Questions for Core Practicals Biology Paper 1

Name: ____________________

Class: ____________________

Date: ____________________

Time: **151 minutes**

Marks: **151 marks**

Comments:

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1 In fish and chip shops, potatoes are cut into chips several hours before the chips are cooked.

The amount of water in the chips must be kept constant during this time.

To keep the water in the chips constant, the chips are kept in salt solution.

A student investigated the effect of different concentrations of salt solution on the mass of five chips.

- He weighed each one of the five chips.
- He placed each chip into a different concentration of salt solution.
- After one hour he removed the chips from the salt solutions and then reweighed the chips.

	Concentration of salt solution				
	0 M	**0.5 M**	**1 M**	**2 M**	**3 M**
Mass of chip at start, in grams	2.6	2.8	2.8	2.5	2.6
Mass of chip after one hour, in grams	2.7	2.8	2.7	2.3	2.1

(a) (i) In which concentration of salt solution did the chip gain mass? ....

(1)

(ii) Explain why the chip gained mass in this solution.

....

....

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(2)

(b) In which concentration of salt solution should the chips be kept in the shop?

Give the reason for your answer.

....

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....

(2)

(Total 5 marks)

2 Students tested eight different foods, **A** – **H**, for carbohydrate, fat and protein.

The table shows the students' results.

Food	Carbohydrate	Fat	Protein
A	✗	✓	✓
B	✗	✓	✓
C	✓	✓	✓
D	✓	✗	✓
E	✗	✗	✗
F	✓	✗	✗
G	✓	✗	✗
H	✓	✗	✓

Key
✓ = present
✗ = not present

(a) (i) How many of the foods contained **only** carbohydrate?

....

(1)

(ii) Which of the foods contained carbohydrate **and** fat **and** protein?
Tick (✓) **one** box.

B, **C** and **D** only ☐

B and **D** only ☐

C only ☐

(1)

(b) A person's diet should contain carbohydrate **and** fat **and** protein.

Give **two** reasons why.

1...

....

2...

....

(2)

(c) As well as carbohydrate, fat and protein, the body also needs vitamins and mineral ions.

(i) Why does the body need vitamins and mineral ions?

....

(1)

(ii) Draw a ring around the correct answer to complete the sentence.

Compared to the mass of carbohydrates, the body needs	a greater a smaller the same	mass

of vitamins and mineral ions.

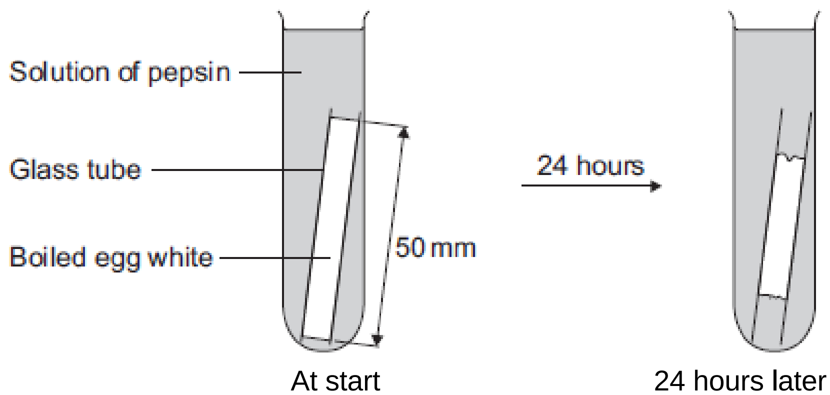
(1)
(Total 6 marks)

3 Some students investigated the effect of pH on the digestion of boiled egg white by an enzyme called pepsin. Egg white contains protein.

The students:

- put a glass tube containing boiled egg white into a test tube
- added a solution containing pepsin at pH 7
- set up six more tubes with solutions of pepsin at different pH values
- left the test tubes for 24 hours at room temperature.

The image below shows one of the test tubes, at the start and at the end of the 24 hours.



(a) (i) Name the product of protein digestion.

....

(1)

(ii) What type of enzyme digests protein?

Tick (✓) **one** box.

amylase ☐

lipase ☐

protease ☐

(1)

(b) The egg white in each tube was 50 mm long at the start of the investigation. The table below shows the students' results.

pH	**Length in mm of boiled egg white after 24 hours**
1	38
2	20
3	34
4	45
5	50
6	50
7	50

(i) At which pH did the pepsin work best?

pH ....

(1)

(ii) The answer you gave in part **(b)(i)** may not be the exact pH at which pepsin works best.

What could the students do to find a more accurate value for this pH?

....

....

....

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(2)

(iii) There was no change in the length of the egg white from pH 5 to pH 7.

Explain why.

....

....

....

....

(2)

(c) Pepsin is made by the stomach.

Name the acid made by the stomach which allows pepsin to work well.

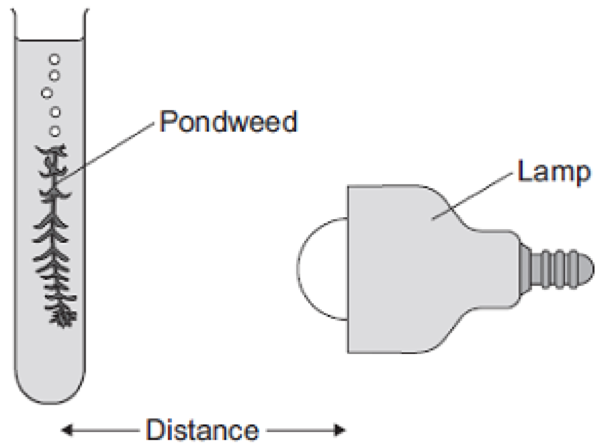
....

(1)
(Total 8 marks)

4 Some students investigated the effect of light intensity on the rate of photosynthesis.

They used the apparatus shown in **Diagram 1**.

Diagram 1



The students:

- placed the lamp 10 cm from the pondweed
- counted the number of bubbles of gas released from the pondweed in 1 minute
- repeated this for different distances between the lamp and the pondweed.

(a) The lamp gives out heat as well as light.

What could the students do to make sure that heat from the lamp did **not** affect the rate of photosynthesis?

....

....

(1)

(b) The table shows the students' results.

Distance in cm	Number of bubbles per minute
10	84
15	84
20	76
40	52
50	26

(i) At distances between 15 cm and 50 cm, light was a limiting factor for photosynthesis.

What evidence is there for this in the table?

....

....

(1)

(ii) Give **one** factor that could have limited the rate of photosynthesis when the distance was between 10 cm and 15 cm.

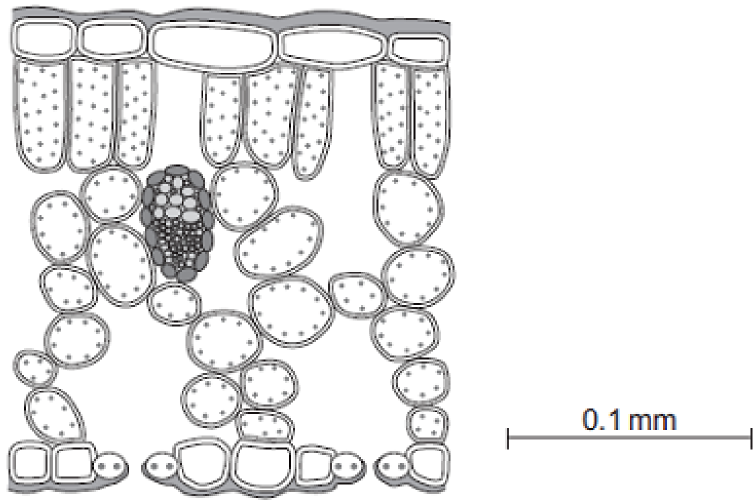
....

(1)

(c) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Diagram 2 shows a section through a plant leaf.

Diagram 2



Describe the structure of the leaf and the functions of the tissues in the leaf.

You should use the names of the tissues in your answer.

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(6)

(Total 9 marks)

5 In fish and chip shops, potatoes are cut into chips several hours before they are cooked.

The amount of water in the chips must be kept constant during this time.

To keep the water in the chips constant, the chips are kept in salt solution.

A student investigated the effect of different concentrations of salt solution on the mass of chips.

- He weighed each of five chips.
- He placed each chip into a different concentration of salt solution.
- After one hour he removed the chips, then reweighed them.

His results are shown in the table.

Concentration of salt solution	**0 M**	**0.5 M**	**1 M**	**2 M**	**3 M**
Mass of chip at start in grams	2.6	2.8	2.8	2.5	2.6
Mass of chip after one hour in grams	2.7	2.8	2.7	2.3	2.1

(a) (i) In which concentration of salt solution did the chip gain mass?

.... M

(1)

(ii) Complete the sentence by drawing a ring around the correct answer in the box.

The chip gained mass because water entered by

digestion
osmosis
respiration

(1)

(b) In which concentration of salt solution should the chips be kept?

.... M

Give a reason for your answer.

....

....

(2)

(c) How could the student have made his investigation more reliable?

....

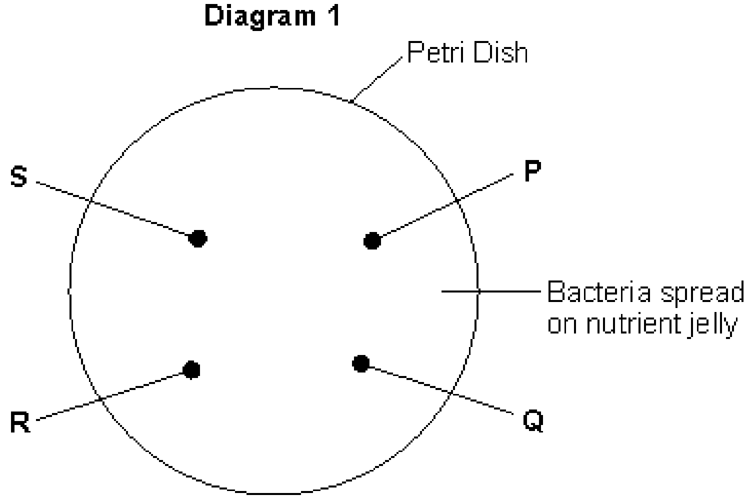
....

