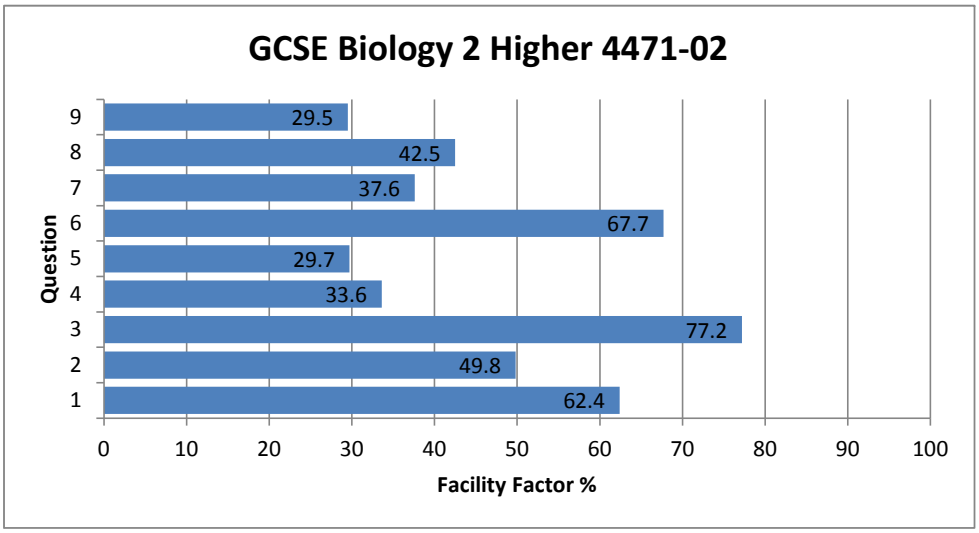
WJEC 2014 Online Exam Review

GCSE Biology 2 Higher 4471-02

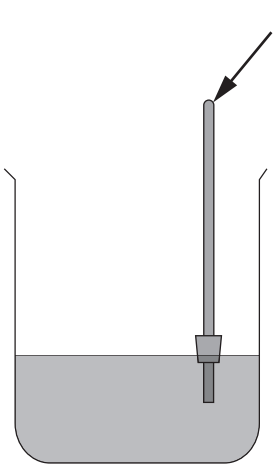
All Candidates' performance across questions

Question Title	N	Mean	S D	Max Mark	F F	Attempt %	
1	5240	4.4	1.6	7	62.4	100	
2	5241	3	1.3	6	49.8	100	
3	5241	3.9	0.9	5	77.2	100	
4	5195	2	1.5	6	33.6	99.1	
5	5231	1.8	1.6	6	29.7	99.8	5
6	5241	6.1	2.1	9	67.7	100	
7	5237	2.6	1.3	7	37.6	99.9	7
8	5238	3.4	1.7	8	42.5	99.9	
9	5210	1.8	2.1	6	29.5	99.4	9



Examiner only

5. An experiment was set up to investigate the digestion of fat in milk by lipase. The following apparatus was used.



Beaker containing milk and lipase

Laptop with pH readout from WiFi pH sensor

The beaker containing milk and lipase was kept at a constant temperature in a water bath.
The pH readout on the laptop was recorded every 5 minutes for 40 minutes.
The results are shown below.

time (minutes)	pH
0	9.1
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(a) Explain why the pH changed during the experiment. [2]

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(b) (i) The average rate of fall in pH in the first 20 minutes is 0.025 pH units per minute. After 20 minutes bile was added to the beaker.
Calculate the average rate of fall in pH units per minute in the 20 minutes after the bile was added. [1]

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Turn over.

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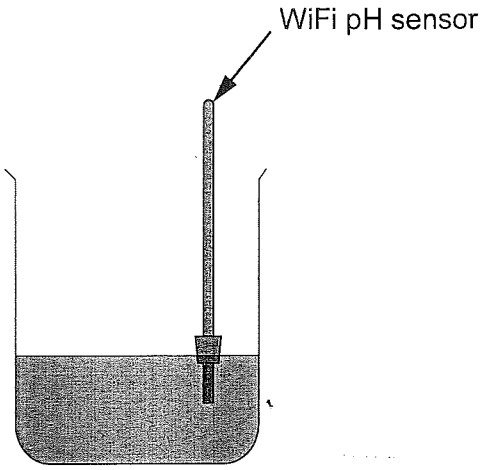

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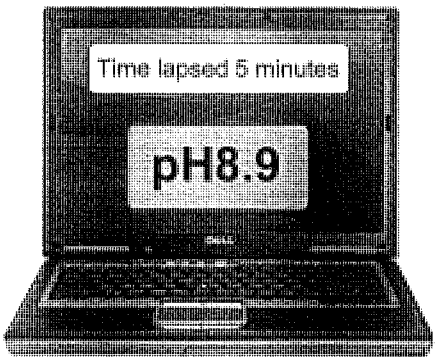

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(a) Explain why the pH changed during the experiment. [2]

The PH changed during the experiment due to lipase breaking down the fat contained in the milk.

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Calculate the average rate of fall in pH units per minute in the 20 minutes after the bile was added. [1]

1·1 0·5
0·6
0·5

0·675 pH units per minute

(ii) Explain why the rate of fall in pH **increased** when bile was added. [3]

It increased because bile emulsifies the fats in the milk, which increases the surface area. This then means that lipase can work faster causing the Ph to ~~rise~~ fall faster.

