level.

The bars in the table below represent the positions on the shore where each species of periwinkle was found.

	Species of periwinkle			
Position on shore	*Small*	*Edible*	*Rough*	*Flat*
High tide level ↓ Low tide level				

(i) State which species of periwinkle is least likely to compete with the small periwinkle.

Explain your answer. **1**

Species _____

Explanation _____

(ii) Using the information given, explain why the competition between these periwinkles is described as interspecific. **1**

_____

_____

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Increased numbers of meadow grass out competing ragwort

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Explain your answer. **1**

Species Flat

Explanation small is at high tide and flat is at low tide

(ii) Using the information given, explain why the competition between these periwinkles is described as interspecific. **1**

They are different species

7. Charles Darwin visited the Galapagos Islands. He found different species of finch on the different islands.

The following gives information on the size and shape of beaks and the island habitats of two of the Galapagos finches.

Size and shape of beak	*Habitat*
Long and narrow	Rotting logs that provide food for insects
Short and wide	Trees and shrubs that provide seeds and nuts



Finch A

Finch B

(*a*) State which finch eats insects and give a reason for your answer.

Finch _____

Reason _____

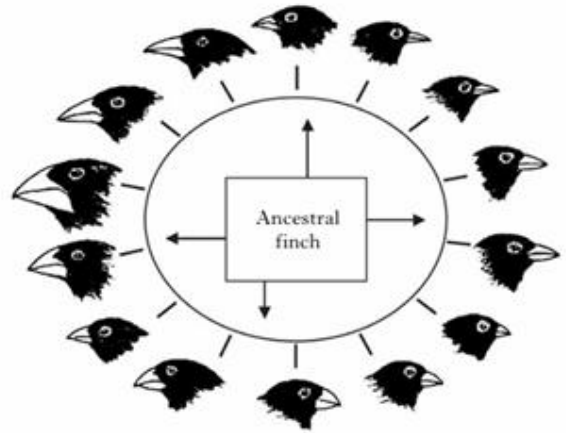
_____ 1

(*b*) Identify **two** ways in which competition between finch A and finch B is reduced.

_____

8. It is thought that Darwin's finches evolved from one type of ancestral finch.

The diagram below shows examples of different species of Darwin's finches.



(*a*) What **two** observations can be made from the diagram about the structure of the finches' beaks?

_____ 1

(*b*) What term is used to describe the role that each finch plays within its community?

_____ 1

9. The diagrams below give some information about three species of Darwin's Finches which live on the Galapagos Islands.



Feeds on insects



Feeds on seeds



Feeds on seeds

Using evidence from the diagrams, explain why these three finch species occupy different niches.

_____

_____

_____ 2

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Finch A

Finch B

(*a*) State which finch eats insects and give a reason for your answer.

Finch A

Reason Has a long and narrow neck to eat insects

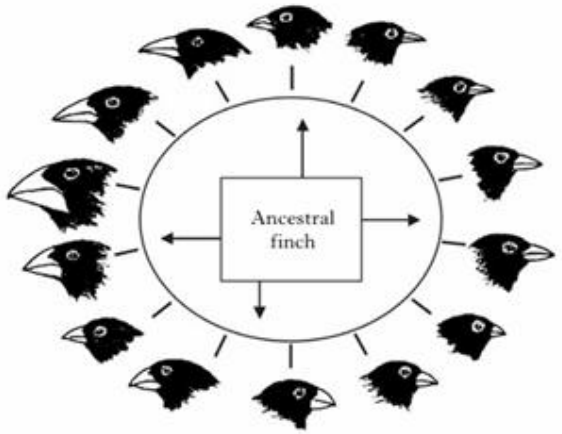
1

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Different shaped beaks to eat different food

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The diagram below shows examples of different species of Darwin's finches.



(*a*) What **two** observations can be made from the diagram about the structure of the finches' beaks?

Different shape and length

1

(*b*) What term is used to describe the role that each finch plays within its community?

niche

1

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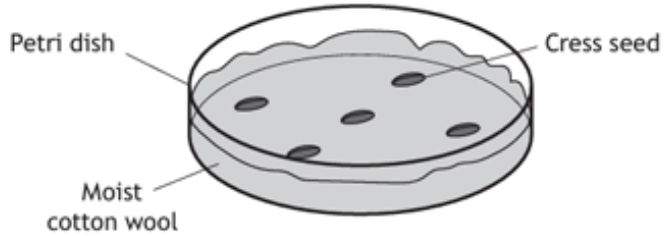
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Different shaped beaks to eat different food

2

10. To investigate the effect of competition on the growth of cress seeds, five Petri dishes, labelled A–E, were set up and left for six days. Each dish contained a layer of moist cotton wool with different numbers of cress seeds sown evenly across its surface.

Dish A is shown in the diagram.



The results are shown in the table.

Dish	*Number of seeds sown*	*Number of seedlings surviving after six days*	*Percentage of seedlings surviving after six days*
A	5	5	100
B	10	10	100
C	20		95
D	40	34	85
E	80	60	75

(a) Explain why the type of competition shown in this investigation is described as being intraspecific. **1**

(b) Name one resource, other than water, for which plants may be in competition. **1**

11. The Scottish crossbill is a small bird which is native to Scotland. It inhabits pine forests in northern Scotland and feeds on pine seeds using its crossed beak.