(1)
(Total 5 marks)

6 Students investigated how well antibacterial mouthwashes worked.
They tested four different mouthwashes, **P**, **Q**, **R** and **S**.

- They spread bacteria on nutrient jelly in a Petri dish.
- They soaked identical discs of filter paper in mouthwashes **P**, **Q**, **R** or **S**.
- They placed the discs on the growing bacteria as shown in **Diagram 1**.
- They covered the Petri dish.
- They incubated the Petri dish for two days.

Diagram 1



(a) The nutrient jelly was heated to 120 °C before being poured into the Petri dish.

Why is this necessary?

Tick (✓) **one** box.

Statement	Tick (✓)
To make bacteria grow more quickly.	
To kill microorganisms.	
To make the nutrients dissolve.	

(1)

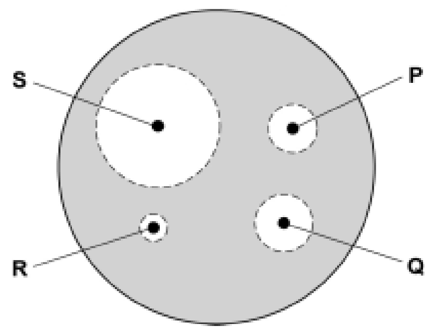
(b) What is the maximum temperature at which bacteria should be incubated in a school laboratory?

Tick (✓) **one** box.

Temperature	Tick (✓)
15 °C	
25 °C	
37 °C	

(1)

(c) **Diagram 2** shows the appearance of the Petri dish after two days.



Which mouthwash, **P, Q, R** or **S** kills most bacteria? ☐

Give **one** reason for your answer.

....

....

(2)
(Total 4 marks)

7 Lipase is an enzyme that digests fat.

(a) (i) Complete the equation to show the digestion of fat.

Use the correct answer from the box.

glucose	**glycerol**	**glycogen**

fat $\xrightarrow{\text{lipase}}$ fatty acids + ...

(1)

(ii) Name **one** organ that makes lipase.

....

(1)

(b) Some students investigated the effect of bile on the digestion of fat by lipase.

The students:

1 mixed milk and bile in a beaker
2 put the pH sensor of a pH meter into the beaker
3 added lipase solution
4 recorded the pH at 2-minute intervals
5 repeated steps 1 to 4, but used water instead of bile.

Suggest **two** variables that the students should have controlled in this investigation.

1...

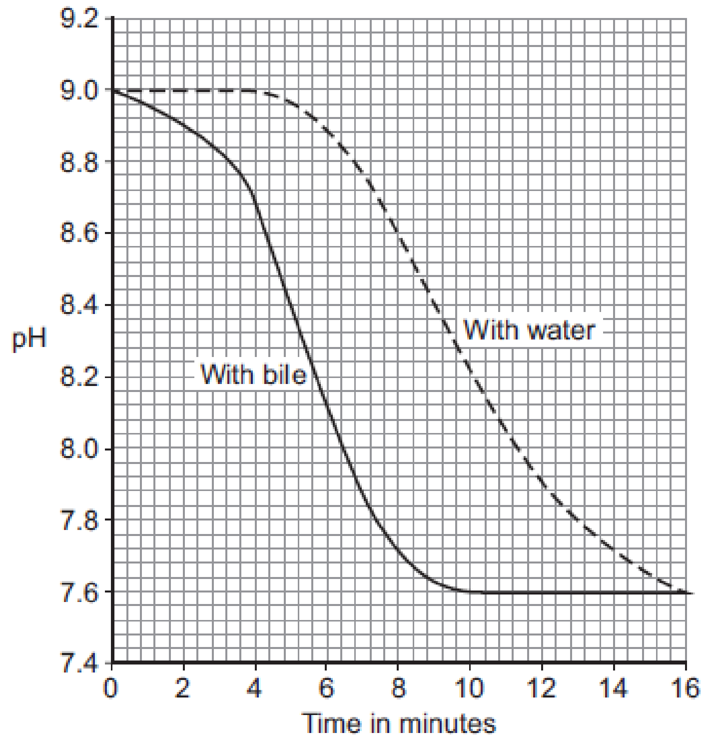
....

2...

....

(2)

(c) The graph shows the students' results.



(i) Why did the pH decrease in both investigations?

....

....

(1)

(ii) Bile helps lipase to digest fat.

What evidence is there in the graph to support this conclusion?

....

....

(1)

(iii) Suggest **one** reason why the contents of both beakers had the same pH at the end of the investigations.

....

....

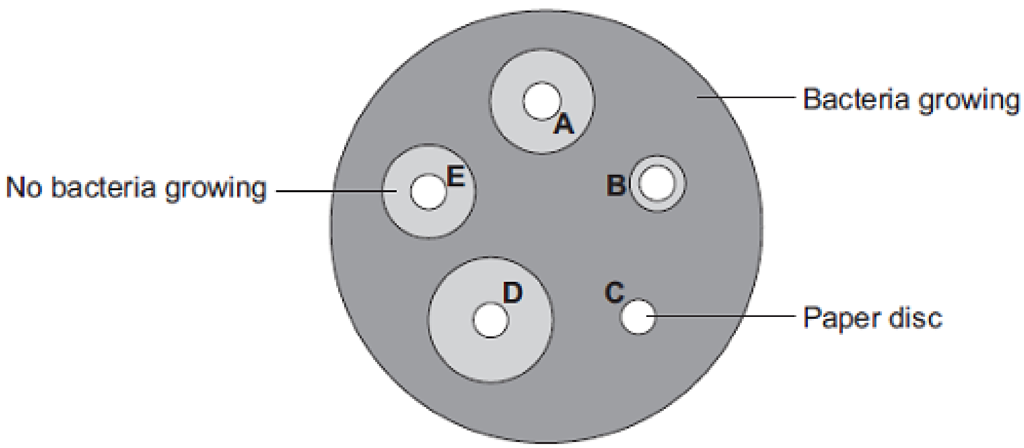
(1)
(Total 7 marks)

8 Students in a school investigated the effect of five different antibiotics, **A**, **B**, **C**, **D** and **E**, on one type of bacterium.

The students:

- grew the bacteria on agar jelly in a Petri dish
- soaked separate paper discs in each of the antibiotics
- put the paper discs onto the bacteria in the Petri dish
- put the Petri dish into an incubator.

The diagram shows what the Petri dish looked like after 3 days.



(a) (i) What is the maximum temperature the incubator should be set at in the school?

Draw a ring around your answer.

10°C **25°C** **50°C**

(1)

(ii) Draw a ring around the correct answer to complete the sentence.

The incubator should **not** be set at a higher temperature because the higher

temperature might help the growth of

pathogens.
toxins.
viruses.

(1)

(b) Which antibiotic, **A**, **B**, **C**, **D** or **E**, would be best to treat a disease caused by this type of bacterium?

Write your answer in the box. ☐

Give the reason for your answer.

....

....

(2)

(c) Antibiotics **cannot** be used to treat diseases caused by viruses.

Why?

Tick (✓) **one** box.

Viruses are not pathogens ☐

There are too many different types of virus ☐

Viruses live inside cells ☐

(1)
(Total 5 marks)

9 This question is about photosynthesis.

(a) Plants make glucose during photosynthesis. Some of the glucose is changed into insoluble starch.

What happens to this starch?

Tick (✓) **one** box.

The starch is converted into oxygen. ☐

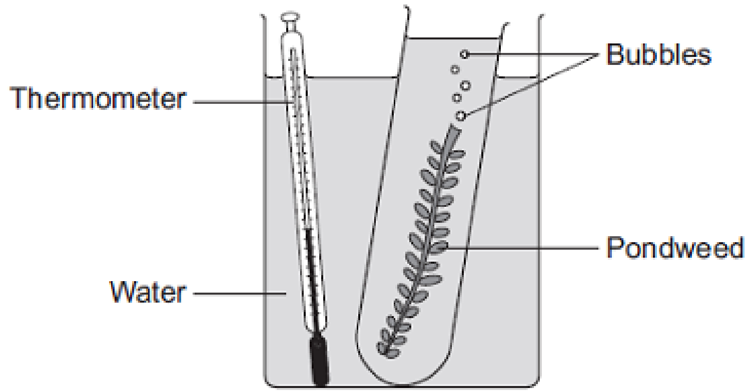
The starch is stored for use later. ☐

The starch is used to make the leaf green. ☐

(1)

(b) A student investigated the effect of temperature on the rate of photosynthesis in pondweed.

The diagram shows the way the experiment was set up.



(i) The student needed to control some variables to make the investigation fair.

State **two** variables the student needed to control in this investigation.

1...

2...

(2)

(ii) The bubbles of gas are only produced while photosynthesis is taking place.

