

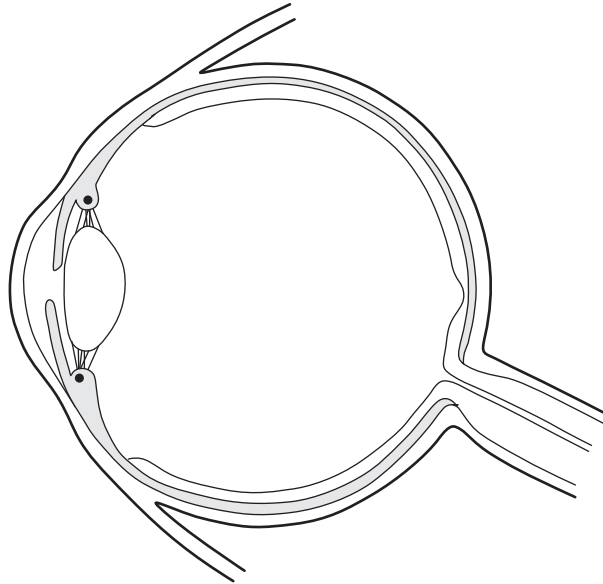


Answer **all** the questions.

**SECTION A – Module B1**

1 This question is about vision.

Look at the diagram of an eye.



(a) Draw straight lines to join each **part of the eye** to its **job**.

One has been done for you.

Part of eye	Job
cornea	carries impulses to the brain
iris	contains light receptors
optic nerve	controls amount of light entering eye
retina	refracts light

[2]

(b) As people get older, the lens in the eye becomes less flexible and cannot change shape easily.

This means they cannot focus clearly on near objects.

Explain why.

.....

.....

..... [2]

2 (a) Bronchi are airways leading to the lungs.

(i) Smoking cigarettes damages cells lining the bronchi.

What is the name of these cells?

Choose your answer from the list.

**ciliated epithelial cells**

**gamete cells**

**red blood cells**

**white blood cells**

..... [1]

(ii) Smoking can cause cancer in cells lining the bronchi.

Describe and explain **one other** way the smoke affects cells lining the bronchi.

.....  
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..... [2]

(iii) There are two main types of tumour.

People who smoke are more likely to get malignant tumours.

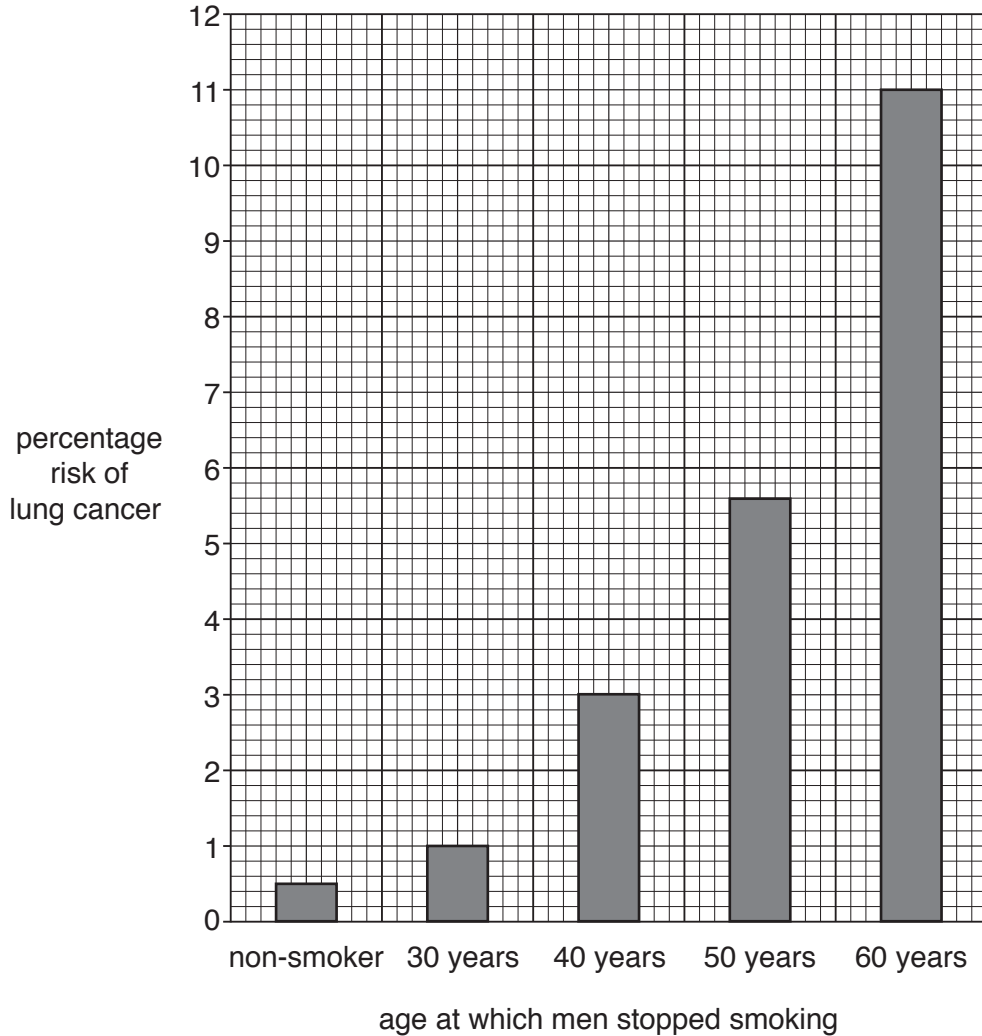
Name the **other** type of tumour and describe how it differs from a malignant tumour.

