



Additional Assessment Materials
Summer 2021

Pearson Edexcel GCSE in Biology (1BI0)
Higher

Resource Set Topic 1: Key Concepts

Questions

(Public release version)

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General guidance to Additional Assessment Materials for use in 2021

Context

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose

- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

3 (a) Figure 5 shows two potato chips.

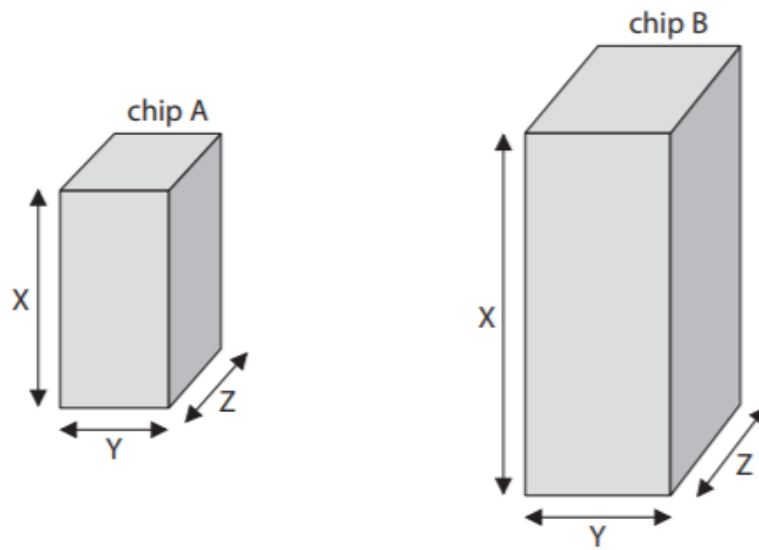


Figure 5

Figure 6 shows some information about each potato chip.

potato chip	length of X in cm	length of Y in cm	length of Z in cm	total surface area of four sides in cm^2	total surface area of top and bottom in cm^2	total surface area of chip in cm^2
A	3.0	1.5	1.5	18.0	4.5	22.5
B	5.0	2.0	2.0	?	?	?

Figure 6

Figure 6 shows some information about each potato chip.

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A	3.0	1.5	1.5	18.0	4.5	22.5
B	5.0	2.0	2.0	?	?	?

Figure 6

(i) Calculate the total surface area of potato chip B using the formula,

$$\text{Total surface area} = 2XY + 2XZ + 2YZ$$

(2)

total surface area = cm²

(ii) The potato chips were placed in distilled water for 20 minutes.

Figure 7 shows the increase in mass of each potato chip.

potato chip	increase in mass in grams
A	0.1
B	0.3

Figure 7

Explain why potato chip B has a greater increase in mass than potato chip A.

(2)

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(iii) Potato chip A is transferred from the distilled water into a concentrated salt solution.
Explain what will happen to the cells in potato chip A.

(3)

(b) The potatoes of a potato plant develop underground.

Explain **one** difference in the sub-cellular structures in a cell in the potato and those in a cell in the leaf of the potato plant.

(2)

4.

(b) Crop plants provide a source of energy in the form of carbohydrates such as starch and sugars.

(i) Describe the test to identify starch.

(2)

- (ii) The amount of energy in the sugars extracted from crop plants can be measured using the calorimeter shown in Figure 9.