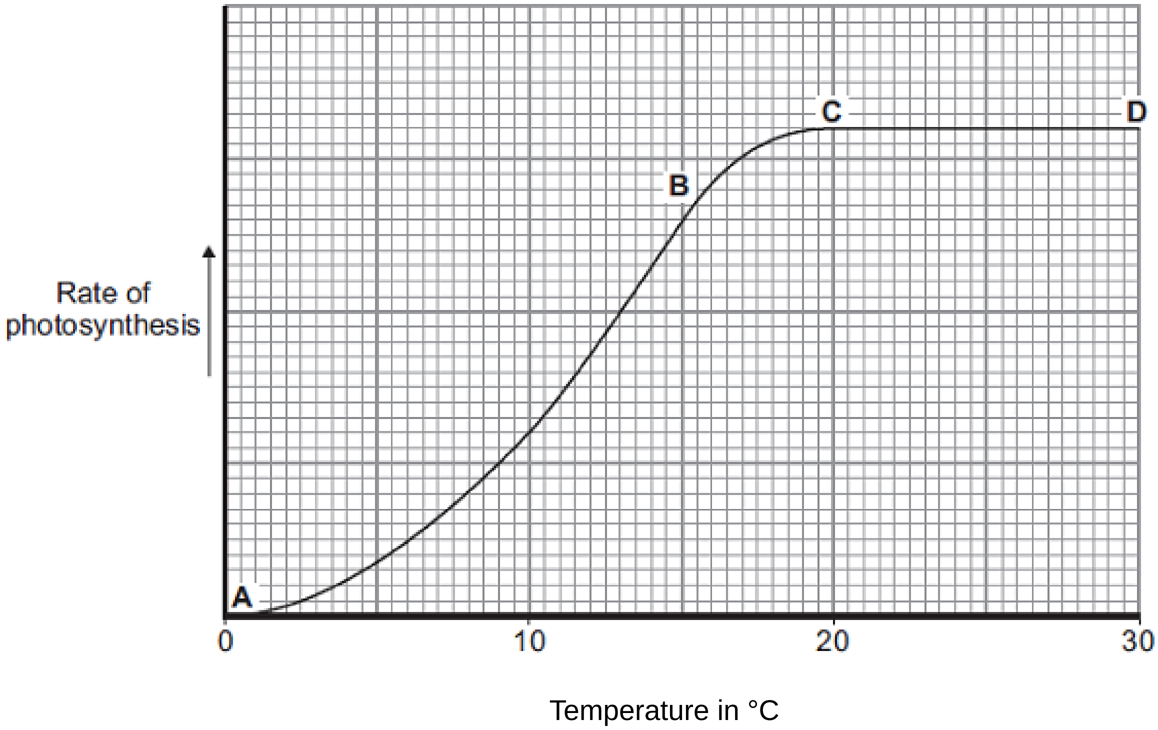
What **two** measurements would the student make to calculate the rate of photosynthesis?

1...

2...

(2)

(c) The graph shows the effect of temperature on the rate of photosynthesis in the pondweed.



(i) Name the factor that limits the rate of photosynthesis between the points labelled **A** and **B** on the graph.

....

(1)

(ii) Suggest which factor, carbon dioxide, oxygen or water, might limit the rate of photosynthesis between the points labelled **C** and **D** on the graph.

....

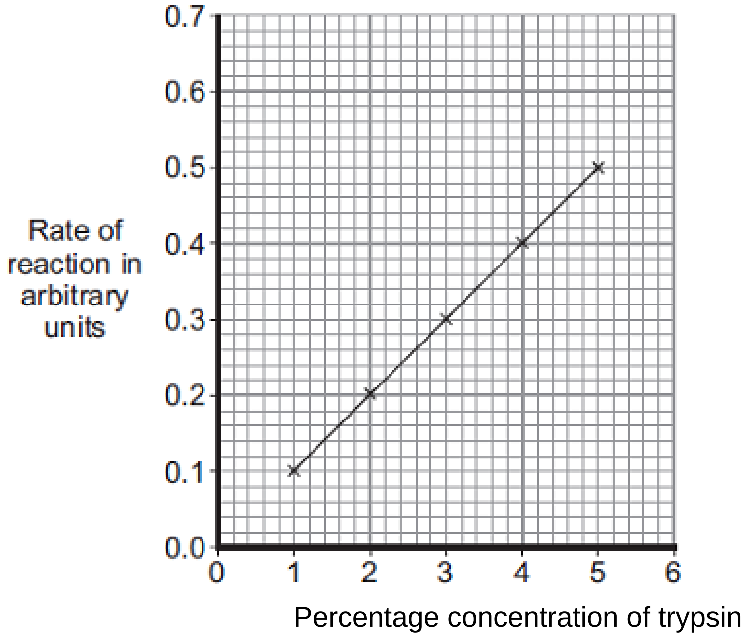
(1)
(Total 7 marks)

10 Trypsin is a protease enzyme. Trypsin will digest a protein called gelatine which covers the surface of photographic film.

Some students investigated the time taken to digest the gelatine with trypsin.
The students used five different concentrations of trypsin.

The rate of reaction was calculated from the time taken for the gelatine to be digested.

The graph shows the students' results.



(a) (i) Describe the relationship between the concentration of trypsin and the rate of reaction.

....

....

....

....

(2)

(ii) Use the graph to predict the rate of reaction with 6% trypsin.

.... arbitrary units

(1)

(b) In industry, trypsin is used to pre-treat some baby foods.
In their experiment, the students used 1–5% trypsin at 20°C.
The baby food manufacturers make most profit if they use 0.5% trypsin at 35°C.

Suggest why the manufacturers make most profit with these conditions.

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(4)

(c) (i) Describe the effect trypsin would have on the baby food.

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....

(2)

(ii) Apart from protease enzymes, give **one** other use of a **named** enzyme in industry.

....

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....

....

(2)

(Total 11 marks)

11 People often grow pondweed in fishponds to *oxygenate* the water.

(a) Name the process that the pondweed uses to produce oxygen.

....

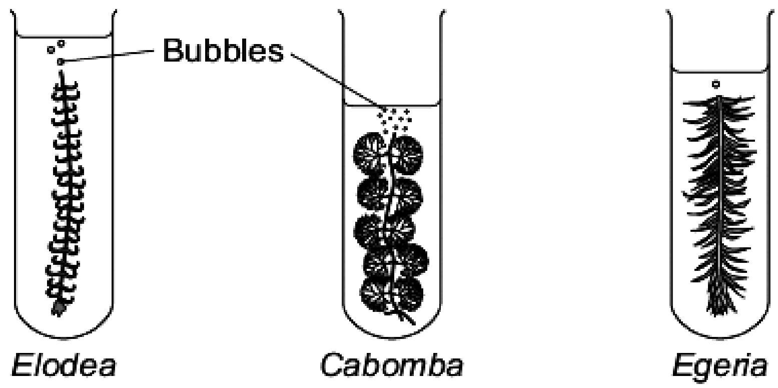
(1)

(b) A student investigated oxygen production in three different pondweeds, *Elodea*,*Cabomba* and *Egeria*.

The student:

- cut a piece of pondweed from an *Elodea* plant
- put the pondweed into a tube of water
- counted the bubbles given off in one minute
- did the experiment again using a piece of pondweed from a *Cabomba* plant
- did the experiment a third time using a piece of pondweed from an *Egeria* plant.

The diagram shows the student's investigation.



The table shows the results.

Pondweed	Number of bubbles produced in 1 minute
Elodea	17
Cabomba	28
Egeria	8

(i) The student said:

"I suggest that people grow *Cabomba* in garden ponds to oxygenate the water fastest."

Give **three** variables the student should have controlled to make sure his conclusion was valid.

Use information from the student's method and the diagram.

1 ....

....

2 ....

....

3 ....

....

(3)

(ii) The three pondweeds all cost about the same.

Suggest **one** other factor that people with fishponds might think about before deciding which type of pondweed to use.

....

(1)

(c) A person grows *Cabomba* in his pond.

The *Cabomba* plants develop yellow leaves.

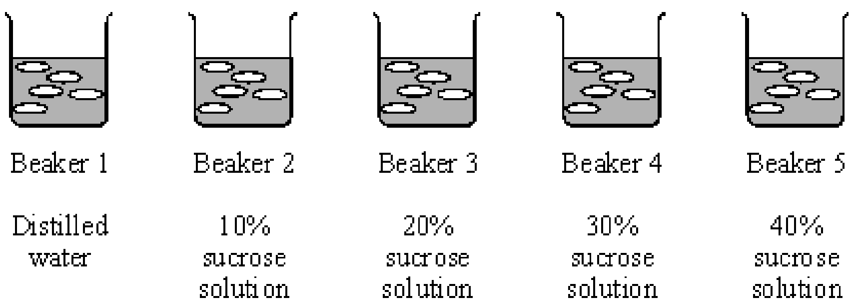
Which mineral ion would stop the leaves turning yellow?

....

(1)

(Total 6 marks)

12 Some students set up an experiment using osmosis to find the concentration of sucrose solution in potato cell sap. They used discs of potato cut to the same size and weighing approximately 10 gms. The discs were put into each of five beakers.



(a) (i) After two hours they reweighed the discs after carefully blotting them first. Why did the students blot the potato before weighing it?

....

....

(1)

(ii) Their results are shown in the table below.

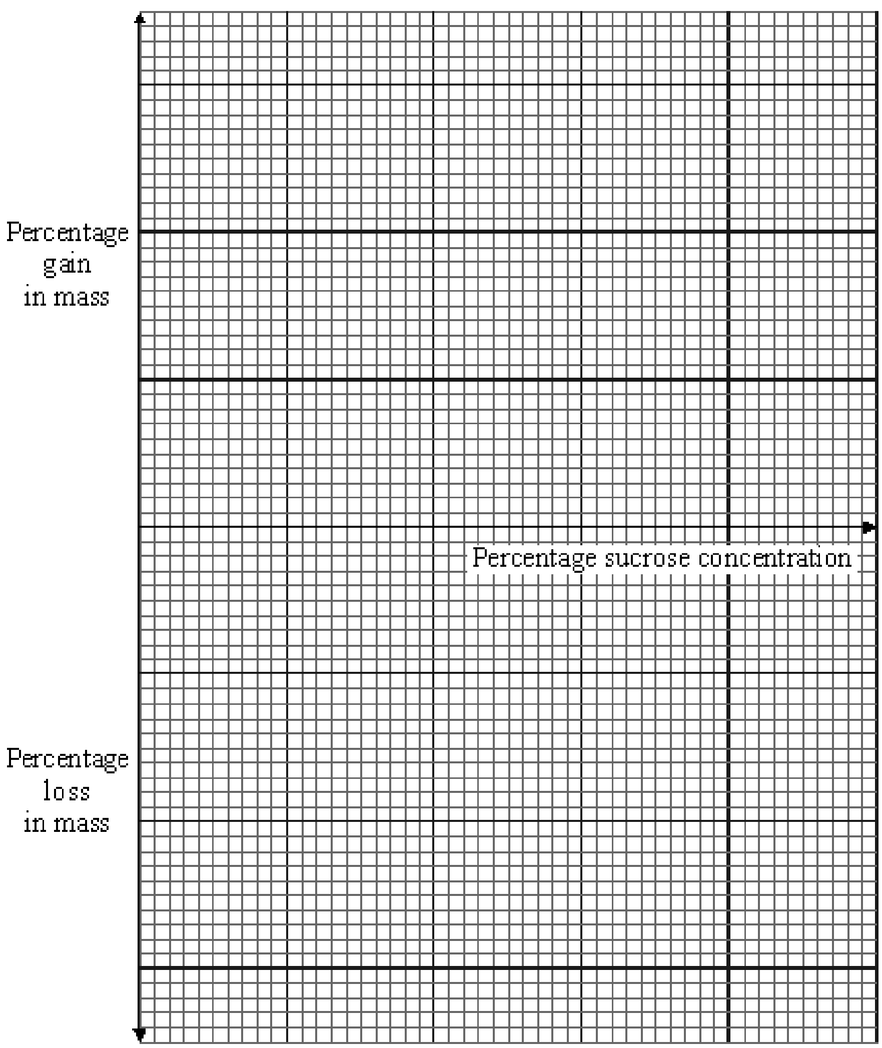
	Beaker 1	**Beaker 2**	**Beaker 3**	**Beaker 4**	**Beaker 5**
Final mass in g	13.0	12.2	9.0	7.9	7.3
Initial mass in g	10.0	10.6	10.0	10.1	10.4

The students calculated the % gain or loss in mass of potato. Complete this table of results for Beakers 2, 4 and 5.