.....  
.....  
..... [2]

(b) Smoking cigarettes increases the risk of lung cancer.

Look at the graph.

It shows the risk of lung cancer in men who have stopped smoking.



(i) Estimate the risk of getting lung cancer for men who stop smoking at the age of 55 years.

..... % [1]

(ii) Stopping smoking reduces the risk of getting lung cancer.

Anti-smoking campaigns aimed at people under 30 will have the biggest effect on reducing lung cancer. Explain why.

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 .....  
 ..... [2]

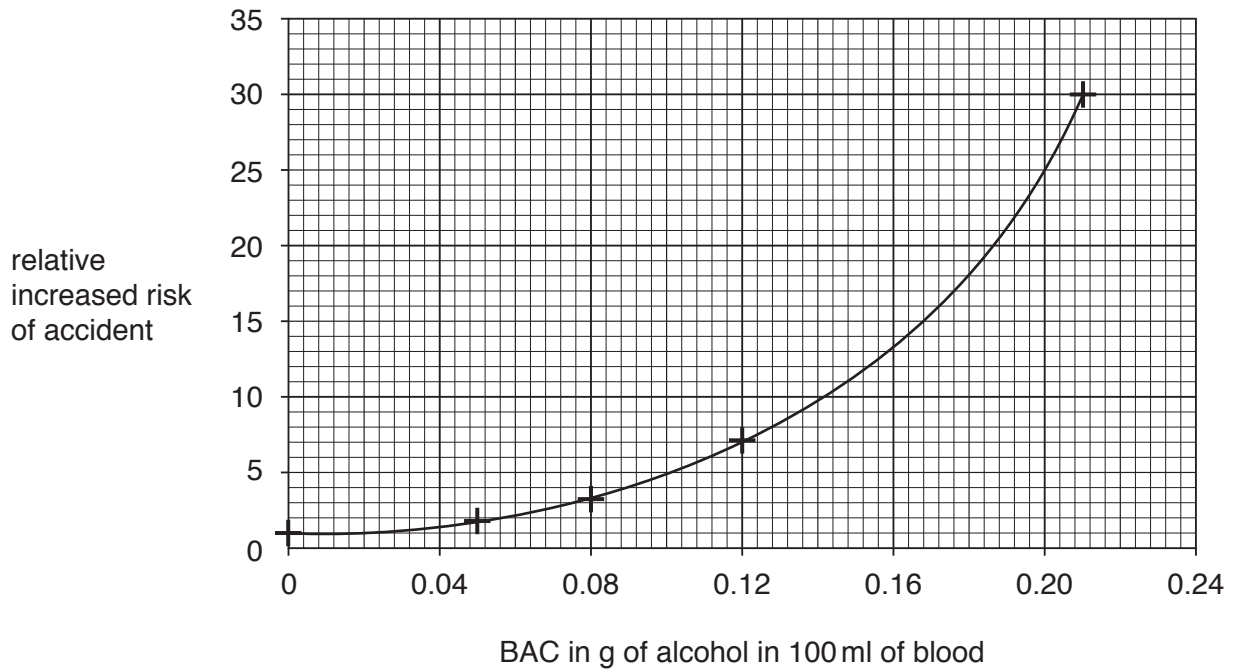
3 When someone drinks alcohol, it is absorbed into the bloodstream.