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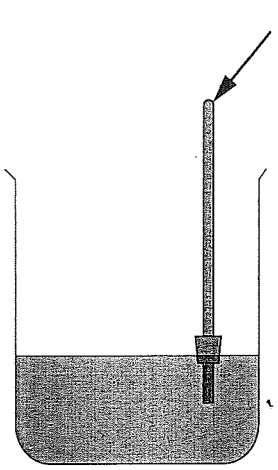

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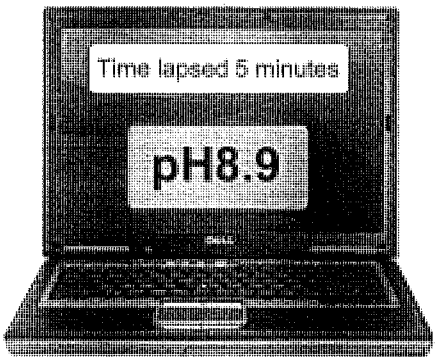

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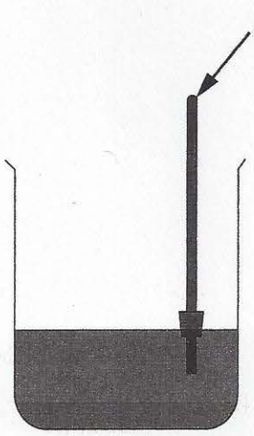

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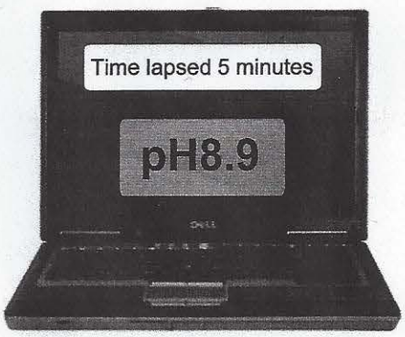

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(a) Explain why the pH changed during the experiment. [2]

The lipase would have digested milk (fat) to produce glycerol and fatty acids i to cause the solution to become acidic.

Examiner only

(b) (i) The average rate of fall in pH in the first 20 minutes is 0.025 pH units per minute. After 20 minutes bile was added to the beaker.
Calculate the average rate of fall in pH units per minute in the 20 minutes after the bile was added. [1]

0·625 pH units per minute

(ii) Explain why the rate of fall in pH **increased** when bile was added. [3]

Bile emulsifies fat; breaks large droplets of fat into smaller droplets. This increases their surface area for lipase to work on, and increasing their rate of digestion.

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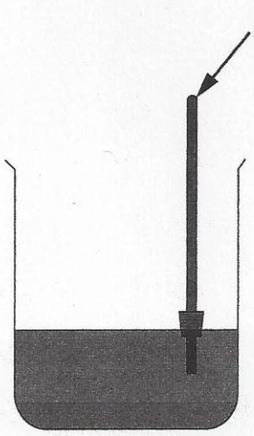

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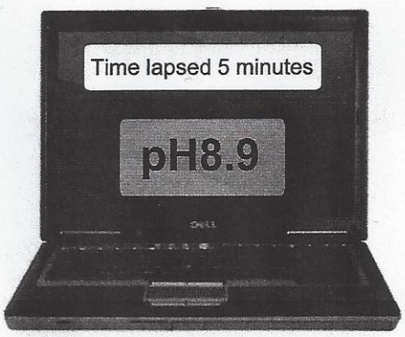

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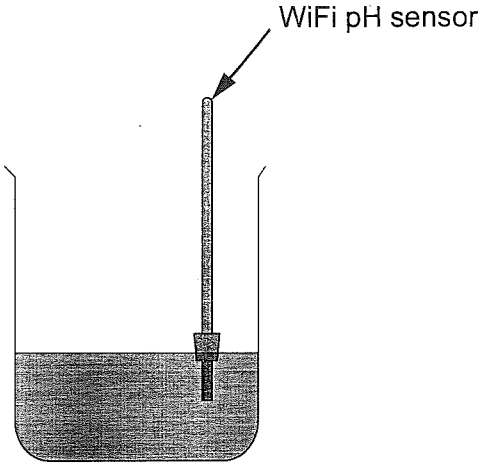

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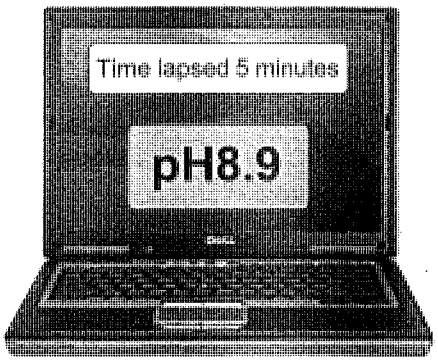

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The pH is decreasing as the time increases. This is because the lipase is breaking the fat in the milk into fatty acids and glycerol. The fatty acids that are being produced are lowering the pH and making it more acidic.

