PEARSON EDEXCEL GCSE BIOLOGY (HIGHER) · 1BI0

# BIOLOGY



EXAM QUESTION PACK

## TOPIC 1: KEY CONCEPTS IN BIOLOGY (PACK 3)

| SCORE | PERCENTAGE |
| --- | --- |
| /108 | % |

STEMUP

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Q1.

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.

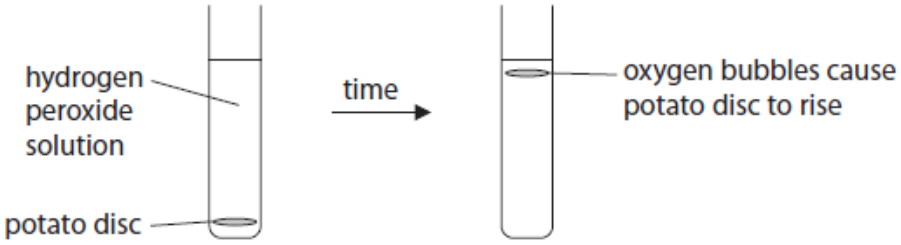



**Figure 15**

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.

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)**

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(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)**

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(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)**

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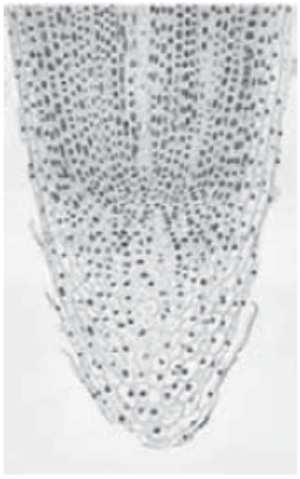
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**(Total for question = 7 marks)**

Q2.

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)**

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**(Total for question = 2 marks)**

Q3.

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)**

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**(Total for question = 2 marks)**

Q4.

Chymosin can be produced by genetically modified bacteria.

Figure 12 shows a bacterial cell.

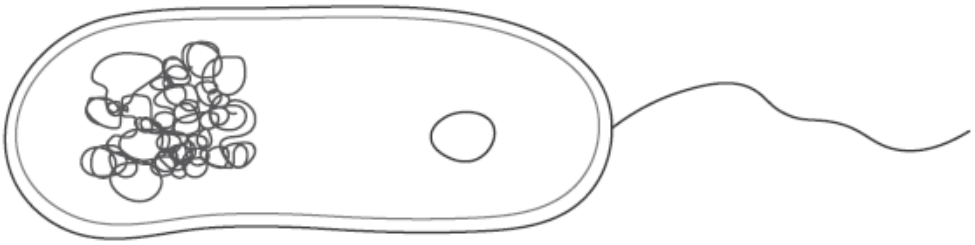


**Figure 12**

Explain how to genetically modify a bacterial cell to produce chymosin.

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**(Total for question = 3 marks)**

Q5.

A student investigated the fat content of two types of milk: milk A and milk B.

Before starting the investigation, the student added a drop of oil from a pipette into a test tube of
water as shown in Figure 5.

The drop of oil rose to the surface of the water.



(Source: © Nana_studio/Shutterstock)

**Figure 5**

5 $cm^3$ of milk B and 1 $cm^3$ of lipase were added to a different test tube.

The pH of this mixture was pH 7.

This test tube was placed in a water bath for 10 minutes.

The pH of the mixture changed from pH 7 to pH 5.

(i) Explain what caused this change in pH.

**(3)**

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(ii) This procedure was repeated with milk A.

There was no change in the pH of this mixture after 10 minutes.

Explain why there was no change in the pH of the mixture containing milk A.

**(2)**

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(iii) The student repeated this procedure with lipase that had been boiled and left to cool.

This was added to another sample of milk B.

Describe why the pH did not change in this mixture.

**(3)**

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**(Total for question = 8 marks)**

Q6.

Amylase is produced by salivary glands and the pancreas.

Explain why amylase is not produced in the stomach.

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**(Total for question = 3 marks)**

Q7.

Figure 3 shows how a student set up equipment to investigate the effect of pH on the action of the enzyme pepsin on boiled egg white.