Beaker 1	**Beaker 2**	**Beaker 3**	**Beaker 4**	**Beaker 5**
13 – 10.0 = 3.0 $\frac{3.0}{10.0} \times 100\% = 30\%$		9.0 – 10.0 = –1.0 $\frac{-1.0}{10.0} \times 100\%$ = –10%		
Gain in mass = 30%		Loss in mass = 10%		

(3)

(b) (i) Draw a graph of % Gain or Loss in mass against sucrose concentration.



(3)

(ii) Use the graph to find the concentration of potato cell sap.

Concentration of cell sap = ... % sucrose solution

(1)

(iii) Explain in terms of osmosis how you chose this value.

....

....

....

(2)

(Total 10 marks)

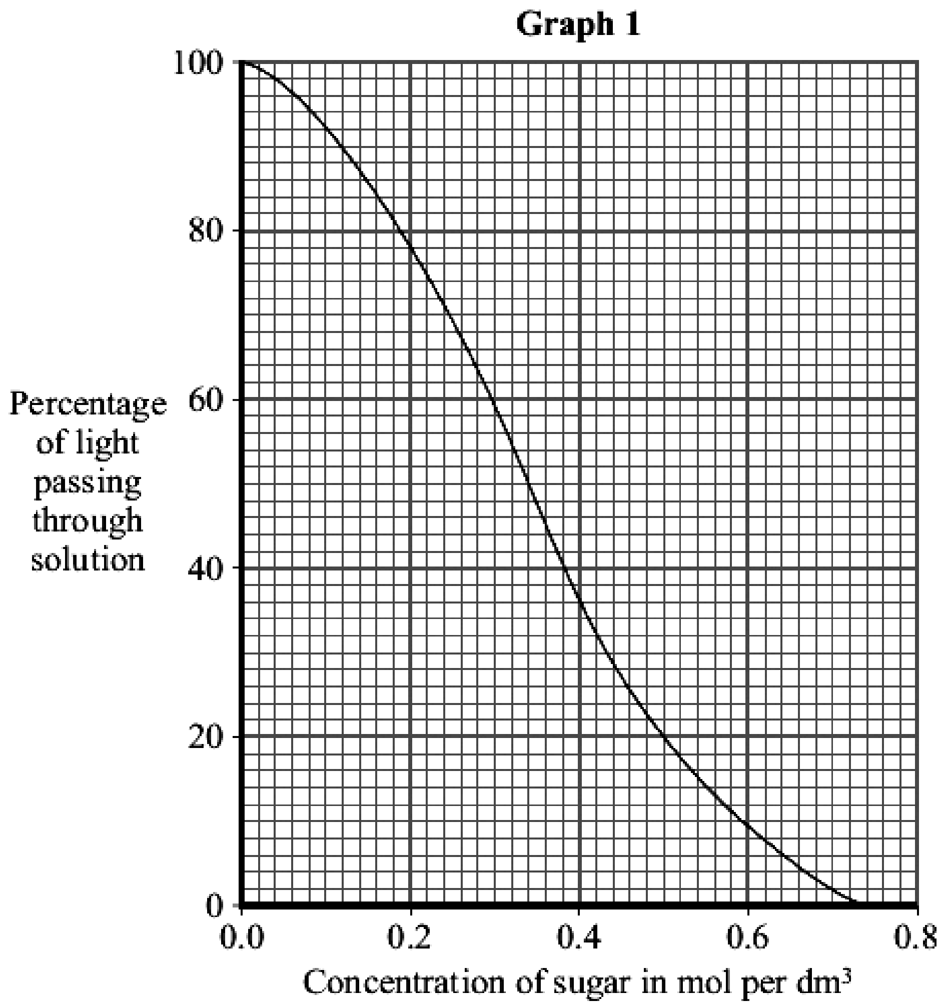
13 Starch is broken down into sugar by amylase. Amylase is produced in the salivary glands.

(a) Name **two** other organs in the digestive system which produce amylase.

.... and ....

(2)

(b) A colorimeter measures colour intensity by measuring the percentage of light that passes through a solution.
Graph 1 shows the percentage of light passing through sugar solutions of different concentrations to which a test reagent has been added.



Students used a colorimeter to compare the starch-digesting ability of amylase enzymes obtained from two organs, **P** and **Q**.

- The students collected 5 cm^3 samples of amylase from **P** and **Q** and placed them into a water-bath at 40 °C.
- Two test tubes containing 10 cm^3 samples of starch solution were also placed into the water-bath.
- All the tubes were left in the water-bath for 10 minutes.
- Each amylase sample was added to one of the tubes containing the starch solution.
- The test tubes were placed back into the water-bath.
- Every minute, a few drops were taken from each tube, the test reagent was added and the percentage of light passing through this solution was measured in the colorimeter.

The tubes containing amylase samples and starch solution were left in the water-bath for ten minutes before the amylase was added to the starch.

Explain why.

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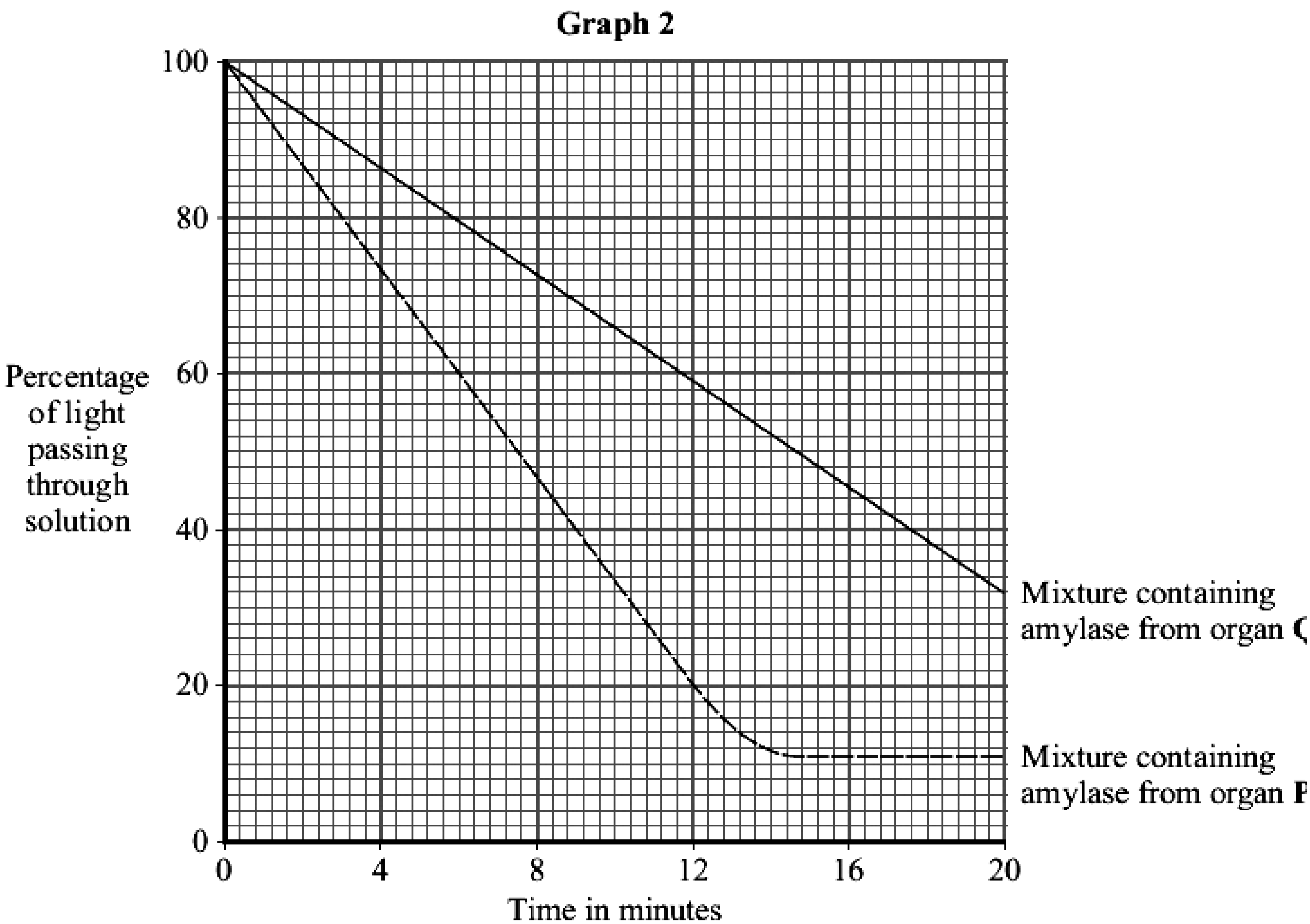
(2)

(c) **Graph 2** shows how the readings from the colorimeter changed over the next 20 minutes.