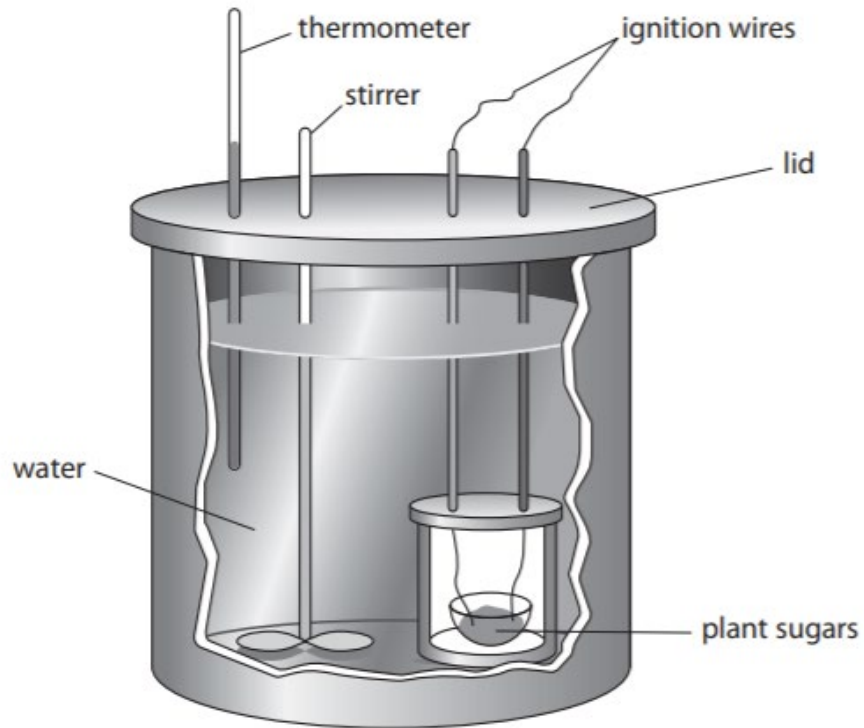


Figure 9

Explain why the calorimeter has a lid.

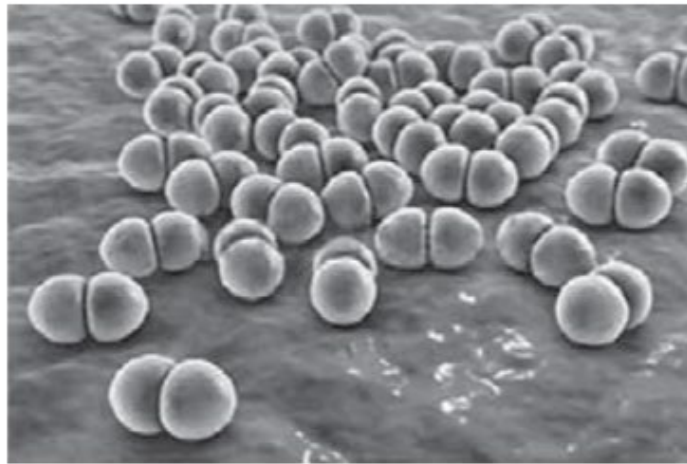
(2)

(iii) State why it is important to stir the water in the calorimeter.

(1)

5a.

(iii) Figure 10 shows some *Streptococcus* bacteria.



© Kateryna Kon/Shutterstock

Figure 10

Some bacteria are motile, meaning they can move themselves.

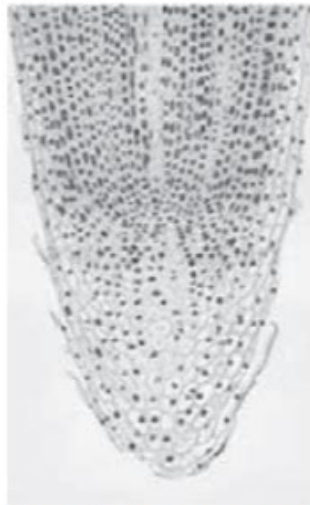
Why is a *Streptococcus* bacterium not motile?

(1)

- A** it does not have flagella
- B** it does not have plasmids
- C** it does not have ribosomes
- D** it does not have acrosomes

6.

- (c) Figure 12 shows a root tip with cells in different stages of mitosis.
The image was magnified 400 ×.



© WIM VAN EGMOND/SCIENCE PHOTO LIBRARY

Figure 12

Explain how a magnification of 400 × can be obtained using the lenses on a light microscope.

(2)

8 Potato cells contain the enzyme catalase.

This enzyme catalyses the breakdown of hydrogen peroxide into oxygen and water.

Figure 15 shows what happened when a student placed a potato disc in a 5% hydrogen peroxide solution.