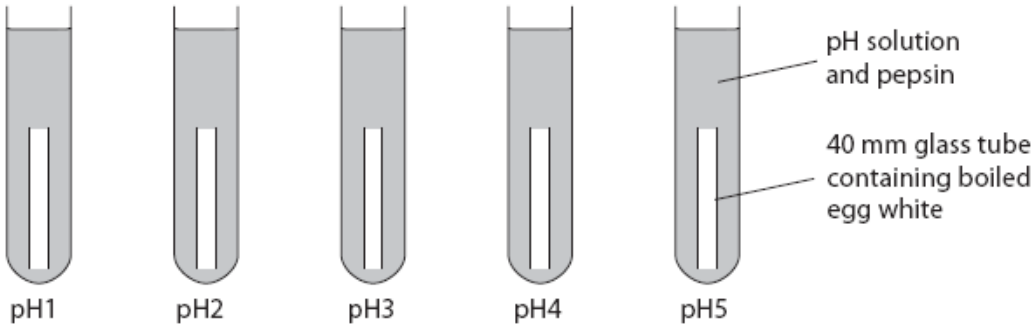
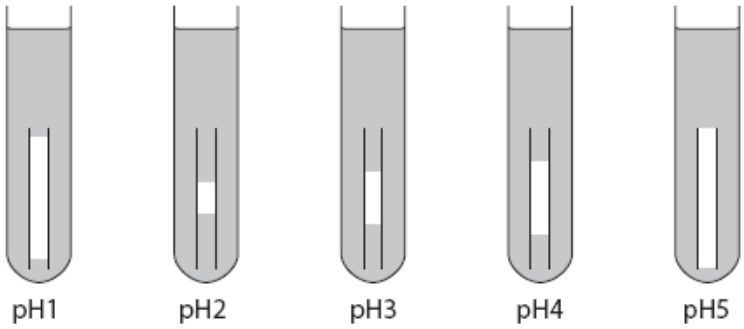



**Figure 3**

The length of egg white in each of the tubes was measured after 24 hours.

The results are shown in Figure 4.




| pH of the solution | length of egg white in glass tube after 24 hrs / mm |
|---|---|
| 1 | 36 |
| 2 | 10 |
| 3 | 24 |
| 4 | 28 |
| 5 | 40 |

**Figure 4**

The student extended his experiment by replacing the boiled egg white with fat.

Explain why there was no change in the length of the fat in the tube at any of the different pH solutions containing pepsin.

**(2)**

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**(Total for question = 2 marks)**

Q8.

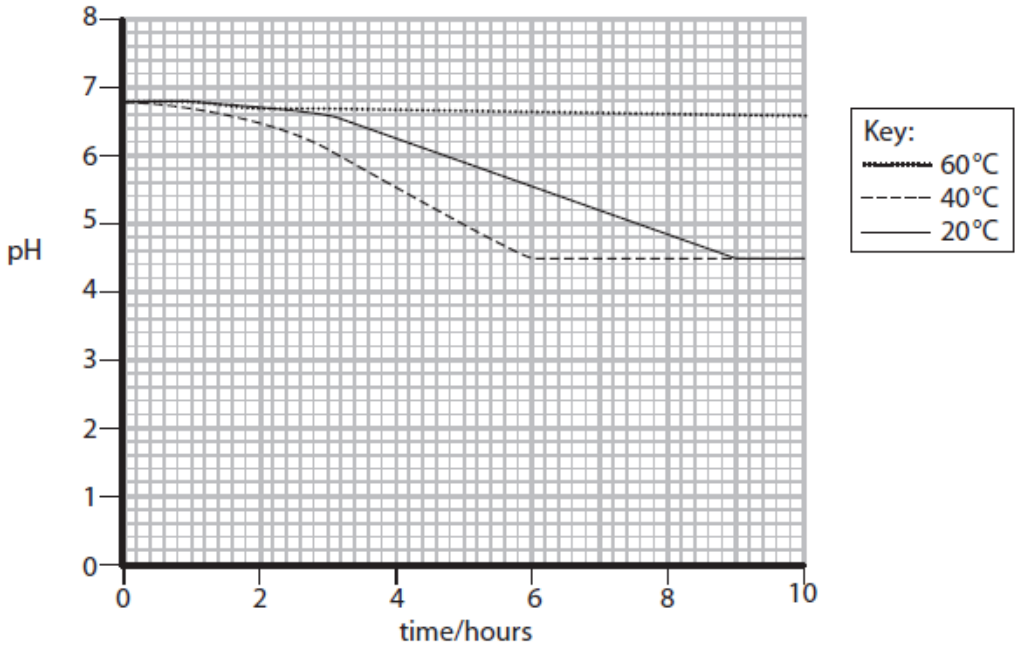
* Yogurt can be produced by adding a starter culture of microorganisms to milk.

The starter culture was added to milk kept at 20°C.

The pH was recorded over 10 hours.