(i) Use **Graph 1** and **Graph 2** to determine the concentration of sugar in the mixture from organ **Q** after 20 minutes.

....

Answer ....mol per dm^3

(1)

(ii) Use your answer to (c)(i) to calculate the rate at which sugar was produced in the mixture containing amylase from organ **Q**.

Show clearly how you work out your answer.

....

....

....

Answer ....mol per dm^3 per minute

(2)

(iii) Suggest why the amount of light passing through the mixture from organ **P** did not change after 16 minutes.

....

....

....

(1)

(iv) One of the students suggested that they could have completed their experiment more quickly if the temperature of the water-bath had been set at 80 °C.

This would **not** have been the case.

Explain why.

....

....

....

....

....

(2)

(Total 10 marks)

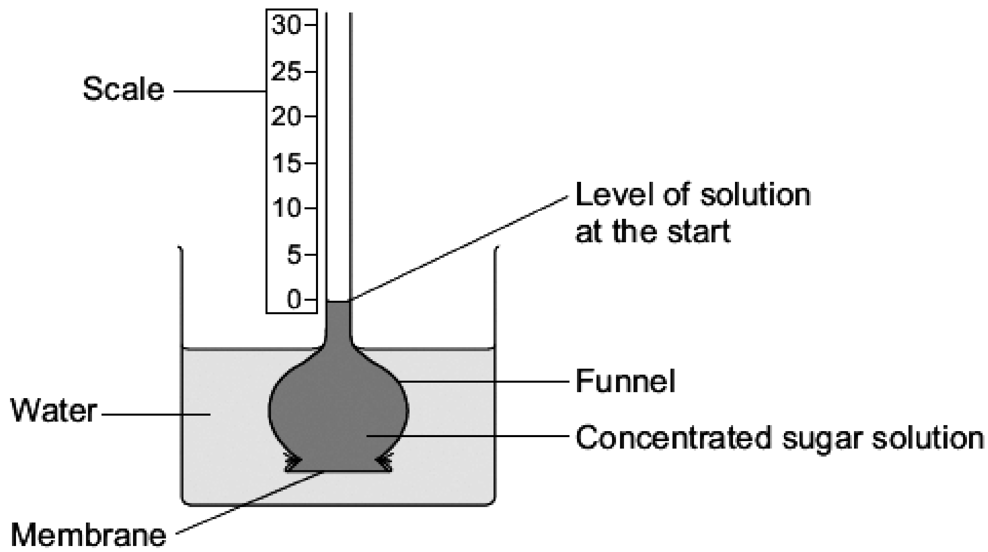
14 Some substances move through membranes.

A student set up an investigation.

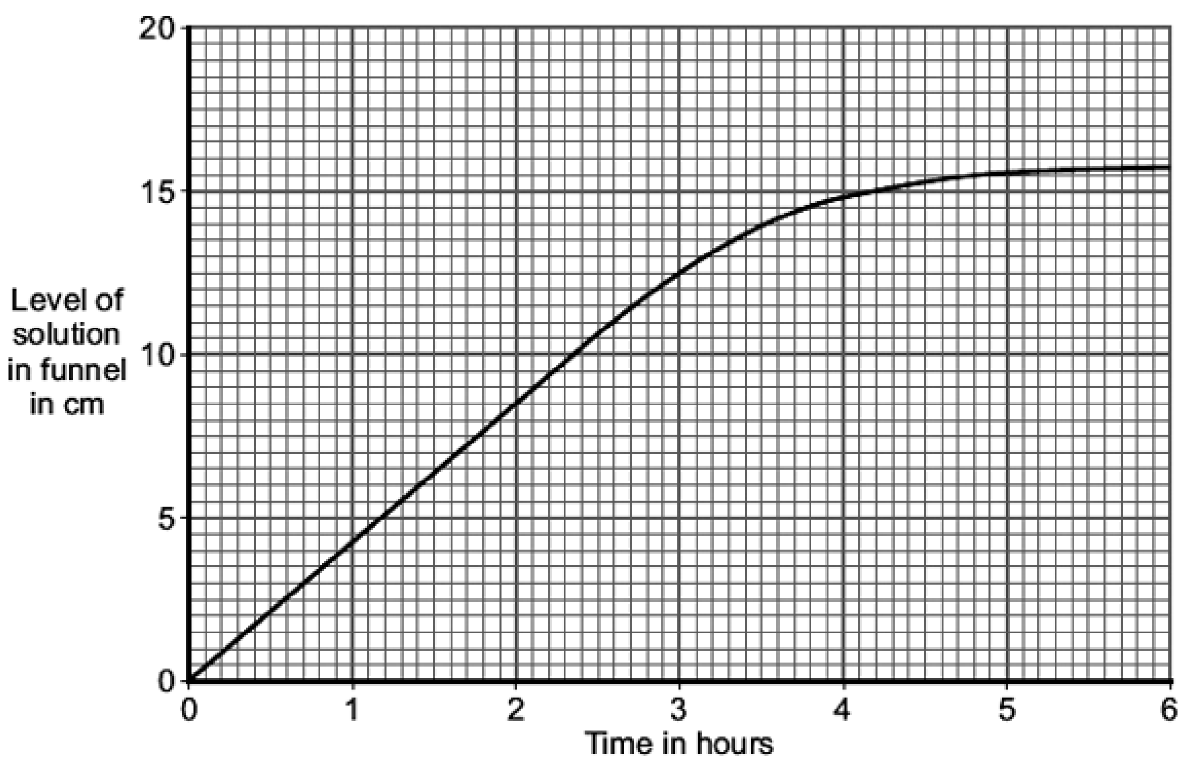
The student:

- tied a thin membrane across the end of a funnel
- put concentrated sugar solution in the funnel
- put the funnel in a beaker of water
- measured the level of the solution in the funnel every 30 minutes.

The diagram shows the apparatus.



The graph shows the results.



(a) After 3 hours, the level of the solution in the funnel is different from the level at the start.

Explain why, as fully as you can.

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....

....

(3)

(b) The student repeated the investigation using dilute sugar solution instead of concentrated sugar solution.

In what way would you expect the results using dilute sugar solution to be different from the results using concentrated sugar solution?

Give the reason for your answer.

....

....

....

....

(2)

(Total 5 marks)

15 Photosynthesis takes place the leaves of green plants.

(a) Write a balanced chemical equation for the formation of glucose by photosynthesis.

....

(3)

(b) Describe **two** ways that the rate of photosynthesis can be decreased without lowering the temperature.

....

....

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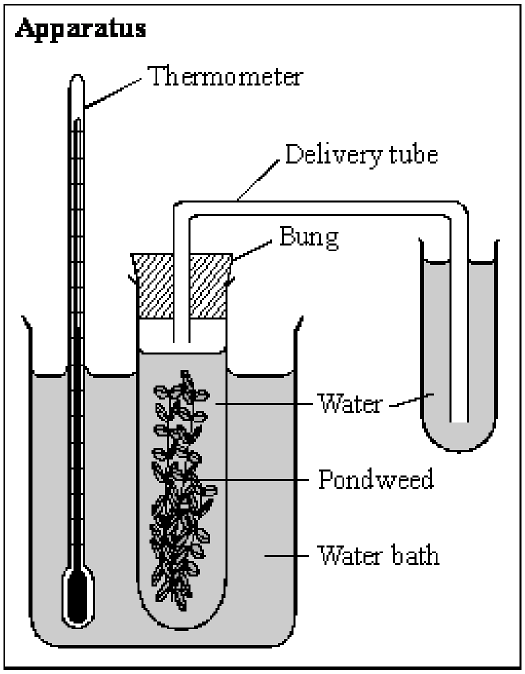
....

....

(2)

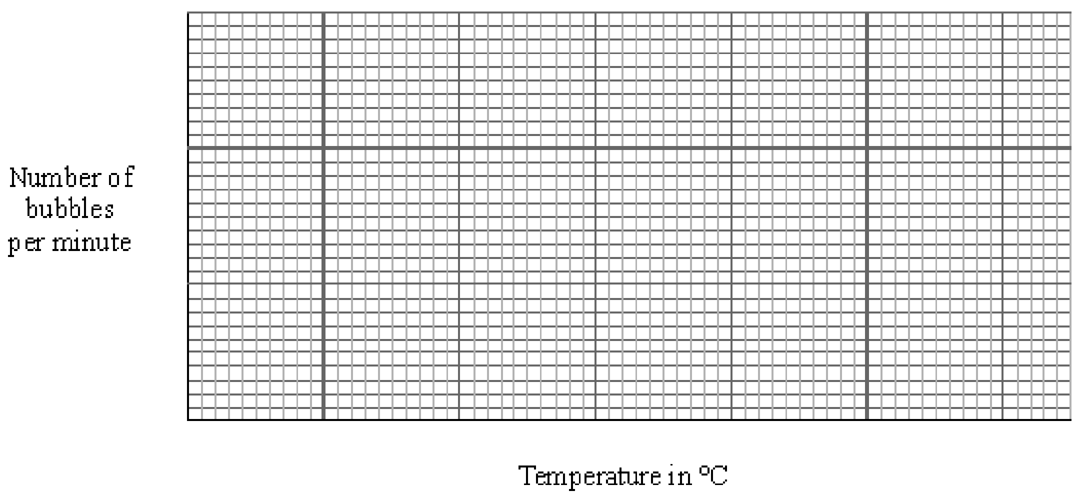
(c) Some students decided to investigate the effect of temperature on the rate of photosynthesis in pond weed. They set up the apparatus and altered the temperature using ice and hot water. The counted the number of bubbles given off in a minute at different temperatures. They obtained the following results.



Results

Temperature in °C	Number of bubbles per minute
10	6
20	15
30	21
40	23
50	19

(i) Plot the points on the graph.



(3)

(ii) Use your graph to predict the number of bubbles per minute at 25 °C.