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Calculate the average rate of fall in pH units per minute in the 20 minutes after the bile was added. [1]

8·6 − 5·9 = 2·7 2·7 ÷ 20 = 0·135

0·135 pH units per minute

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Bile emulsifies fats therefore it ~~xxxx~~ breaks large globules into smaller globules, increasing the surface area and making it easier for lipase to work on. Fatty acids are therefore being produced at a faster rate because of the increased surface area so the rate of fall in pH increased when bile was added

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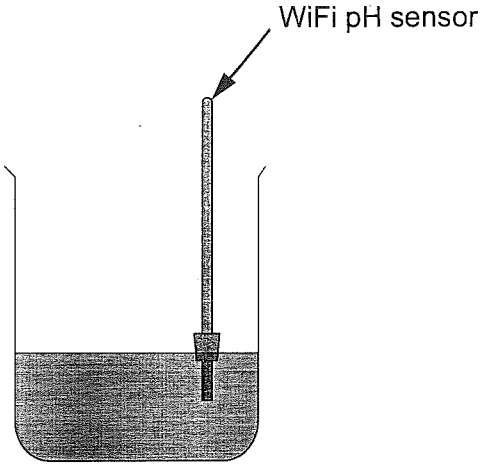

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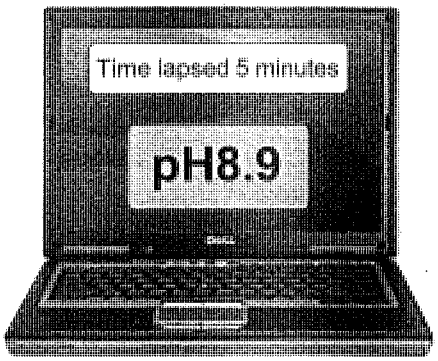

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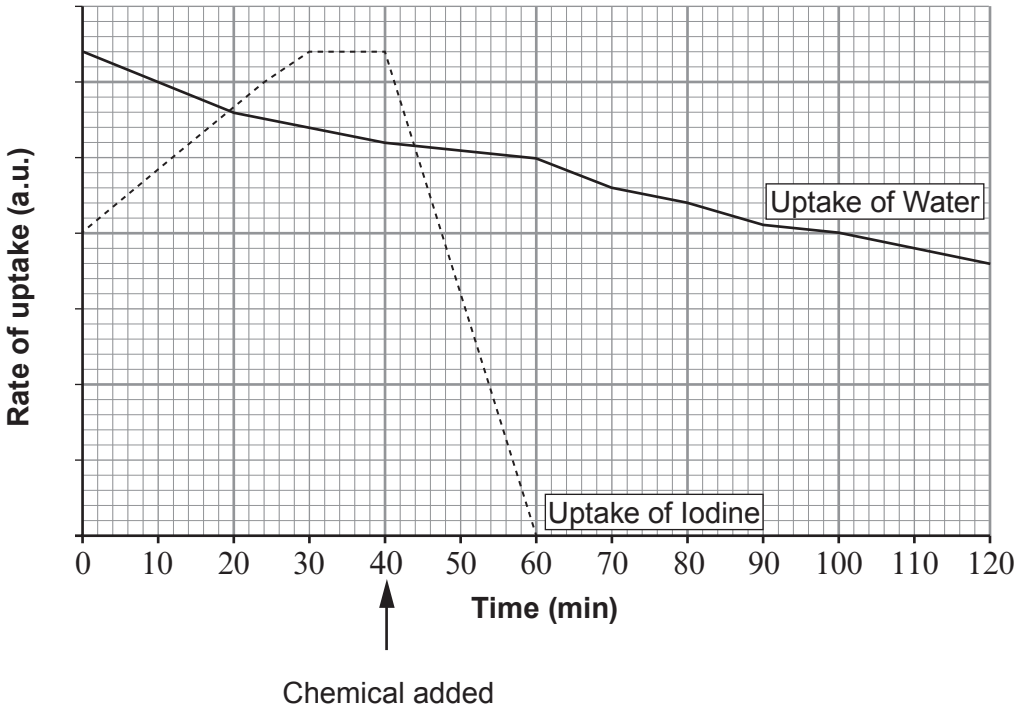
7. Kelp, *Laminaria digitata*, is an alga which lives in the sea.

The graph below shows the rate of uptake of water and iodine from sea water into kelp in a laboratory.



Examiner only

At forty minutes, a chemical was added to the sea water which stopped respiration taking place in the cells of the kelp.

(a) (i) Use the graph opposite to **describe** the effect of adding the chemical on the uptake of iodine **and** water. [3]

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7

Turn over.

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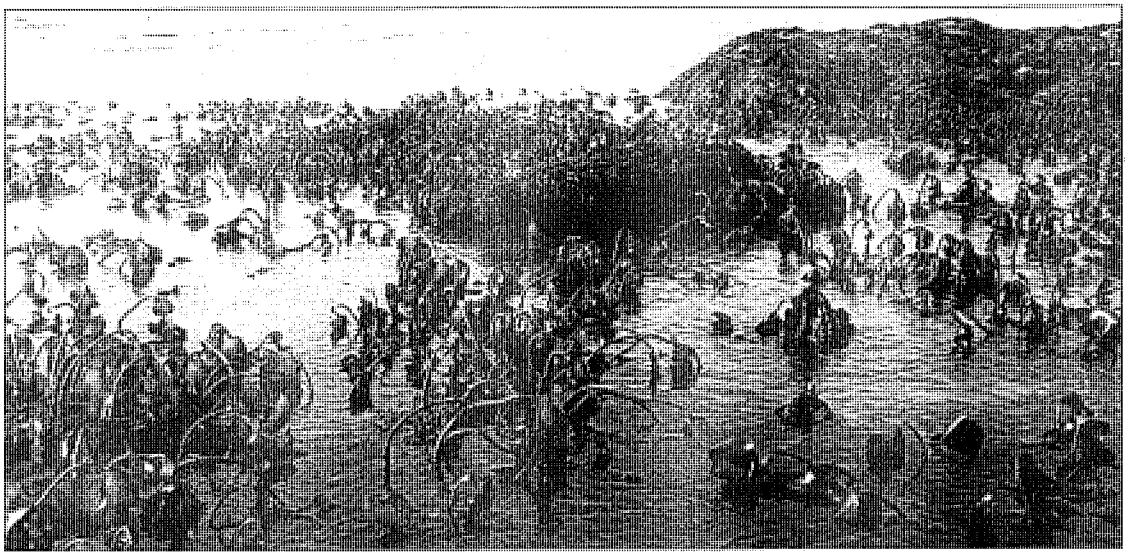