This was repeated with milk kept at 40°C and 60°C.

The graph shows the results.




Using the information in the graph, explain how temperature affects the fermentation process during yogurt production.

**(6)**

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Q9.

Complete the sentence by putting a cross ( ☒ ) in the box next to your answer.

The function of the gall bladder is to

**(1)**

☒ **A** make bile

☒ **B** make lipase

☒ **C** store bile

☒ **D** store lipase

Q10.

A student investigated the fat content of two types of milk: milk A and milk B.

Before starting the investigation, the student added a drop of oil from a pipette into a test tube of water as shown in Figure 5.

The drop of oil rose to the surface of the water.



(Source: © Nana_studio/Shutterstock)

**Figure 5**

The student then placed a drop of milk A into one test tube of water and a drop of milk B into a different test tube of water.

The drop of milk A sank to the bottom and the drop of milk B rose to the surface.

Give **one** reason for the drop of milk B rising to the surface.

**(1)**

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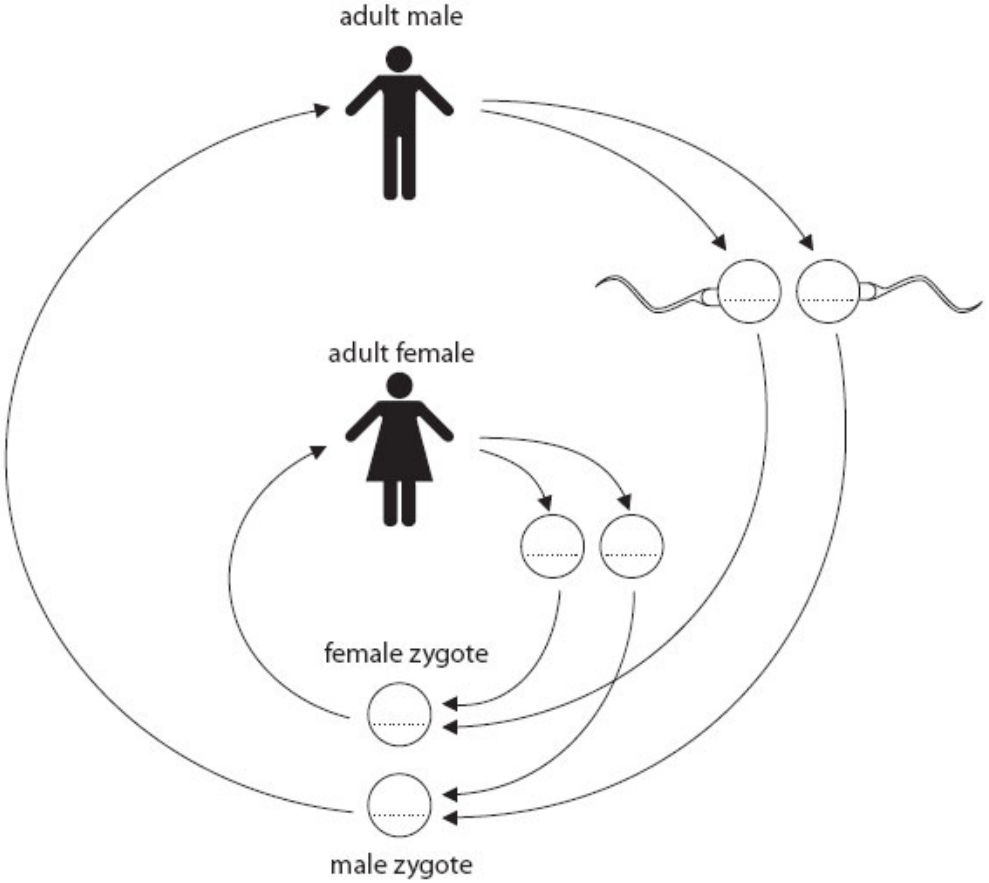
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**(Total for question = 1 mark)**

Q11.

The diagram shows the human life cycle.

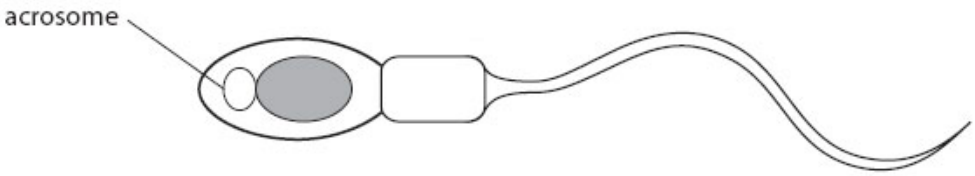
When a sperm cell fertilises an egg cell, a zygote is formed.