....

(1)

(iii) Suggest a reason why the rate of photosynthesis seems to decrease in this pondweed after 40 °C.

....

....

(1)

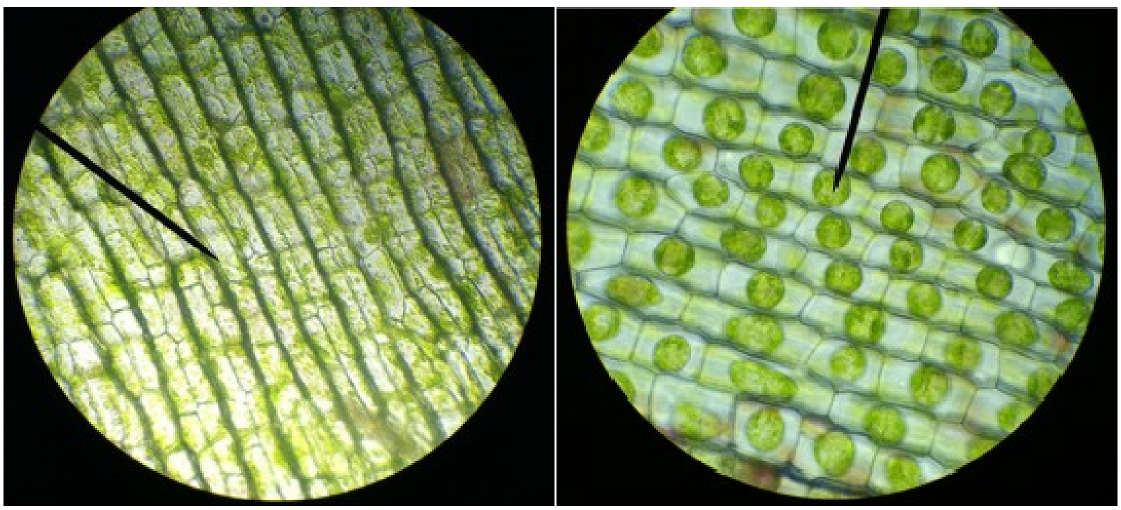
(Total 10 marks)

16 The photographs show the same cells of a common pond plant.

Photograph A shows the cells in a hypotonic solution.

Photograph B shows the same cells in a hypertonic solution.

Photograph A **Photograph B**



(a) What is a **hypertonic** solution?

....

....

....

....

(2)

(b) What word is used to describe plant cells placed in:

(i) a **hypotonic** solution

....

(1)

(ii) a **hypertonic** solution?

....

(1)

(c) Explain what has happened to the plant cells in **Photograph B**.

....

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(4)

(d) Animal cells will also change when placed in different solutions.

Some red blood cells are put in a hypotonic solution.

Describe what would happen to these red blood cells **and** explain why this is different from what happened to the plant cells in **Photograph A**.

....

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(4)

(Total 12 marks)

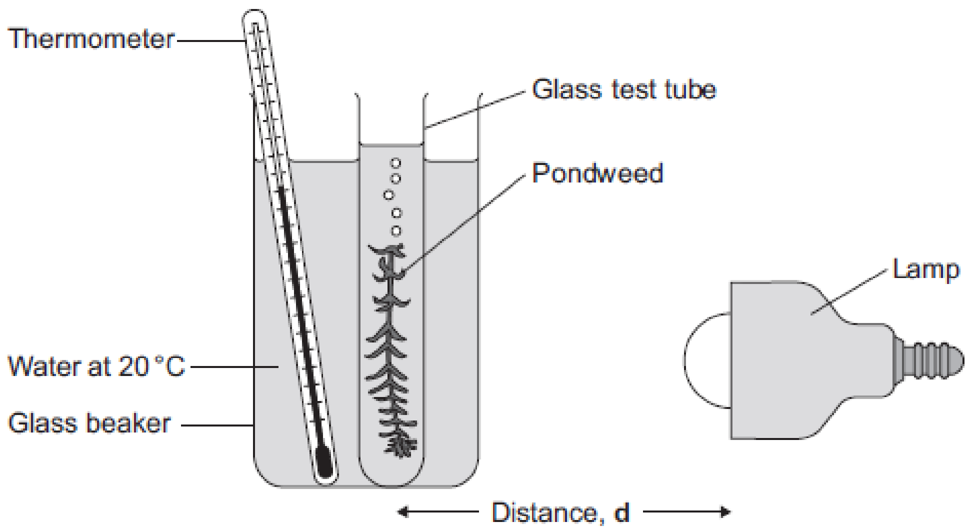
17 (a) Complete the equation for photosynthesis. Draw a ring around each correct answer.

		hydrogen		alcohol		
Carbon dioxide	+	nitrogen	$\xrightarrow{\text{light energy}}$	glucose	+	oxygen
		water		methane		

(2)

Some students investigated the effect of light intensity on the rate of photosynthesis in pondweed.

The diagram shows the apparatus the students used.



The closer the lamp is to the pondweed, the more light the pondweed receives.

The students placed the lamp at different distances, **d**, from the pondweed.

They counted the number of bubbles of gas released from the pondweed in 1 minute for each distance.

(b) A thermometer was placed in the glass beaker.

Why was it important to use a thermometer in this investigation?

....

....

....

....

....

....

(3)

(c) The students counted the bubbles four times at each distance and calculated the correct mean value of their results.

The table shows the students' results.

Distance d in cm	Number of bubbles per minute				
	1	**2**	**3**	**4**	**Mean**
10	52	52	54	54	53
20	49	51	48	52	50
30	32	30	27	31	30
40	30	10	9	11	

(i) Calculate the mean number of bubbles released per minute when the lamp was 40 cm from the pondweed.

....

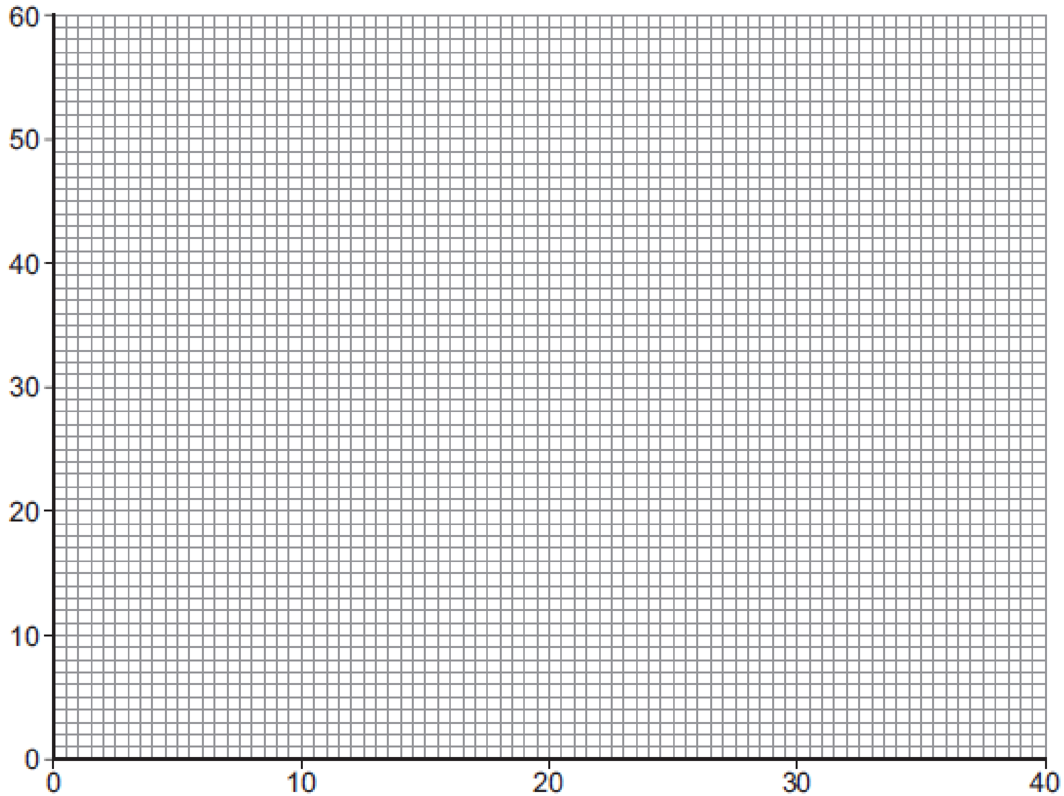
....

Mean number of bubbles at 40 cm = ...

(2)

(ii) On the graph paper below, draw a graph to show the students' results:

- add a label to the vertical axis
- plot the **mean values** of the number of bubbles
- draw a line of best fit.



Distance **d** in cm

(4)

(iii) One student concluded that the rate of photosynthesis was inversely proportional to the distance of the lamp from the plant.

Does the data support this conclusion?

Explain your answer.

....

....

....

....

....

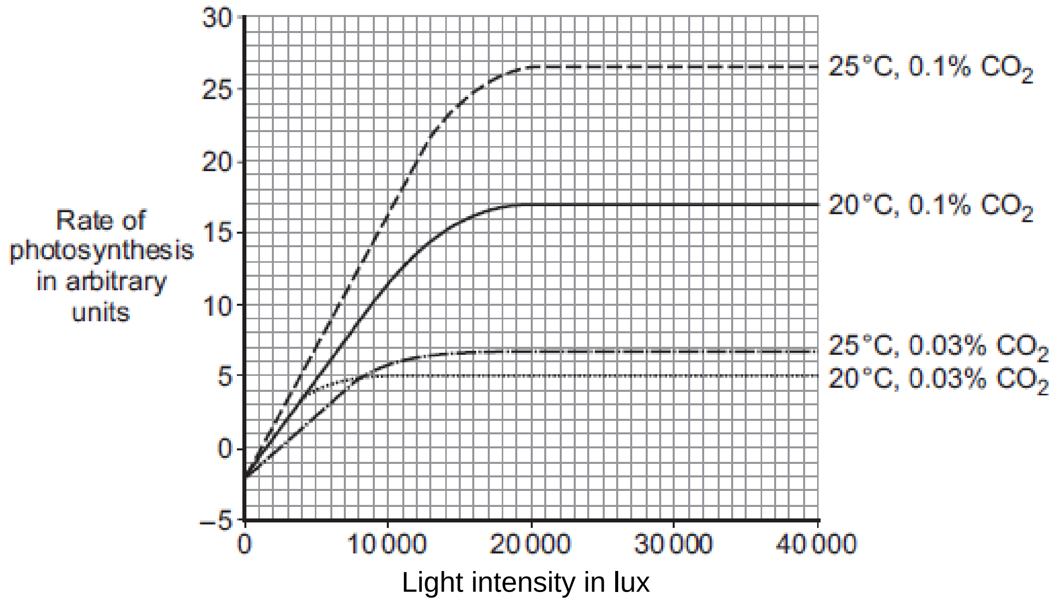
....