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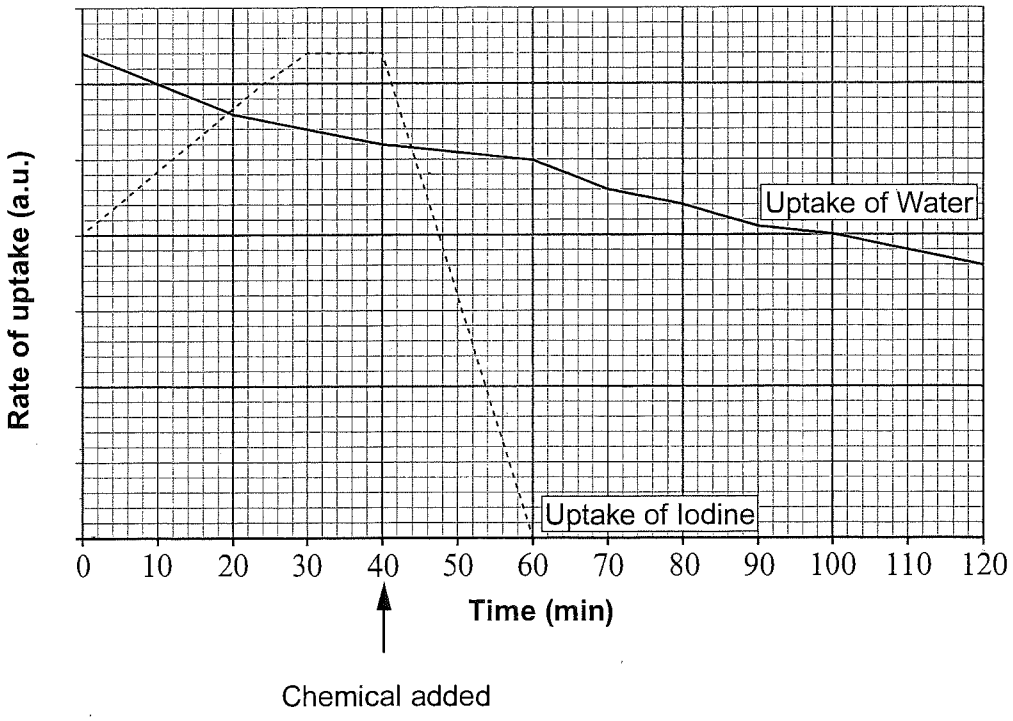

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(ii) **Explain** the effect of adding the chemical on the uptake of iodine. [3]

the iodine moved from a high concentration to a low concentration as the chemical was added It moved down a concentration gradient. Therefore the uptake of iodine decreased.

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osmosis

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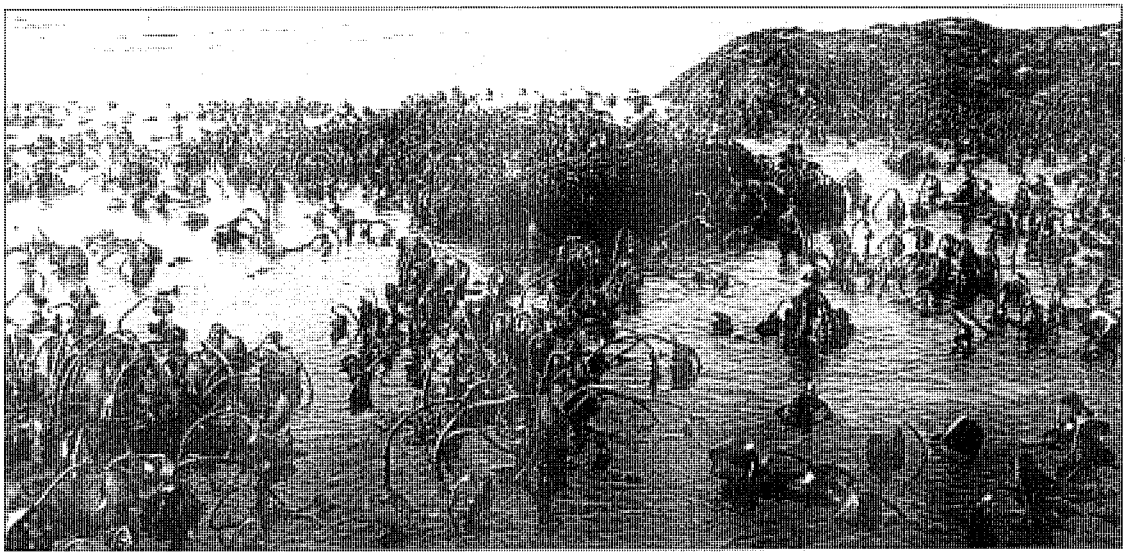