(a) State the term used to describe the role of the Scottish crossbill within its community. **1**

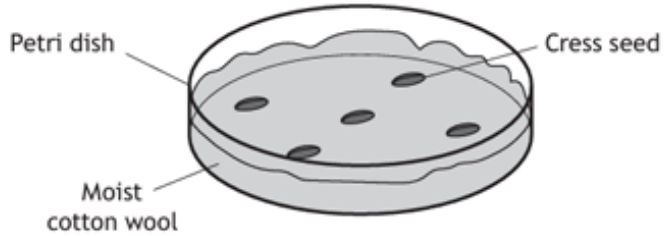
(b) Dover sole and rex sole are different species of flatfish and are predators of lugworms. Curlews, which are a species of wading bird, also feed on lugworms.

Complete the table below by placing a tick (✓) in the correct box to show the type of competition that would occur between the different predators. **1**

Predator	*Type of Competition*	
	Intraspecific	*Interspecific*
rex sole and curlew		
curlew and curlew		
rex sole and dover sole		

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D	40	34	85
E	80	60	75

(a) Explain why the type of competition shown in this investigation is described as being intraspecific. 1

Cress seeds are the same species

(b) Name one resource, other than water, for which plants may be in competition. 1

Light/moisture/nutrients/space

11. The Scottish crossbill is a small bird which is native to Scotland. It inhabits pine forests in northern Scotland and feeds on pine seeds using its crossed beak.



(a) State the term used to describe the role of the Scottish crossbill within its community. 1

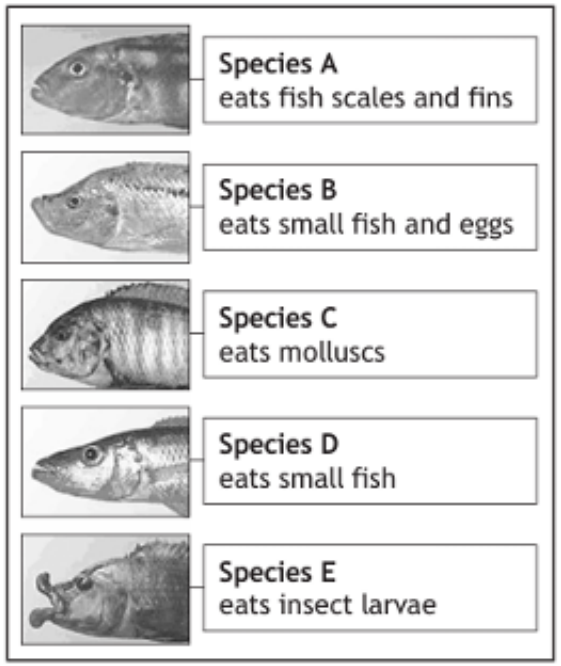
niche

(b) Dover sole and rex sole are different species of flatfish and are predators of lugworms. Curlews, which are a species of wading bird, also feed on lugworms.

Complete the table below by placing a tick (✓) in the correct box to show the type of competition that would occur between the different predators. 1

Predator	*Type of Competition*	
	Intraspecific	*Interspecific*
rex sole and curlew		x
curlew and curlew	x	
rex sole and dover sole		x

12. (a) Cichlid fish are all found in Lake Malawi in Africa.



(i) Using the information shown, identify the feature which enables Cichlid fish to have different diets. 1

_____

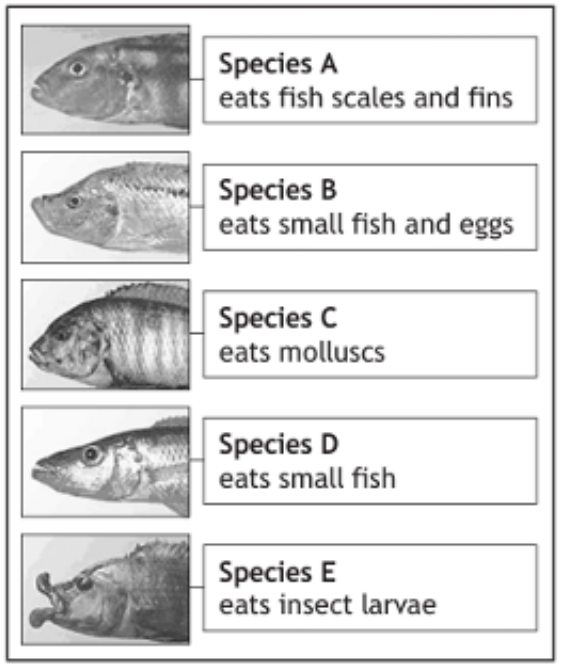
(ii) Predict **two** species of Cichlid which would be in competition with each other if there was a shortage of fish eggs. 1

Species _____ and _____

(b) State the term which describes the role that an organism, such as the Cichlid fish, plays within its community. 1

_____

12. (a) Cichlid fish are all found in Lake Malawi in Africa.



(i) Using the information shown, identify the feature which enables Cichlid fish to have different diets. 1

Different shaped mouths

(ii) Predict **two** species of Cichlid which would be in competition with each other if there was a shortage of fish eggs. 1

Species b and d

(b) State the term which describes the role that an organism, such as the Cichlid fish, plays within its community. 1

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