(a) Complete the diagram by writing the sex chromosomes in the egg cells, sperm cells, male zygote and female zygote.

**(2)**

(b) The diagram shows a sperm cell.




Complete the sentence by putting a cross ( ☒ ) in the box next to your answer.

The acrosome contains

**(1)**

☒ **A** enzymes to help get through the membrane of the egg cell

☒ **B** mitochondria to supply energy to swim

☒ **C** muscle fibres to swim

☒ **D** 23 chromosomes

(c) State why egg cells have a large amount of cytoplasm.

**(1)**

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(d) During ovulation an egg cell is released from the ovary.

Explain how changes in the levels of hormones result in ovulation.

**(2)**

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(e) Explain what happens to the uterus lining if the egg cell is fertilised.

**(2)**

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**(Total for Question = 8 marks)**

Q12.

Organisms can be classified by the five kingdom or three domain method.

(i) What is the name of the domain that plants belong to?

**(1)**

☒ **A** Eukarya

☒ **B** Archaea

☒ **C** Monera

☒ **D** Protista

(ii) Plant cells contain chloroplasts.

What happens in a chloroplast?

**(1)**

| | | | |
|---|---|---|---|
| ☒ | **A** | oxygen produced | sunlight absorbed by chlorophyll |
| ☒ | **B** | carbon dioxide produced | sunlight absorbed by mitochondria |
| ☒ | **C** | oxygen produced | sunlight absorbed by mitochondria |
| ☒ | **D** | carbon dioxide produced | sunlight absorbed by chlorophyll |

(iii) Give a reason why the three domain method of classification has been suggested.

**(1)**

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**(Total for question = 3 marks)**

Q13.

*Streptococcus* bacteria can cause a sore throat or skin infection.

An illness called scarlet fever can also develop during an infection with this bacterium.

(i) Give **two** precautions a doctor should take when treating a patient who is infected with *Streptococcus*.

**(2)**

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(ii) From September 2013 to March 2014 there were 2 830 cases of scarlet fever in the UK.

From September 2014 to March 2015 there were 5 943 cases of scarlet fever.

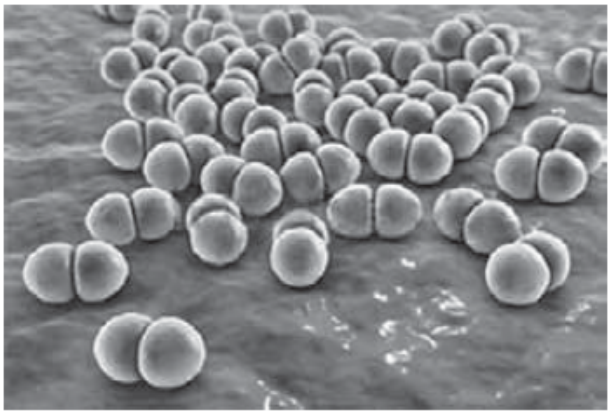
Calculate the percentage increase of the number of cases of scarlet fever between the periods

September 2014 to March 2015 and September 2013 to March 2014.

**(2)**

..... %

(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

**(Total for question = 5 marks)**

Q14.

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 $cm^3$ 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.

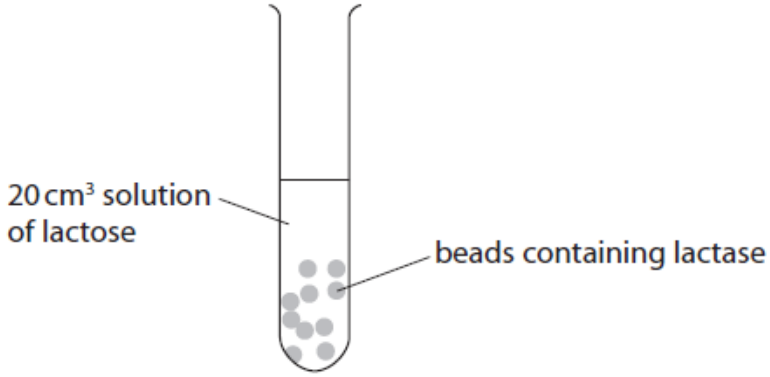



**Figure 9**

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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**(Total for question = 6 marks)**

Q15.