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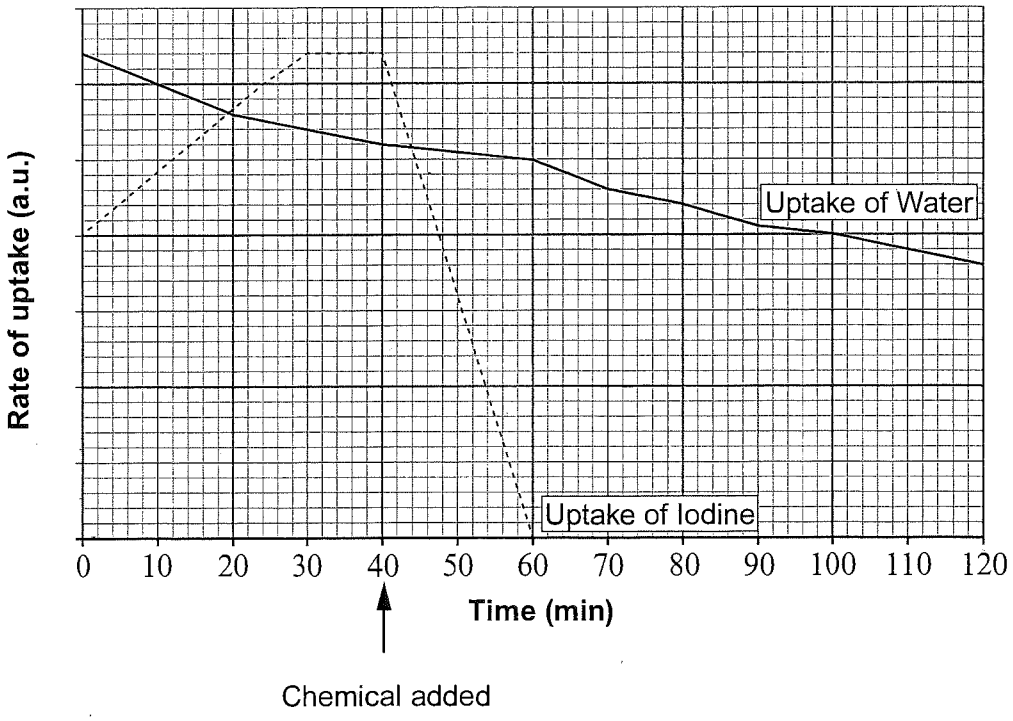

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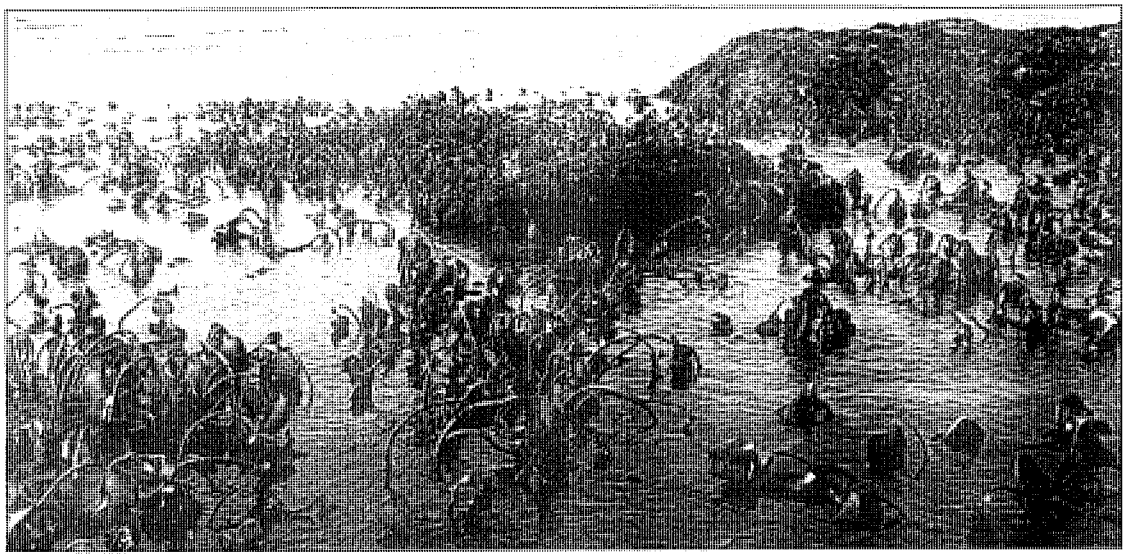

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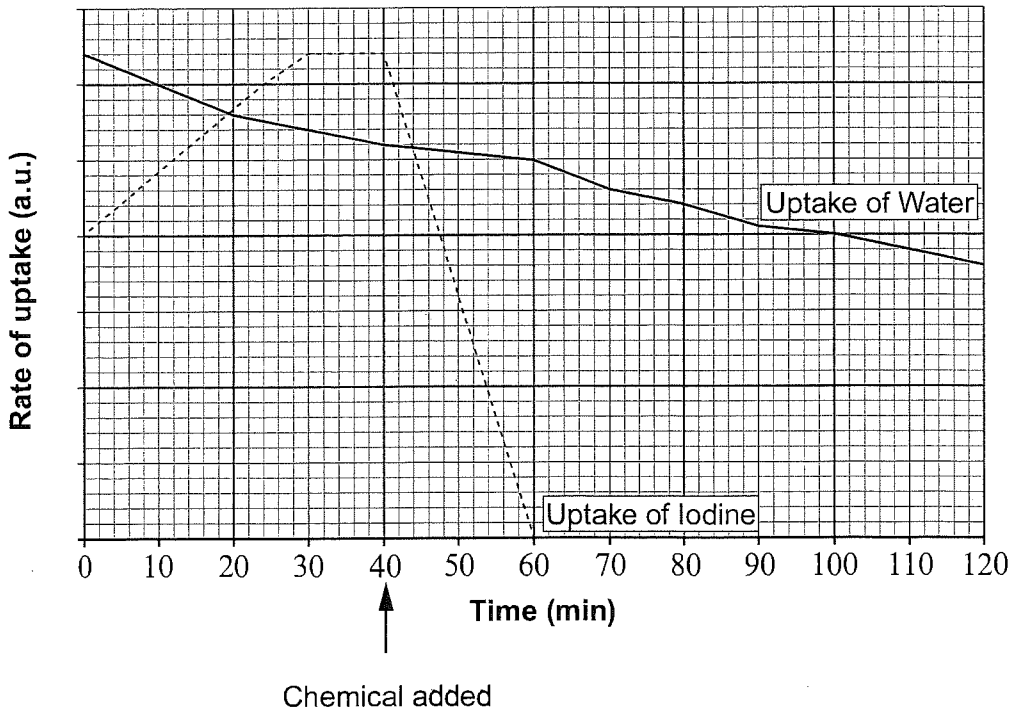