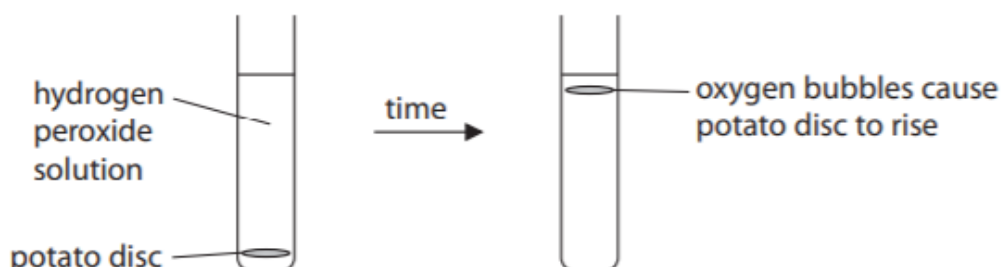


Figure 15

The student measured the time taken for the potato disc to rise.

The student repeated the investigation using 10%, 15% and 20% concentrations of hydrogen peroxide solution.

(a) (i) Which term describes the hydrogen peroxide in this reaction?

(1)

- A** product
- B** substrate
- C** active site
- D** control

(ii) The potato discs all had the same mass.

Explain why the student used potato discs with the same mass.

(2)

(iii) State **two** other factors that need to be kept the same to improve this investigation. (2)

8.

(b) Figure 16 shows the results of this investigation.

The student calculated the rate of reaction using

$$\frac{1}{\text{time in seconds}}$$

concentration of hydrogen peroxide solution (%)	time taken for disc to rise (s)	rate (s ⁻¹)
5	325	0.003
10	245	0.004
15	132	0.008
20	72	0.014

Figure 16

(i) State and explain a conclusion based on these results.

(4)

(ii) The student repeated the investigation with a 25% hydrogen peroxide solution and recorded a time of 75 seconds.

Calculate the rate of reaction for the 25% hydrogen peroxide solution.

(2)

..... s⁻¹

(iii) The student decided that the rate for the 25% hydrogen peroxide solution was not anomalous.

Give the reason why the result was not anomalous.

(1)

- 2 (a) Figure 3 shows a diagram of a red blood cell from a turtle and a diagram of a red blood cell from a human.



Figure 3

- (i) These cells are animal cells.

Animal cells do not have

- A cytoplasm
- B a cell membrane
- C a cell wall
- D mitochondria

(1)

- (ii) The actual length of the red blood cell from a turtle is $20.5\ \mu\text{m}$.

Calculate the length of the magnified image of the red blood cell of the turtle when magnified $400\times$.

(2)

..... μm

(iii) The width of the human red blood cell, when magnified $400\times$, is 3.08 mm.

Calculate the actual width of the cell and show your answer in standard form.

(2)

.....mm

1 (a) A student had solutions of four different foods labelled W, X, Y and Z.

Each solution was tested for starch and protein.

The colour of the solutions after the tests are shown in Figure 1.

solution	colour after testing for starch	colour after testing for protein
W	orange	purple
X	blue/black	purple
Y	blue/black	blue
Z	orange	blue

Figure 1

(i) Which solution contains starch but **not** protein?

(1)

- A solution W
- B solution X
- C solution Y
- D solution Z

(ii) Describe how a solution of food can be tested for reducing sugars.

(2)

(b) Figure 2 shows a calorimeter.