The amount of alcohol in the blood is shown by the blood alcohol concentration (BAC).

This is measured as the number of grams (g) of alcohol in 100 millilitres (ml) of blood.

Look at the graph.

It shows the relative increased risk of an accident based on BAC levels.



Read the information below.

All the alcohol consumed is absorbed into the bloodstream.

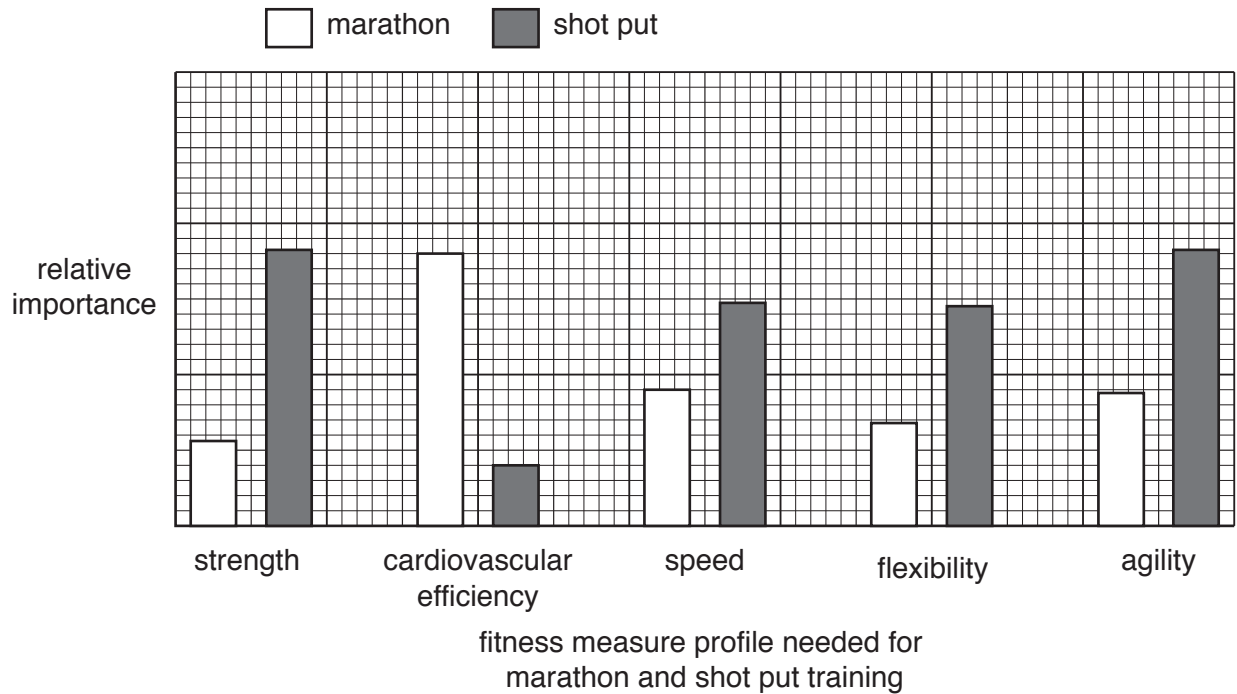
There are 4000 ml of blood in the body of an adult.



- 4 The marathon and the shot put are two different athletic events.  
The fitness training for the marathon and shot put are very different.

Look at the graph.

It shows the fitness measure profile for the two events.



- (a) (i) The fitness measure profiles for strength and for cardiovascular efficiency for the two events are different.

Describe **one** difference.

.....

.....

..... [1]



(ii) Paula wants to train for a marathon.

She finds three different training programmes, **A**, **B** and **C**.

The table shows the levels of training for each fitness measure.

Fitness measure	Training programme		
	A	B	C
Strength	High	Low	Low
Cardiovascular efficiency	Medium	High	High
Speed	Low	Medium	Low
Flexibility	High	Medium	High
Agility	High	Medium	Low

Which training programme would be the best to use when training for a marathon?