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At forty minutes, a chemical was added to the sea water which stopped respiration taking place in the cells of the kelp.

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When the chemical was added at 40 minutes, the rate of the uptake of iodine dramatically decreased until there was no uptake of iodine after 60 minutes. The uptake of water was already gradually decreasing before the chemical was added and it continued to gradually decrease after the chemical was added so it had no effect on the uptake of water.

(ii) **Explain** the effect of adding the chemical on the uptake of iodine. [3]

The uptake of iodine dramatically decreased when the chemical was added. This is because iodine is used to test for starch therefore when the chemical was added, starch couldn't be made so the levels of iodine dropped.

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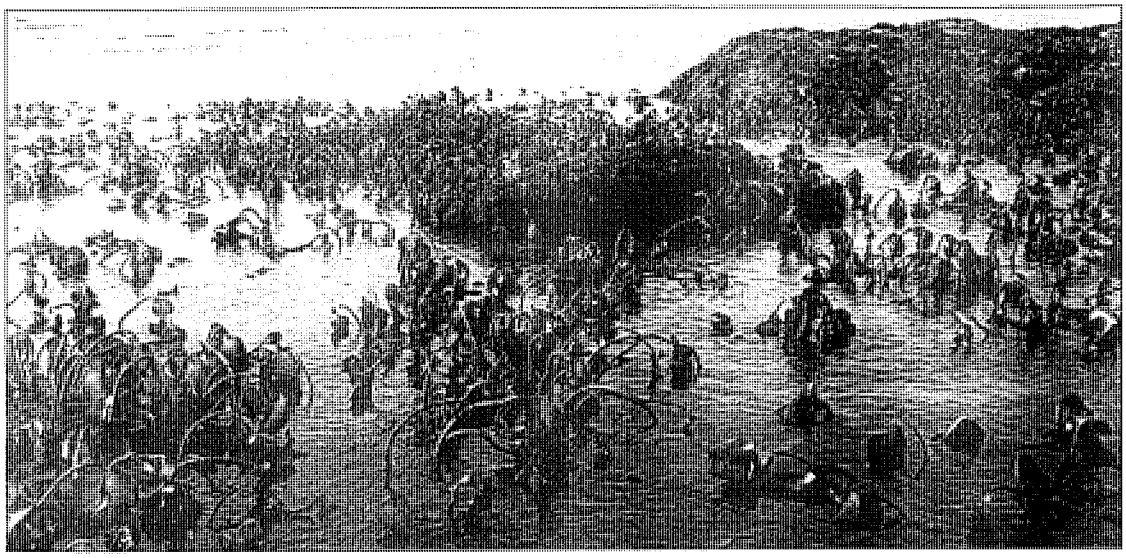

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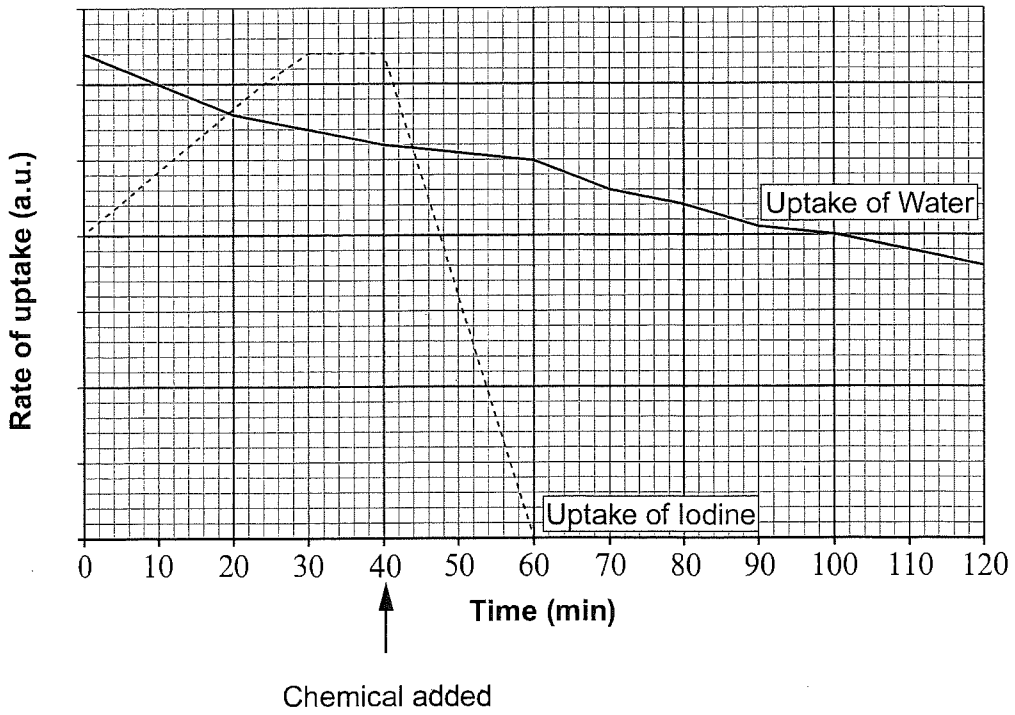