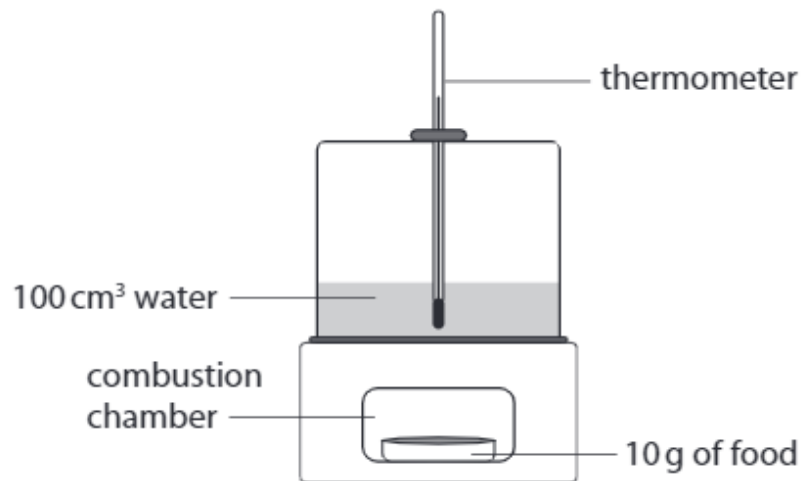


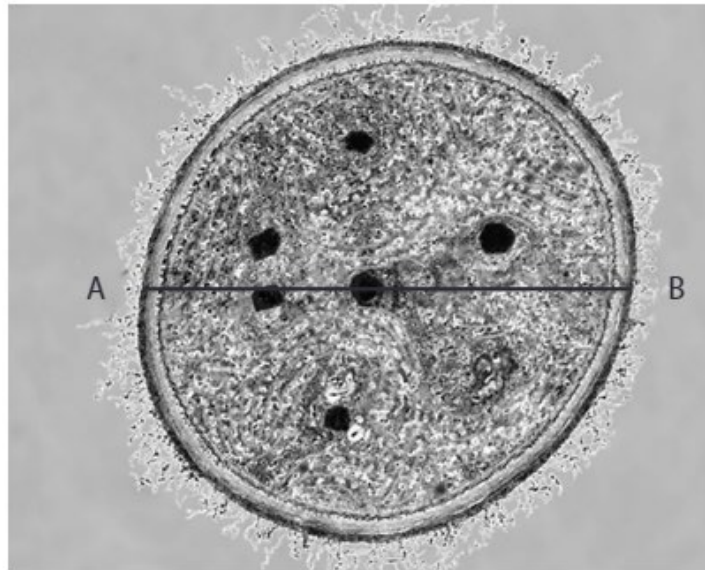
Figure 2

Describe how this calorimeter can be used to find the energy content of 10g of food. (3)

6.

(b) Figure 7 shows a cyanobacterium magnified 50 000 times.

The line AB shows the diameter of the bacterial cell.



(Source: © The Christian Science Monitor)

Figure 7

(i) Calculate the actual diameter of the cyanobacterium.

Give your answer in micrometres (μm).

(3)

..... μm

(ii) Bacterial cells contain plasmids.

Describe **three** other features of a bacterial cell.

(3)

6 (a) Lactase is an enzyme that breaks down lactose into glucose and galactose.

A student made some alginate beads containing lactase.

The student added 10 beads to 20 cm³ of a solution of lactose, as shown in Figure 9.

The student timed how long it took for glucose to be produced.

The experiment was repeated using 15, 20 and 25 beads.

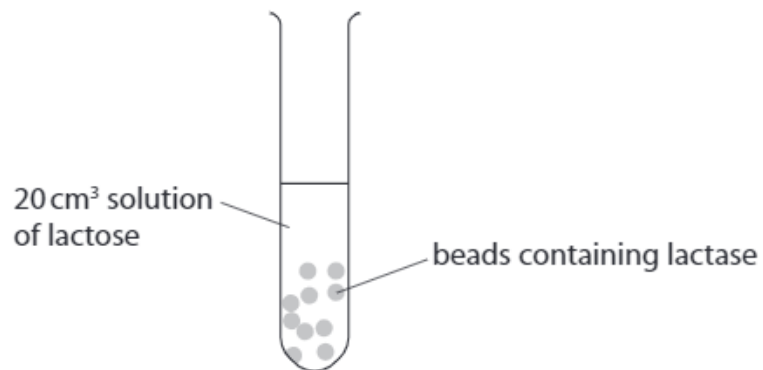


Figure 9

The results are shown in Figure 10.

number of beads containing lactase	time taken to produce glucose in seconds
10	240
15	210
20	150
25	120

Figure 10

(i) What is the rate of reaction for 25 beads?

(1)

A 0.008 s^{-1}

B 0.04 s^{-1}

C 0.21 s^{-1}

D 4.8 s^{-1}

(ii) Explain the conclusion that can be made from these results.

(3)

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(iii) Explain why the same volume of lactose solution was used for each test.

(2)

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(b) Devise a method to find the optimum temperature for the enzyme lactase.

(3)

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10 (a) Figure 16 shows the number of neurones in the brain of different animals.

animal	number of neurones in the brain
lobster	1.0×10^5
frog	1.6×10^7
rat	2.0×10^8
human	8.6×10^{10}

Figure 16

(i) Calculate the difference between the number of neurones in the brain of the rat and the brain of the frog.

Give your answer in standard form.