Choose from **A**, **B** or **C** .....

Explain your choice.

.....

.....

..... [2]

(b) Paula’s mother is a good marathon runner but her father competes in the shot put.

Could Paula be a good marathon runner?

Explain your answer.

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..... [2]

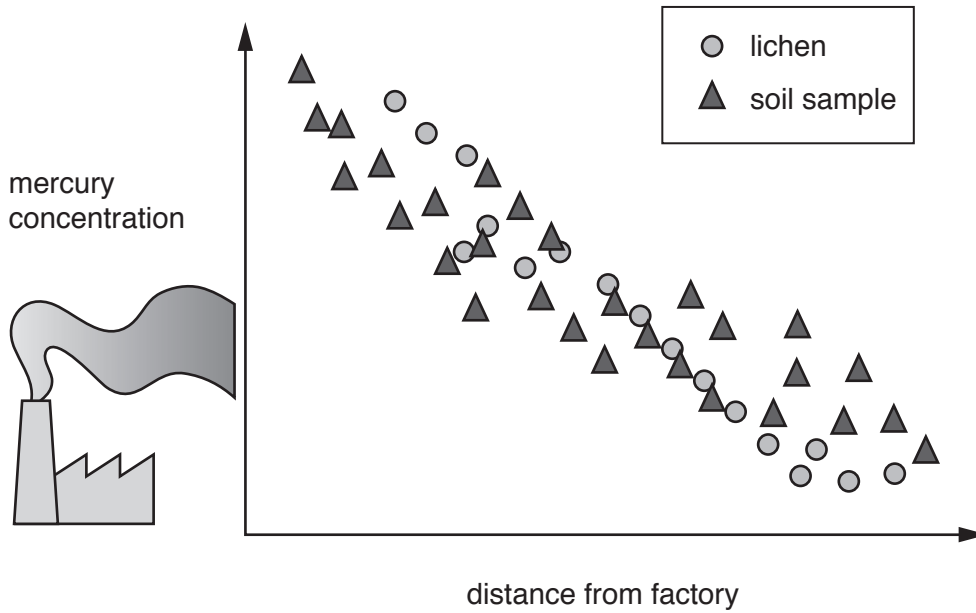
SECTION B – Module B2

5 This question is about mercury pollution.

The normal method of detecting mercury pollution is to measure its concentration in soil.

Scientists want to know if lichens can be used to measure mercury pollution.

The graph shows the concentration of mercury in lichens and in soil at different distances from a factory.



(a) Describe the trends shown in the graph.

