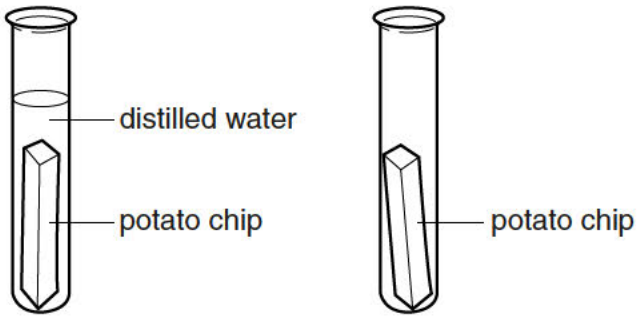
1 Katie cuts two chips from a potato.

She puts one of the chips into a test tube of distilled water.

Katie puts the other chip into an empty test tube.



(a) Water enters the cells of the potato chip that has been left in distilled water by osmosis.

Explain why.

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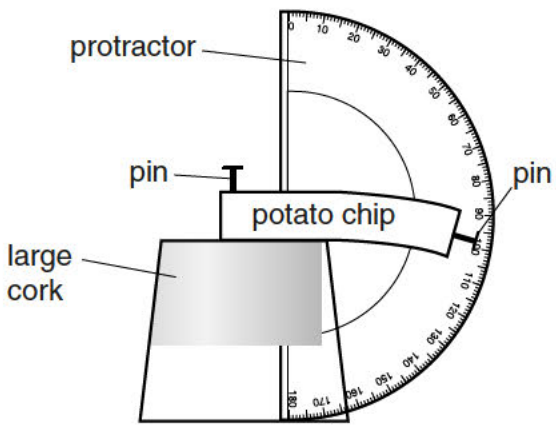
..... **[2]**

(b) Katie takes the potato chip out of the empty test tube.

She measures how much it bends.

To do this, she pins the chip to a cork.

Katie then measures how much it bends, using a protractor.



(i) Katie then measures how much the chip from the distilled water bends.

The chip that has been in distilled water does **not** bend.

Explain why.

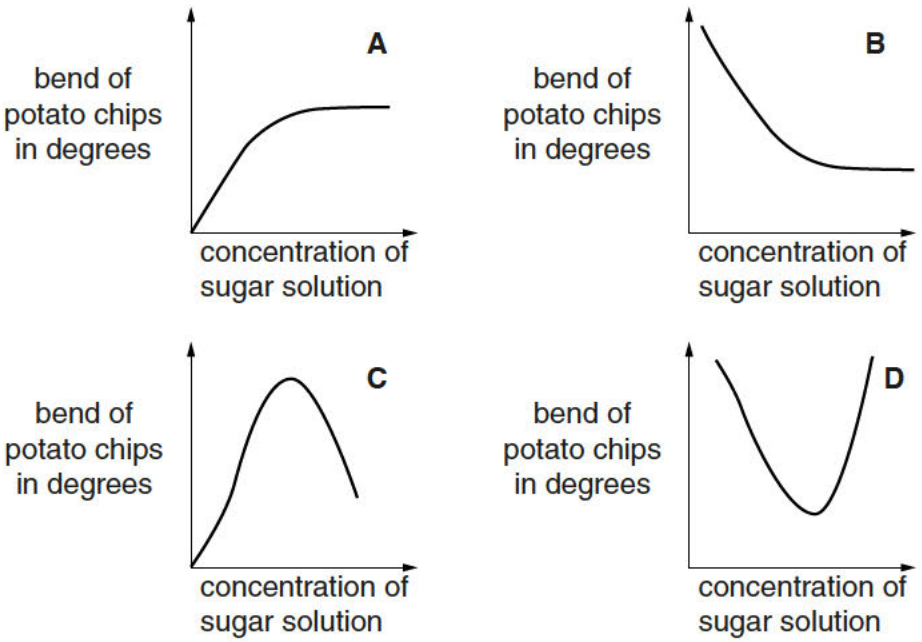
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..... **[2]**

(ii) Katie repeats her experiment, but puts potato chips in different concentrations of sugar solution.

Look at the graphs.