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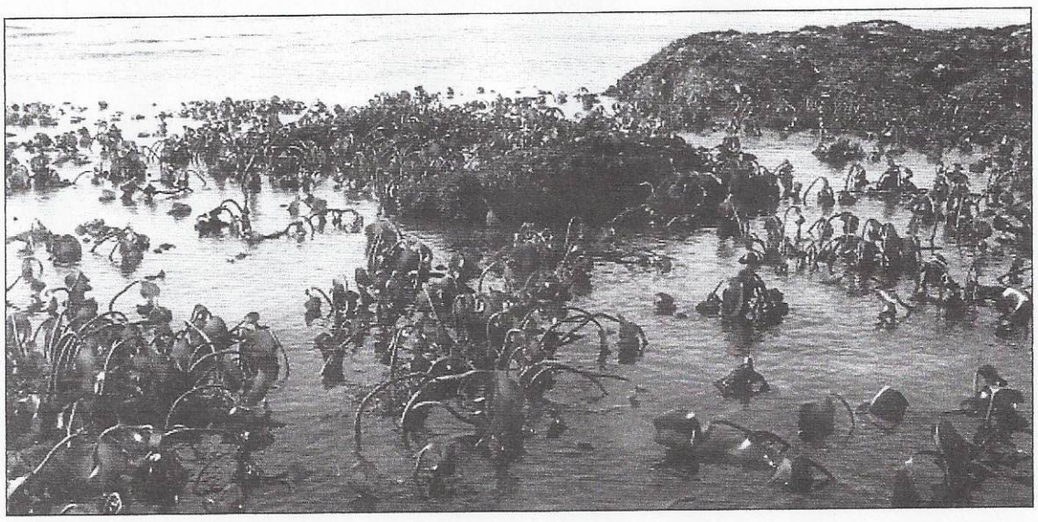

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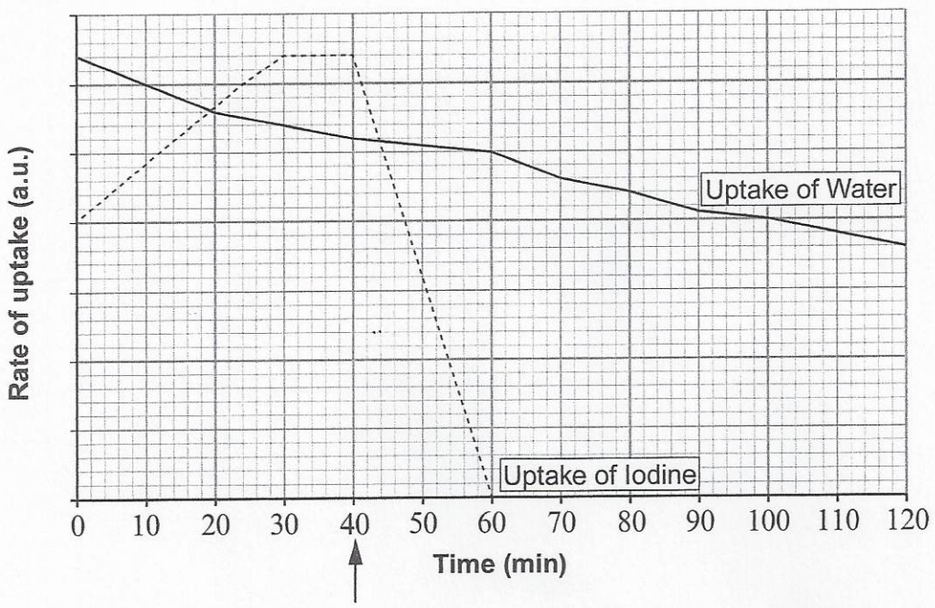

Chemical added

Examiner only

At forty minutes, a chemical was added to the sea water which stopped respiration taking place in the cells of the kelp.

(a) (i) Use the graph opposite to **describe** the effect of adding the chemical on the uptake of iodine **and** water. [3]

Adding the chemical has little effect on the uptake of water, it continues to reduce at the same rate. Adding the chemical causes the uptake of iodine to decrease rapidly, and within 20 min, the kelp no longer takes in iodine

(ii) **Explain** the effect of adding the chemical on the uptake of iodine. [3]

Adding the chemical stopped the kelp from respiring. This stopped the kelp from creating energy. Without energy active transport can't take place to ~~take~~ take in the iodine, which is why the uptake of iodine reduced.