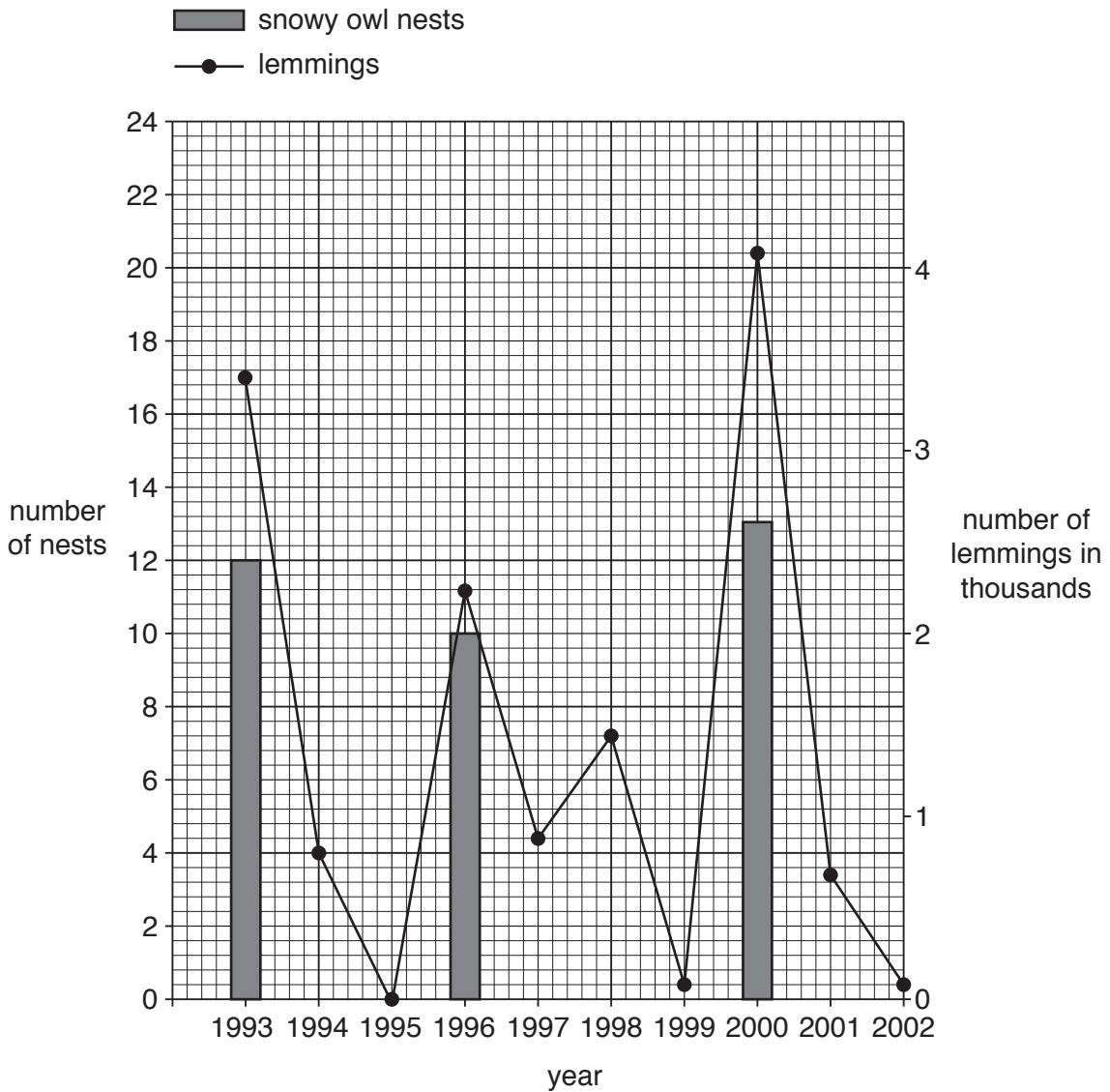
.....  
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..... [2]

(b) What conclusions can the scientists make about using lichens to measure mercury pollution?

.....  
.....  
..... [2]

6 (a) Snowy owls feed on lemmings.

The graph shows the number of snowy owl nests and the number of lemmings found on Bylot Island, Canada.



The data in the graph suggests there is a pattern shown between the breeding of snowy owls and the numbers of lemmings.

Describe this pattern and explain how it affects the **populations** of snowy owls and lemmings.

.....

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.....

[2]

(b) Look at the picture of a lemming.



Lemmings live in Arctic conditions.

They do **not** hibernate.

Suggest and explain how lemmings are adapted to cold environments.

.....  
.....  
..... [2]

(c) Penguins also live in cold climates.

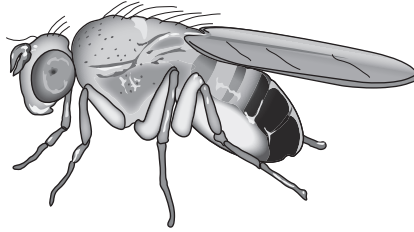
Penguins use a counter-current heat exchange system.

Explain how this adaptation reduces heat loss.

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.....  
..... [2]

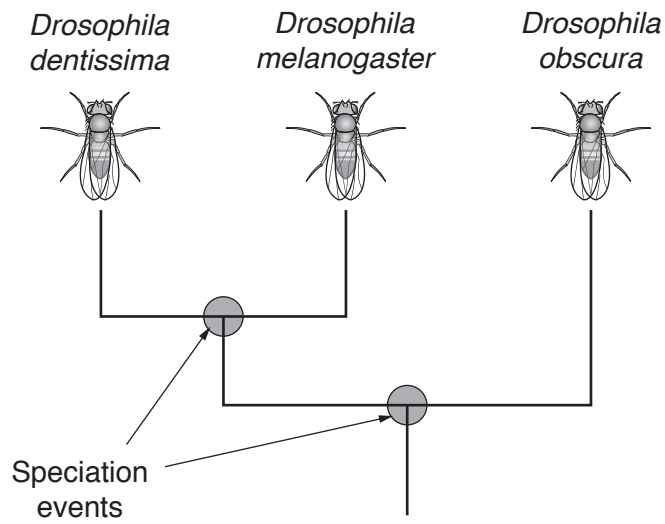
7 This question is about classification.