Write down the letter of the graph that shows Katie's expected results.

answer ..... **[1]**

[Total: 5]

2 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?

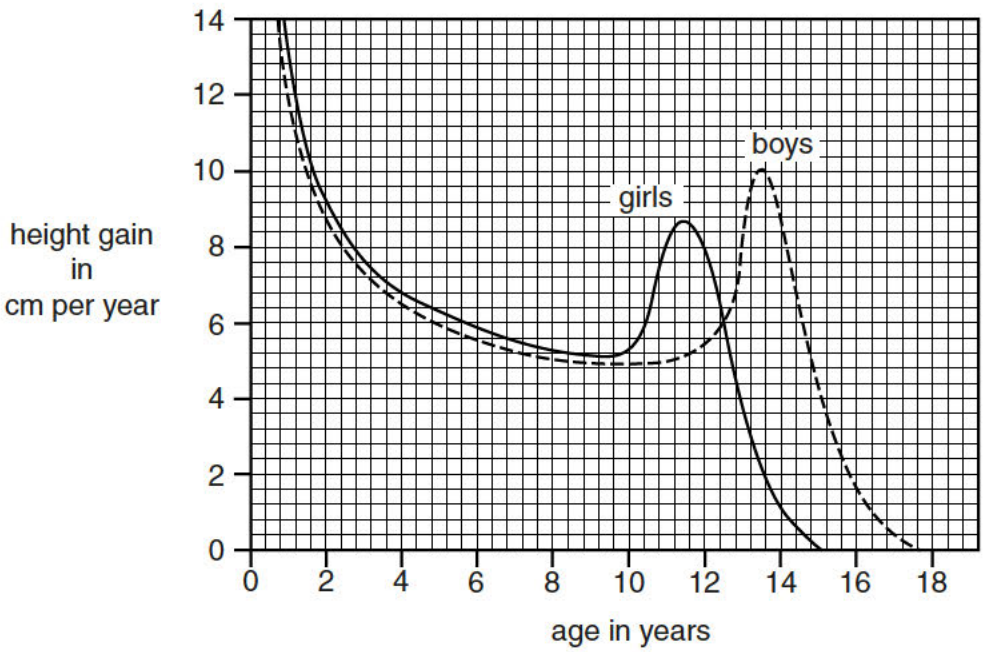
..... **[1]**

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

Write down all the different bases.

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

3 **(a** The graph shows the average height gained per year by girls and boys at different ages.



Use the graph to answer these questions.

(i) At what age do girls start adolescence?

..... years **[1]**

(ii) At what age do boys grow at their fastest rate?

..... years **[1]**

(iii) At which age is there the greatest difference in the rate of growth between girls and boys?

..... years

How can you tell this from the graph?

.....

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

(b) Girls and boys grow by their cells dividing.

(i) What is the name of this type of cell division?

..... [1]

(ii) Just before cells divide, DNA replication occurs.

Describe how DNA replication occurs.

You may use labelled diagrams to help you answer.

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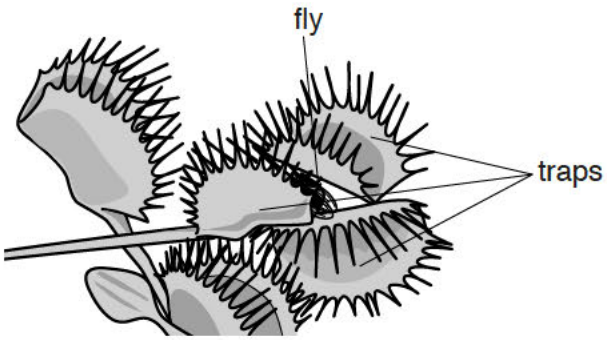
..... [3]

[Total: 8]

4 The venus flytrap is a plant that lives in very wet ground, such as bogs.

Bogs contain very low levels of minerals, such as nitrates, that plants need for growth.

The venus flytrap catches insects which it digests to get minerals.



(a) Venus flytraps digest insects by extracellular digestion.

What does **extracellular** mean?

.....

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

(b) Bogs contain very low levels of minerals because the rate of decay is very slow.