(2)

..... neurones

6.

(b) Describe how a student could test a sample of urine for the presence of protein.

(2)

(ii) A student took a sample of cells from a meristem to view under a light microscope.

Describe how the student would prepare a microscope slide using these cells.

(3)

3.

(b) Figure 3 is a drawing of a eukaryotic cell.

Structure **Z** is found in plant leaf cells.

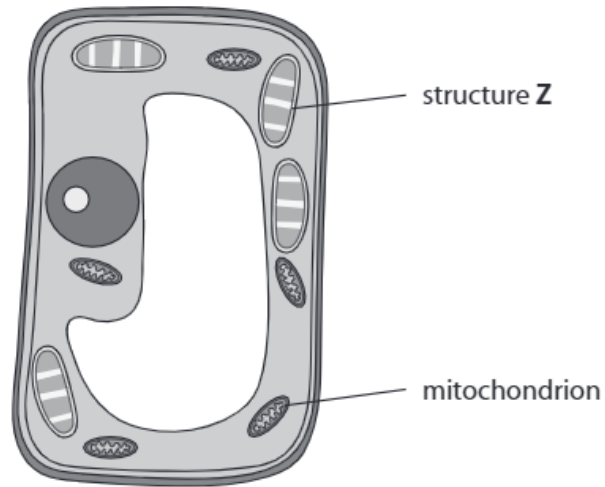


Figure 3

(i) Name structure **Z**.

(1)

.....

(ii) Give **one** function of the mitochondrion.

(1)

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(iii) Describe how a prokaryotic cell is different from the cell in Figure 3.

(2)

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4.

(c) Peas contain small amounts of fat.

Describe a test to identify fat.

(2)

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6 (a) A student mixed 10 cm^3 of starch solution with 5 cm^3 of amylase solution and kept the tube in a water bath at 25°C .

The student tested the solution for starch and for glucose every 30 seconds.

Figure 6 shows the results.

time in seconds	starch detected	glucose detected
0	Yes	No
30	Yes	No
60	Yes	Yes
90	Yes	Yes
120	Yes	Yes
150	No	Yes
180	No	Yes

Figure 6

(i) Give **one** reason for the result at 150 seconds.

(1)

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(ii) Another student repeated the investigation with the same volumes of solutions and at the same temperature of 25 °C.

Give **two** other variables that would need to be controlled in the investigation.

(2)

1

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2

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(iii) Both students also included a tube containing 10 cm³ of starch solution with 5 cm³ of distilled water instead of 5 cm³ of amylase solution.

They tested the solution for starch and for glucose every 30 seconds.

Give **one** reason why this tube was included in their investigations.

(1)

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(b) Amylase has an optimum pH of 6.8.

Devise a method the students could use to confirm the optimum pH for amylase.

(3)

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(c) Amylase is produced by salivary glands and the pancreas.

Explain why amylase is not produced in the stomach.

(3)

(b) (i) The white petals of the water lily flowers cannot photosynthesise.

Which structure in leaf cells is the site of photosynthesis?

(1)

- A nucleus
- B vacuole
- C mitochondrion
- D chloroplast

3 A slide of potato cells was viewed using a light microscope.

Figure 4 is a drawing of the slide showing starch grains in the potato cells.

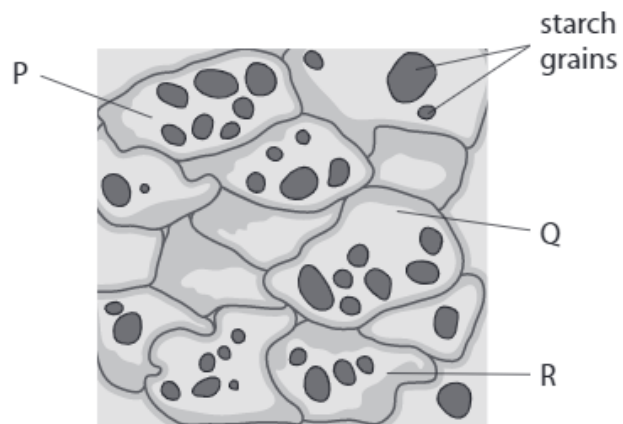


Figure 4

(a) (i) Calculate the mean number of starch grains in potato cells P, Q and R.