(a) The picture shows a species of fruit fly, *Drosophila melanogaster*.



Look at the diagram.

It shows part of an evolutionary tree for three different drosophila fruit flies.



What is the genus of all three fruit flies?

..... [1]

(b) Look at the picture of a Catalina macaw.

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Catalina macaws are produced when a 'Scarlet' macaw species breeds with a 'Blue and Gold' macaw species.

Most Catalina macaws are infertile.

However, there are now some Catalina macaws that can breed together and produce new Catalina macaws.

Explain why this has caused problems in classifying the Catalina macaw.

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.....  
.....  
..... [2]

(c) (i) Natural selection can help explain how species evolve.

When Charles Darwin suggested his ideas about evolution by natural selection, some people were against his theory.

Explain why.

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..... [2]

(ii) Natural selection is now widely accepted as a theory about evolution.

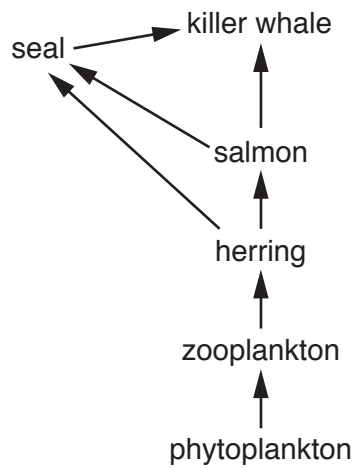
Explain why.

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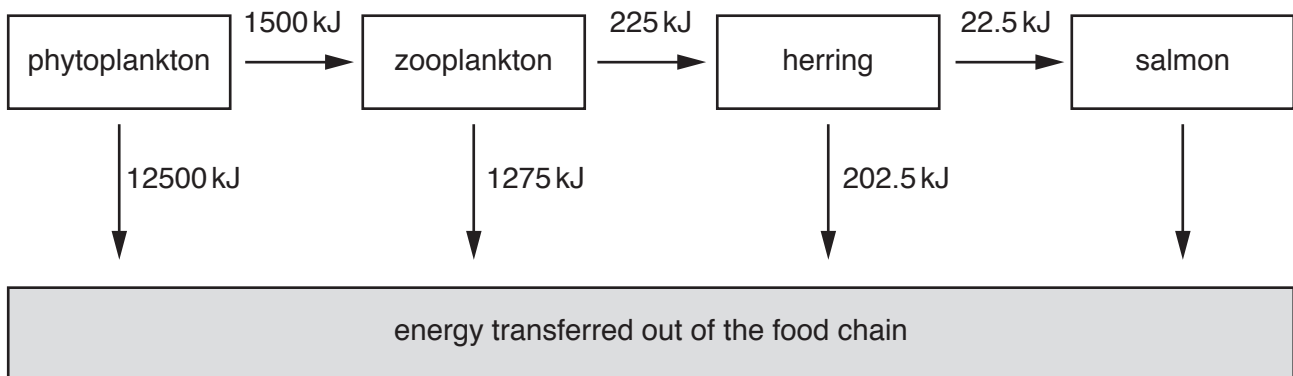
..... [2]

8 Look at the food web.



Look at the diagram.

It shows the energy flow in **part** of one food chain from the food web.







SECTION C – Module B3

9 Weever fish are small fish that live in sand in shallow waters on some of Britain’s beaches.

They have poisonous spines on their back.