This is because very low levels of oxygen mean there are very low numbers of the microorganisms that cause decay.

Explain why very low levels of oxygen mean there are very low numbers of these microorganisms.

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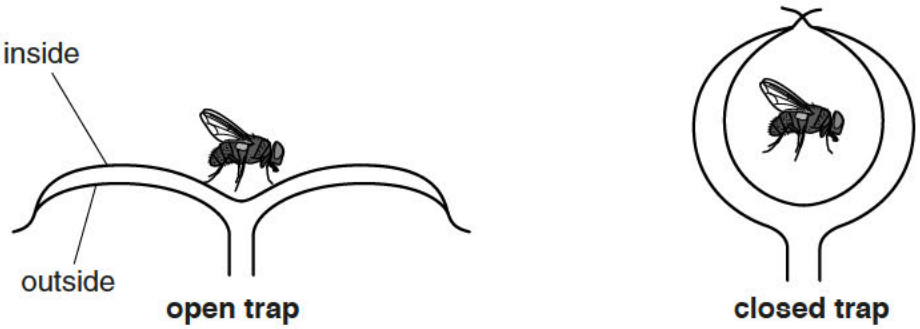
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..... **[2]**

(c) The way the traps close to catch insects involves osmosis.

The cells on the outside of the trap become turgid and swell more than the cells on the inside.

This causes the trap to close.



Suggest how the cells on the outside become more turgid than those on the inside.

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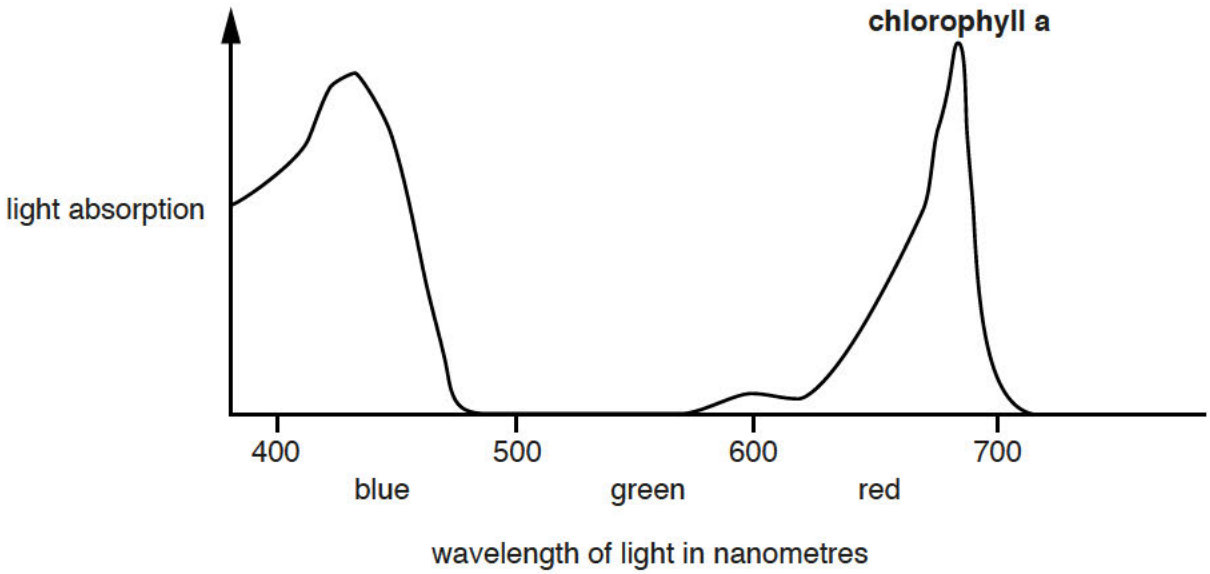
..... **[3]**

(d) The outside of each trap is green because these cells contain **chlorophyll a**.

The inside of each trap is red because these cells contain a red pigment called anthocyanin.

The red colour attracts insects.

The diagram shows how **chlorophyll a** absorbs light of different wavelengths.



Draw a line **on the graph** to show the absorption of light by anthocyanin. **[1]**