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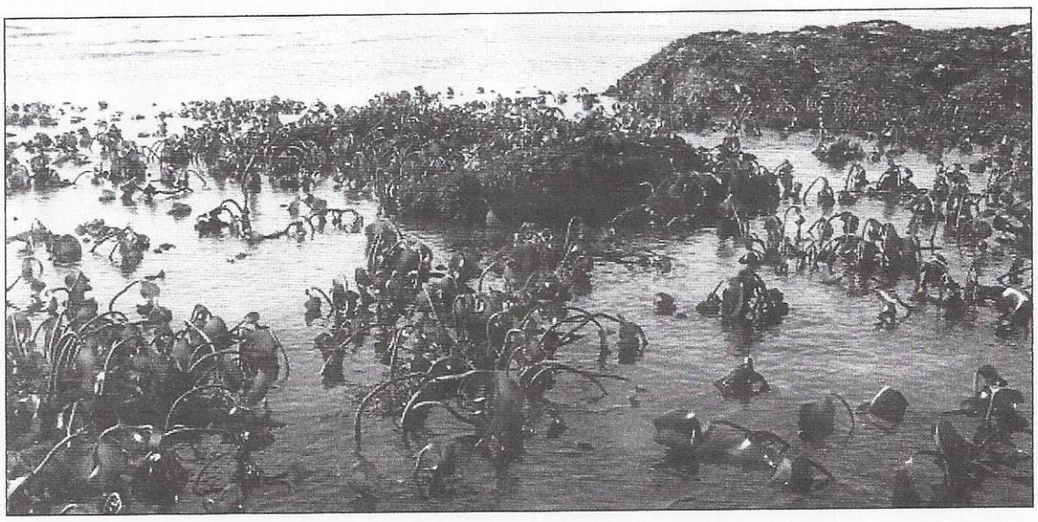

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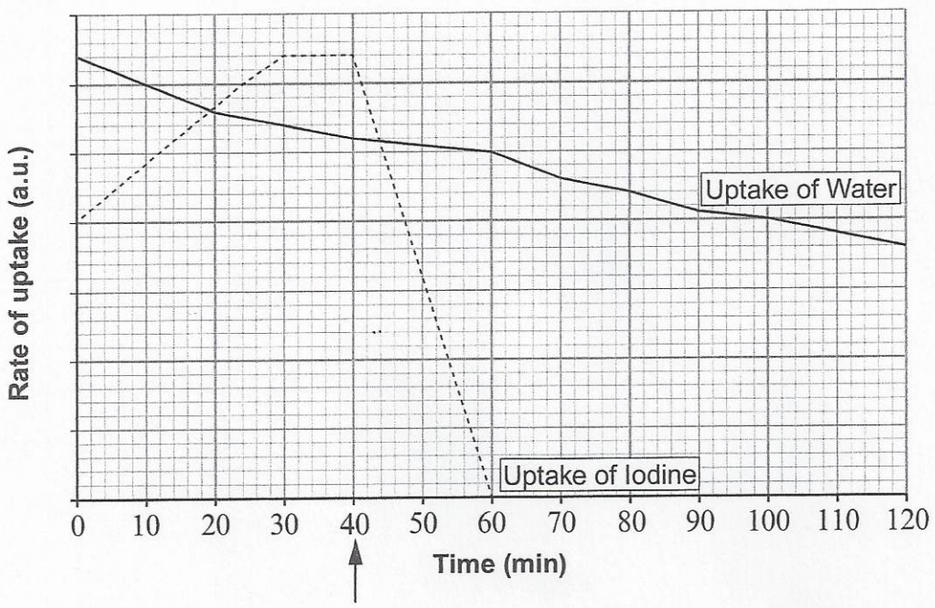

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osmosis

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9. A student used red blood cells to carry out an investigation into cell membranes. Red blood cells were placed in salt solutions at three different concentrations. A sample of red blood cells was then removed from each concentration and placed on a microscope slide. The cells were viewed using a microscope for a period of time. The observations were recorded in a table:

concentration of salt solution (%)	observation of red blood cells
0.0	swell and burst
0.9	remain the same size
3.0	smaller and shrivelled

Explain the observations shown in the table. [6 QWC]

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The observations show that the red blood cells have a salt concentration of 0.9%. This is because at 0.9 the was no net movement of the solution and the red blood cell remained the same. However at 0% because the red blood cell was more dilute than the water around it osmosis occured and water moved in at a greater net movement causing the swelling and eventual bursting of the cell. Finally with the solution at 3% salt concentration, the solution outside the cell was more dilute and a greater net movement caused water to move out of the cell via a semi permeable membrane present with osmosis.

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Explain the observations shown in the table. [6 QWC]

For the 0.0% concentration of Salt Solution, the observations Show that water has moved into the cell, by osmosis, via a Selectively permeable membrane. This is due to the Concentration of water in the outside salt solution being more dilute and ~~bigger~~ larger than the concentration of water inside the cell, which is more Solute. Water has moved into the red blood cell causing it to burst as it cannot take anymore water. Secondly, for the 0.9% Salt Solution, nothing has occured via osmosis. This means the Concentration of water outside the cell is the same as the concentration inside the cell. Finally, the cell grew Smaller and Shrivelled in a 3.0% Salt Solution. This means the Concentration of water outside the cell is more Solute than the dilute solution inside the cell. This has resulted in water being drawn out from the cell through a semi-permeable membrane, via osmosis.

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Explain the observations shown in the table. [6 QWC]

It seems that when the red blood cells were placed in a 0.0% concentration of salt solution, the red blood cells did swell and burst. This is because it is a more dilute solution so there are more water molecules in the salt solution than there are in the red blood cells. The water molecules then move from an area of high concentration in the salt solution to an area of low concentration in the cells through a partially permeable membrane by osmosis. This causes the cells to swell and burst because they contain a lot more water. At a 0.9% concentration of salt solution, the red blood cells remained the same size because there is no net movement of water molecules due to there being roughly the same amount in both the salt solution and the red blood cells. When the cells were placed in the 3.0% concentration of salt solution, the red blood cells became smaller and shrivelled. This is because the water molecules are moving from an area of high concentration in the cells to an area of low concentration in the salt solution, causing the cells to become smaller and shrivel.

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