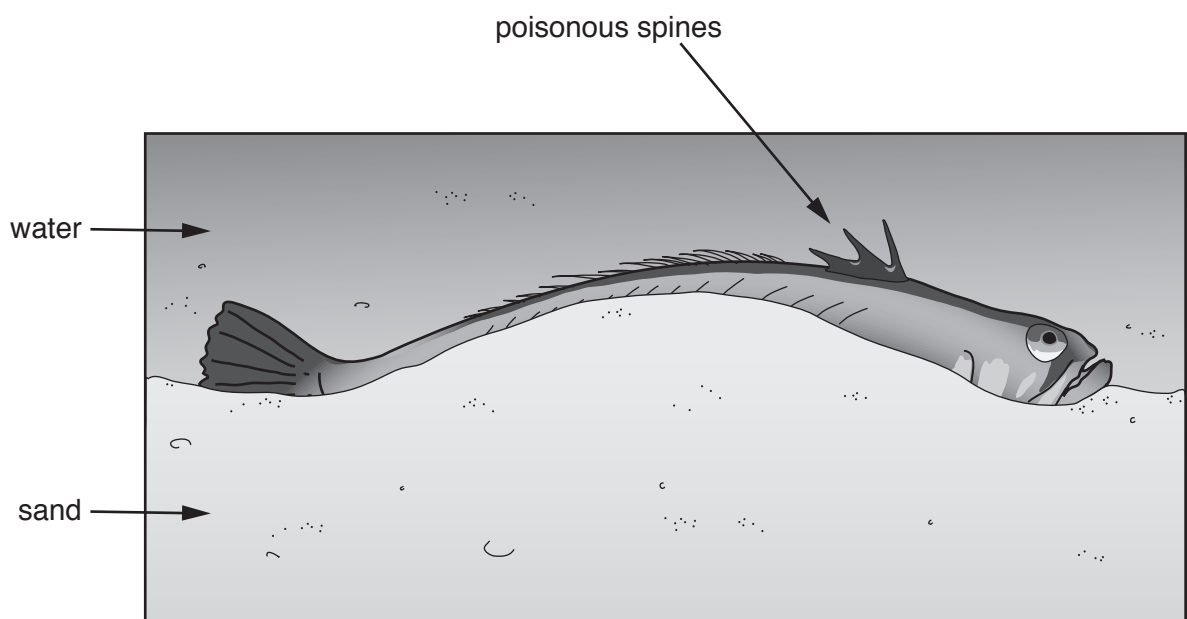
Anyone touching the spines can get a painful sting.

The spines inject a nerve poison made of protein.

The first aid treatment is to put the affected area in hot water, as hot as the victim can bear.

The pain will start to ease after a few minutes.

Although the sting is very painful, it does not usually cause any lasting harm.



(a) The weever fish poison is made of protein.

What are proteins made of?

..... [1]

(b) The treatment involves hot water, the hotter the better.

Suggest why.

.....  
.....  
..... [2]

(c) The information for making the poison is coded in the fish's DNA and is in every cell.

However, the poison is only produced in the spines.

Explain why the poison is **not** produced in every cell.

.....  
..... [1]

(d) On Britain's beaches in 2011, over 1000 holiday-makers were stung by weever fish.

Some people want to close the beaches where people have been stung.

Should the beaches be closed?

Explain your answer.

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.....  
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..... [2]



21  
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11 Read the newspaper article.

### Scientists make eggs from skin cells

In 2012, Japanese scientists reported that they had used normal skin cells from mice to make mouse stem cells.

They then used these stem cells to make eggs.

The eggs were fertilised with sperm from a male mouse and implanted into a female mouse.

When the baby mice were born they were perfectly healthy and grew up to breed normally and have babies of their own.

The scientists have also produced sperm cells in a similar way.

If these techniques could be used with humans they could help infertile couples have children.

(a) What are stem cells?

.....  
.....  
..... [2]

(b) The stem cells used by the Japanese scientists were different from normal mouse stem cells.  
How were these stem cells different from normal mouse stem cells?

.....  
.....  
..... [2]

(c) The stem cells are all clones of the skin cell they were made from.

Would the egg cells be clones of each other?

Explain your answer.

.....  
.....  
.....  
..... [2]

- (d) In the future, scientists could try to use similar techniques to produce human children. This will be controversial.

Some people think that it is unethical and goes against religious beliefs.

Suggest **other** reasons why it is controversial.

.....  
.....  
.....  
..... [2]

- (e) Sperm cells contain many mitochondria.

Mitochondria produce ATP.

What is ATP used for?

..... [1]

- (f) Egg cells contain many ribosomes.

The ribosomes use the genetic code from the nucleus.

- (i) What do ribosomes do?

..... [1]

- (ii) What substance carries the genetic code from the nucleus to the ribosomes?

..... [1]

- (iii) In the nucleus, the genetic code is contained in the base sequence of DNA.

Write down all the different bases.

..... [1]

**END OF QUESTION PAPER**

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