(2)

(d) Light intensity, temperature and concentration of carbon dioxide are factors that affect the rate of photosynthesis.

Scientists investigated the effects of these three factors on the rate of photosynthesis in tomato plants growing in a greenhouse.

The graph below shows the scientists' results.



A farmer in the UK wants to grow tomatoes commercially in a greenhouse.

The farmer read about the scientists' investigation.

During the growing season for tomatoes in the UK, natural daylight has an intensity higher than 30 000 lux.

The farmer therefore decided to use the following conditions in his greenhouse during the day:

- 20°C
- 0.1% CO_2
- no extra lighting.

Suggest why the farmer decided to use these conditions for growing the tomatoes.

You should use information from the scientists' graph in your answer.

....

....

....

....

....

....

....

....

....

....

....

....

(4)

(Total 17 marks)

18 (a) Microorganisms can be grown on agar jelly in a Petri dish.

List A gives four actions that are sometimes used when growing microorganisms.

List B gives five possible effects of these actions.

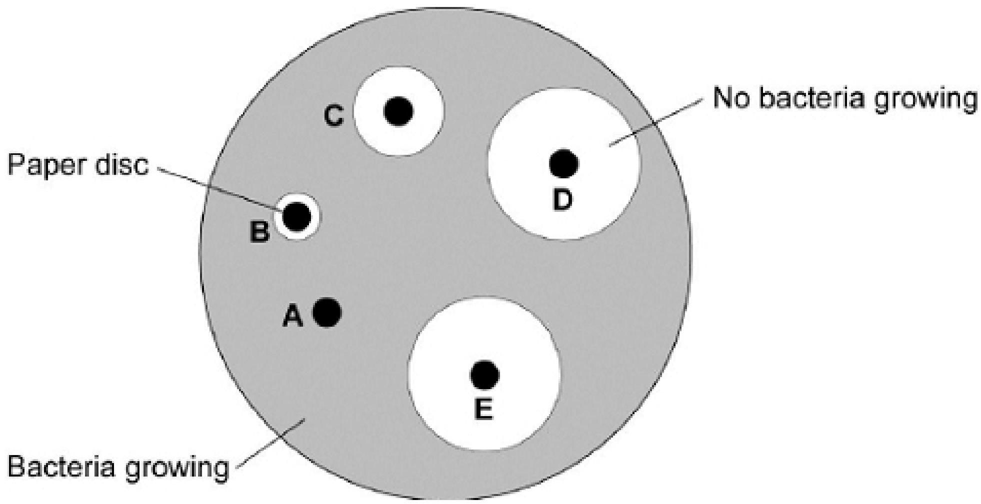
Draw a line from each action in **List A** to its effect in **List B**.

List A – Action	List B – Effect
	Increases the risk of contamination with bacteria
Heating loop in flame	
	Decreases the risk of bacteria entering
Placing loop on bench to cool	
	Kills bacteria
Only lifting lid of Petri dish a little	
	Prevents air entering
Placing Petri dish in incubator at 25 °C rather than 35 °C	
	Decreases the risk of growth of pathogens

(4)

(b) An investigator placed paper discs containing different concentrations of an antibiotic onto a culture of bacteria in a Petri dish.

After an incubation period of two days, the dish looked like this.



NB: Not to scale

(i) Explain why there are areas around some of the paper discs where no bacteria are growing.

....

....

....

....

(2)

(ii) The results of the investigation are given in the table.

The table shows the concentration of the antibiotic on the paper discs and the diameter of the circles where no bacteria are growing.

Disc	**Concentration of the antibiotic in units**	**Diameter of circle where no bacteria are growing in mm**
A	0	0
B	2	8
C	4	14
D	6	26
E	10	26

Why did the investigator include Disc **A**?

....

(1)

(iii) Use the table to describe the effect of an increase in the concentration of the antibiotic on the growth of the bacteria.

....

....

....

....

(2)

(iv) The results of the investigation did **not** show the best concentration of antibiotic to kill the bacteria.

Describe how the experiment could be improved to find the best concentration.

....

....

....

....

(2)

(c) Scientists are concerned that many bacteria are developing resistance to antibiotic.

(i) Name an antibiotic-resistant strain of bacterium that is causing problems in many hospitals.

....

(1)

(ii) Name the process that produces an antibiotic-resistant strain of a bacterium.

....

(1)

(iii) Give **one** reason why the rate of development of new antibiotic-resistant strains of bacteria has increased.

....

....

(1)

(Total 14 marks)

1 (a) (i) 0 M

1

(ii) water entered cells by osmosis

1

because the concentration of water outside cells was higher than inside the cells

1

(b) 0.5 M

1

because the chip did not change mass in this solution

1

[5]

2 (a) (i) 2 / two

allow F <u>and</u> G

1

(ii) **C** only

1

(b) any **two** from:

ignore reference to health / strength

- balanced diet / otherwise malnourished
- (release) energy
- build cells / growth / repair

or allow:

- *carbohydrates for energy (1)*
- *fat for energy / insulation (1)*
- *protein for growth / repair (1)*

2

(c) (i) health

*do **not** allow energy / insulation / growth / repair*

allow reference to specific function of vitamin or ion, eg prevent scurvy / harden bones

allow to prevent deficiency diseases

ignore strength / fitness / prevent diseases

1

(ii) a smaller

1

[6]

3 (a) (i) amino acid(s)

accept peptide(s)

*do **not** allow polypeptide(s)*

1

(ii) protease

1

(b) (i) 2

1

(ii) repeat

do not allow other enzyme / substrate

1

using smaller pH intervals between pH1 and pH3

allow smaller intervals on both sides of / around pH2

allow smaller intervals on both sides of / around answer to (b)(i)

1

(iii) enzyme / pepsin denatured / shape changed

*do **not** allow enzyme killed*

allow enzyme 'destroyed'

1

enzyme / pepsin no longer fits (substrate)

allow enzyme / pepsin does not work

1

(c) hydrochloric (acid)

allow phonetic spelling

accept HCl

allow HCL

ignore hcl

*do **not** allow incorrect formula –e.g.* H_2Cl / HCl_2

1

[8]

4 (a) any **one** from:

ignore 'check temperature'

- add a water bath
- heat screen
- use LED
- low energy bulb / described

1

(b) (i) rate / number of bubbles decreases

accept converse with reference to increasing light ***or*** *shorter distance*

or

less oxygen / gas released

ignore reference to rate of photosynthesis

1

(ii) temperature / CO_2 (concentration)

accept 'it was too cool' ***or*** *not enough* CO_2

accept number of chloroplasts / amount of chlorophyll

allow heat

allow CO2

do ***not*** *allow* CO^2

1

(c) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance, and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1-2 marks)
There is a brief description of at least 1 tissue **or** at least 1 function of an indicated part of the leaf.

The account lacks clarity or detail.

Level 2 (3-4 marks)
There is a clear description which includes at least 1 named tissue and at least 1 correct function described for an indicated part of the leaf.

Level 3 (5-6 marks)
There is a detailed description of most of the structures and their functions.

Examples of responses:

- epidermis
- cover the plant
- mesophyll / palisade
- photosynthesises
- phloem
- xylem
- transport.

The following points are all acceptable but beyond the scope of the specification:

- (waxy) cuticle – reduce water loss
- epidermis – no chloroplasts so allows light to penetrate
- stomata / guard cells – allow CO_2 in (and O_2 out) **or** controls water loss
- palisade (mesophyll) – <u>many</u> chloroplasts to trap light

  – near top of leaf for receiving more light
- spongy (mesophyll) – air spaces for rapid movement of gases

6

[9]

5 (a) (i) 0

1

(ii) osmosis

1

(b) 0.5

1

no change in mass / weight

allow 'chip / it stays the same'

1

or

no (net) osmosis / same amount of water in <u>and</u> out

(c) repeat / use more chips in each solution

allow use of other people's results

*do **not** allow 'get more results' unqualified*

*do **not** allow leave longer / use more concentrations / better instrumentation*

1

[5]

6 (a) to kill microorganisms

extra boxes ticked cancels the mark

1

(b) 25 °C

extra boxes ticked cancels the mark

1

(c) **S**

1

widest clear area

1

[4]

7 (a) (i) glycerol

1

(ii) pancreas / <u>small</u> intestine

accept duodenum / ileum

ignore intestine unqualified

1

(b) any **two** from:

- type of milk
- volume / amount of milk
- vol. bile equals vol. water
- volume of lipase
- concentration of lipase
- temperature

ignore time interval

ignore solution unqualified

*do **not** allow pH*

ignore starting pH

ignore volume / amount of bile / water

ignore concentration of bile

accept amount of lipase if neither volume nor concentration given

2

(c) (i) fatty acid (production)

1

(ii) faster reaction / digestion (with bile)

or

pH decreases faster (with bile)

or

takes less time (with bile)

or

steeper fall / line (with bile)

allow use of data

ignore easier

1

(iii) all fat / milk digested

or

same amount of fatty acids present

or

(lower pH) denatures the enzyme / lipase

allow all reactants used up

ignore reference to neutralisation

allow enzyme won't work at low pH

*do **not** allow enzyme killed*

1

[7]