(1)

..... starch grains

(ii) Which structures are found in plant cells but are **not** found in animal cells?

(1)

- A cell membrane, nucleus, chloroplast
- B cell wall, cell membrane, cytoplasm
- C nucleus, large vacuole, chloroplast
- D cell wall, chloroplast, large vacuole

- (b) A scientist investigated how the length of starch grains in potatoes changed when the potatoes were stored in the dark.

Figure 5 shows a potato after being stored in the dark.



© rodimov/Shutterstock

Figure 5

Three potatoes were used in the investigation.

The length of starch grains in potato 1 were measured at the start.

The length of starch grains in potato 2 were measured after 5 weeks in the dark.

The length of starch grains in potato 3 were measured after 10 weeks in the dark.

Figure 6 shows the results.

potato	time after placing in the dark in weeks	mean length of starch grains in μm
1	0	64
2	5	50
3	10	30

Figure 6

- (i) Calculate the percentage difference in the mean length of starch grains in potato 2 at 5 weeks and in potato 3 at 10 weeks.

(2)

.....%

(ii) State **two** variables the scientist should have controlled to improve this investigation. (2)

1.....

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2.....

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(iv) Describe how starch is broken down into glucose. (2)

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4.

(b) Protein is an important nutrient.
Describe the laboratory test for protein. (2)

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5 Trypsin is a protease enzyme used in the manufacture of food for babies.

(a) (i) Which food group is digested by trypsin?

(1)

- A carbohydrates
- B lipids
- C fibre
- D proteins

(ii) The food is mashed before the trypsin is added.

Explain the advantage of mashing the food before adding the trypsin.

(2)

(b) A manufacturer of baby food wanted to find out the optimum pH for trypsin.

Equal volumes of different pH solutions were placed in six separate test tubes.

5 cm³ of 1% trypsin solution was added to each test tube.

1.5 g of mashed food was placed in each test tube.

The time taken to digest the food was recorded.

(i) State **one** other variable that should be controlled in this investigation.

(1)

(ii) State how this variable could be controlled.

(1)

(c) The results are shown in Figure 10.

pH	time taken to digest the food in minutes
1	42
2	15
3	9
4	2
5	16
6	40

Figure 10

(i) Describe the trends shown in this data.

(2)

- (ii) At pH 4, the trypsin digested 1.5 g of mashed food at a rate of 0.8 g per minute.
 Calculate the rate of digestion at pH 1.
 Give your answer to one significant figure.

(2)

..... g per minute

- (iii) Explain the difference in the rate of reaction at pH 1 and the rate of reaction at pH 4.
 (2)

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10 (a) A person with kidney disease may need kidney dialysis treatment.

Figure 15 shows an experiment to show how a dialysis membrane works.

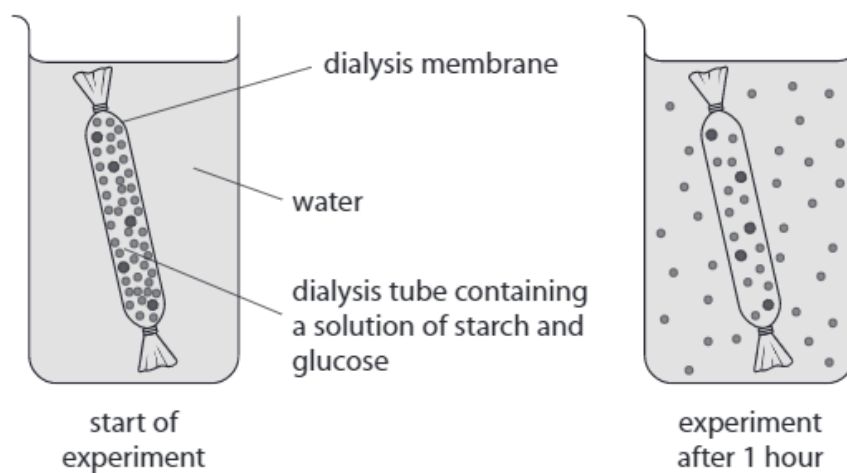


Figure 15

(ii) Explain how this experiment represents a simple model of kidney dialysis treatment. (2)

TOTAL = 106 MARKS