8 (a) (i) 25°C

1

(ii) pathogens

1

(b) **D**

1

more / most bacteria killed

accept biggest area / ring where no bacteria are growing

1

(c) viruses live inside cells

1

[5]

9 (a) The starch is stored for use later

no mark if more than one box is ticked

1

(b) (i) any **two** from:

*do **not** accept temperature*

apply list principle

ignore reference to time

- carbon dioxide (concentration)

- light intensity
- light colour / wavelength

*allow **1** mark for light if neither intensity or colour are awarded*

- pH
- size / amount of pondweed / plant
- same / species / type pondweed
- amount of water in the tube

ignore amount of water alone

2

(ii) number / amount of bubbles **or** amount of gas / oxygen

allow volume of bubbles (together)

ignore 'the bubbles' unqualified

1

(relevant reference to) time / named time interval

allow how long it bubbles for

*do **not** accept time bubbles start / stop*

ignore speed / rate of bubbling

ignore instruments

*do **not** accept other factors eg temperature*

*accept how many bubbles per minute for **2** marks*

1

(c) (i) temperature

allow heat / cold / °C

1

(ii) carbon dioxide / CO_2

allow CO2

*do **not** accept CO^2*

1

[7]

10 (a) (i) directly proportional

gains full marks

or

0.1 rise in rate for 1% rise in concentration

accept increased concentration: increased rate ***or*** *positive correlation* ***or*** *proportional for* ***1*** *mark*

2

(ii) 0.6

allow ± 0.01

1

(b) (0.5% trypsin) cheaper

ignore more profit

1

(35°C) faster reaction

allow (35°C) optimum / best temperature

1

so takes less time to make product

1

extra heating cost outweighed by savings on enzyme cost

1

(c) (i) any **two** from:

- breaks down / digests food

  allow pre-digests protein / food
  allow easier for baby to digest

- from protein into amino acids / peptides

- makes soft(er) / runni(er)

  allow description of texture change
  allow make (more) soluble

2

(ii) correct named enzyme

1

correct function

to gain ***2*** *marks function must relate to correctly named enzyme*

Eg

carbohydrase

accept amylase / maltase / lactase

1

starch → sugar **or** lactose → glucose **or** making sugar syrup

or

isomerase

glucose → fructose **or** making slimming foods

or

lipase

fats / oils → fatty acids **or** removal of grease stains

accept other correct example

[11]

11 (a) photosynthesis

*do **not** accept other additional processes*

1

(b) (i) any **three** from, eg:

ignore time / apparatus

- mass of pondweed

  *type of pondweed = max **2***

  accept amount / volume / length / size

  ignore number / surface area of leaves / pondweed unqualified

- volume of water

  accept amount

- other reasonable features of the water

- light intensity

  accept distance between light source and tube / pondweed

- light colour

  accept light if neither colour nor intensity is given

- carbon dioxide

- temperature

- pH

3

(ii) any **one** idea from, eg:

ignore reference to cost

- how much oxygen they give off
- is pondweed poisonous to fish
- will fish eat pondweed
- is pondweed harmful to environment
- how long the pondweed lives
- growth rate / size of pondweed
- reference to appearance / aesthetics
- availability

1

(c) magnesium / Mg

accept iron / Fe

ignore ion and $^{+}$ or $^{-}$

ignore nitrate

1

[6]

12 (a) (i) change in weight was due to changes <u>in</u> potato **or** osmosis **or** not due to outside liquid

ignore 'to make fair test'

1

(ii) beaker 2 = 15.1(%) gain

allow 15%

1

beaker 4 = 21.8(5) loss

not *21.7*
allow –22%
if no minus or no 'loss' check graph

1

beaker 5 = 29.8(%) loss

allow –30%

1

(b) (i) both axes correct values
and scales > ½ of each axis

ignore lack of minus signs on vertical axis

1

points correct
< ± ½ square

allow answers in (a)(ii)

1

line correct

allow curve of best fit which can miss 10, 15
***or** straight lines between points*
*do **not** allow <u>one</u> straight line or sketched line*
bar graph zero marks

1

(ii) point where line crosses axis (eg 15-16% sucrose)

allow point from candidate's graph (± 0.5%)

1

(iii) any **two** from:

looking for understanding that water in equilibrium

no change in mass

not **net** movement of water
or water entry and exit are equal

because sucrose solution same concentration as cell sap **or** sucrose has same water potential as cell contents

allow because the concentrations are the same (inside and out)

2

[10]

13 (a) pancreas

either order

1

<u>small</u> intestine

1

(b) any **two** from:

- to give them time to come to temperature of the water-bath
  accept so (they / both) are at the same temperature
- at / near body temperature / best / optimum temperature
- otherwise reaction would take place at a series of different temperatures
  or sensible statement about control / fair test

2

(c) (i) 0.42

allow in range 0.42 to 0.425

1

(ii) 0.021

correct answer with or without working
*allow ecf from (c)(i) ie (c)(i) ÷ 20 correctly calculated for **2** marks*
*if answer incorrect 0.42 ÷ 20 **or** (c)(i) ÷ 20 gains **1** mark*

2

(iii) (all) starch digested / gone / used up / turned to sugar

allow the amount of sugar stays the same / maximum

1

(iv) any **two** from

allow reference to active site once only as alternative to first or second bullet point

- enzyme destroyed / denatured / damaged / shape changed

  *do **not** accept killed*

- unable to fit (starch molecule)

- starch can't be digested

  enzymes don't work is insufficient

2

[10]

14 (a) water enters (funnel / sugar solution) **or** water diffuses in (to the funnel)

*do **not** accept if diffusion of sugar*

1

membrane partially / selectively / semi permeable **or** by osmosis

allow description

1

because concentration (of sugar) greater
inside funnel than outside / water / in beaker

assume 'concentration' refers to sugar unless candidate indicates otherwise
the position of the solutions may be implied

1

(b) (level / it) rises more slowly **or** levels out earlier **or** does not rise as much

accept inference of less steep gradient (of graph)

allow less / slower osmosis / diffusion / less water passes through or less water enters funnel

allow water enters / passes through slower

1

less difference in concentration (between solution / funnel and water / beaker)

accept due to lower diffusion / concentration gradient / described

1

[5]

15 (a) reactants: $CO_2 + H_2O$

1

products: $C_6H_{12}O_6 + O_2$

1

balance:

$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

1

(b) **1** mark each for any of the following ideas:

lower CO_2 concentration

lower light intensity

decrease water availability

alter light wavelength **or** colour

accept more green light

2

(c) (i) scales correctly constructed

i.e. equal intervals along each axis

1

points plotted correctly

1

appropriate line correctly drawn

accept dot to dot ***or*** *line of best fit*

cancel if line extends through zero or beyond 50°C

1

(ii) 18 – 19 (bubbles per minute)

1

(iii) heat denatures enzymes **or** destroys membranes **or** ruptures cells **or** destroys cells

do not accept kills enzymes

1

[10]

16 (a) more concentrated

must be a comparison

1

than the cell / cytoplasm

accept more salty / solutes / ions

accept cell is less concentrated than solution for ***2*** *marks*

1

(b) (i) turgid

1

(ii) plasmolysed

accept flaccid

1

(c) any **four** from:

- water left the cells (in A)
- by osmosis
- from dilute to more concentrated solution

  accept high to low water potential or from high to low water concentration
- via partially permeable membrane
- so cell membrane shrank away from cell wall

4

(d) water enters the cells (by osmosis)

*allow **1** mark for:*

1

they burst / lyse / lysis occurs

water leaves and cell shrinks (if they think it is hypertonic solution)

1

animal cells have no cell wall **or** plant cells have a cell wall

1

cell wall prevents lysis / bursting / allows turgidity

allow correct description

1

[12]

17 (a) LHS = water

1

RHS = glucose

1

(b) any **three** from:

- (measure) temperature

  ignore reference to fair test
- to check that the temperature isn't changing
- rate of reaction changes with temperature
- temperature is a variable that needs to be controlled

  allow lamp gives out heat

3

(c) (i) 10

*correct answer = **2** marks*

*allow **1** mark for:* $\frac{(10+9+11)}{3}$

*allow **1** mark for correct calculation without removal of anomalous result ie 15*

2

(ii) graph:

*allow ecf from **(c)(i)***

label on y-axis as ‘number of bubbles per minute’

1

three points correct = **1** mark

allow ± 1 mm

four points correct = **2** marks

2

line of best fit = smooth curve

1

(iii) as distance increases, rate decreases – pro

allow yes between 20 – 40

1

but should be a straight line / but line curves – con / not quite pro

allow not between 10 – 20

if line of best fit is straight line, allow idea of poor fit

1

(d) any **four** from:

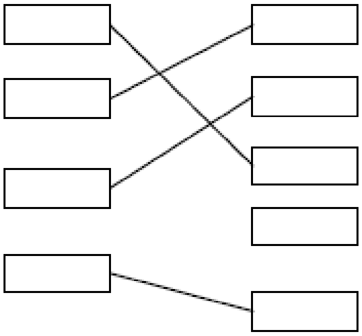
- make more profit / cost effective
- raising temp. to 25 °C makes very little difference at 0.03% CO_2
- (at 20 °C) with CO_2 at 0.1%, raises rate
- (at 20 °C with CO_2 at 0.1%) → >3x rate / rises from 5 to 17
- although 25 °C → higher rate, cost of heating not economical
- extra light does not increase rate / already max. rate with daylight

accept ref to profits c.f. costs must be favourable

4

[17]

18 (a)



1 *mark for each correct line*

mark each line from left hand box

two lines from left hand box cancels mark for that box

4

(b) (i) because antibiotics diffuse / pass (into agar)

1

where they kill bacteria

1

(ii) as a control

1

(iii) as the concentration increases more bacteria are killed

or

causes less growth

1

levels off (at 6 units)

or

the greatest effect is when the concentration is increased from 4 to 6 units

1

(iv) repeat experiment with more concentrations of antibiotic

1

between 4 and 6 units

1

(c) (i) MRSA

accept Clostridium

1

(ii) mutation

1

(iii) overuse / inappropriate use of antibiotics

1

[14]