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)**

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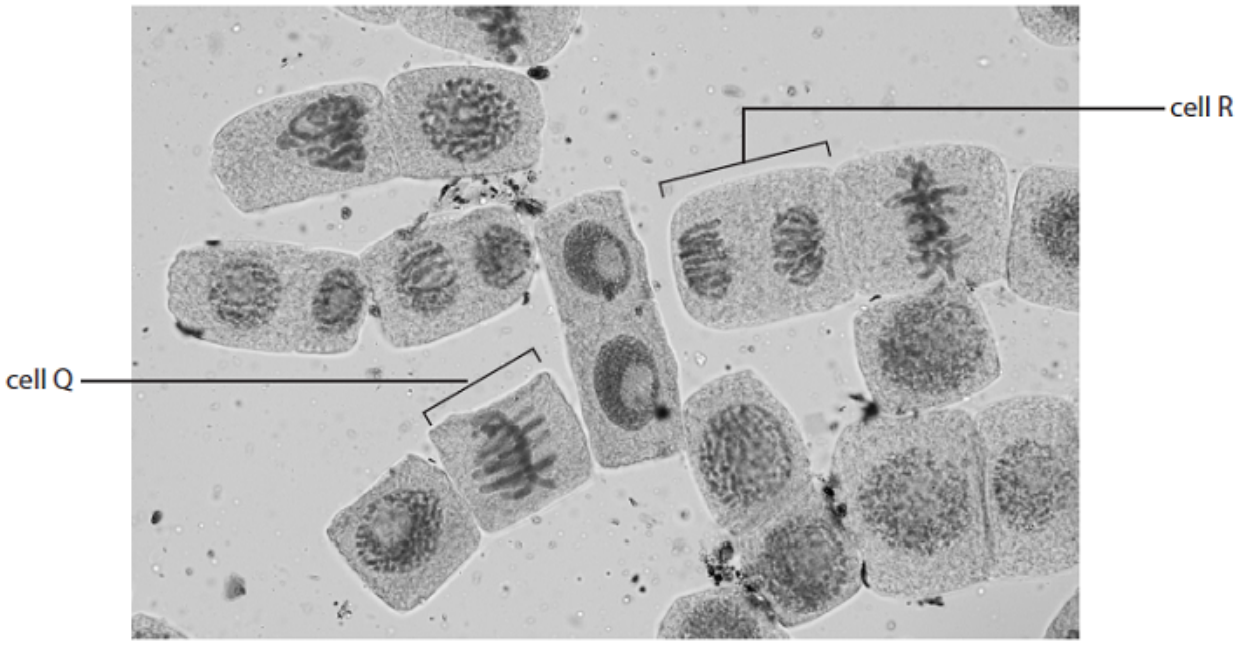
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**(Total for question = 3 marks)**

Q16.

**Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.**

Figure 7 shows cells from an onion root tip as seen using a light microscope.




(Source: © Rattiya Thongdumhyu/Shutterstock)

**Figure 7**

(i) Identify the stages of mitosis shown in cell Q and cell R.

**(1)**

| | cell Q | cell R |
|---|---|---|
| ☒ **A** | metaphase | anaphase |
| ☒ **B** | telophase | anaphase |
| ☒ **C** | metaphase | interphase |
| ☒ **D** | telophase | interphase |

(ii) Describe **two** processes that occur in cells during prophase.

**(2)**

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2 .....

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(iii) State the term used to describe the process which occurs after mitosis, when the cell divides into two.

**(1)**

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(iv) The diameter of one cell in Figure 7 is 0.075 mm.

Which is this diameter in µm?

**(1)**

☒ **A** 0.75 µm

☒ **B** 75 µm

☒ **C** 750 µm

☒ **D** 75 000 µm

**(Total for question = 5 marks)**

Q17.

**Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .**

(i) Which of the following describes osmosis?

**(1)**

☒ **A** does not use energy to move water into cells

☒ **B** does not use energy to move glucose into cells

☒ **C** uses energy to move water into cells

☒ **D** uses energy to move glucose into cells

(ii) Animal cells will swell and burst when placed in a hypotonic solution.

Explain what happens to plant cells when they are placed in a hypotonic solution.

**(3)**

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**(Total for question = 4 marks)**

Q18.

Figure 7 shows the steps involved in making a slide to observe mitosis in plant tissue.

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|---|---|
| step 1 | a small sample of tissue is removed from a plant |
| step 2 | the plant tissue is placed in a weak acid solution |
| step 3 | a stain is added to the plant tissue |
| step 4 | the stained plant tissue is squashed onto a slide |
| step 5 | a cover slip is placed over the stained plant tissue |
| step 6 | the stained plant tissue is observed using a microscope |

**Figure 7**

**Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .**

(i) To observe mitosis, the plant tissue should be removed from the

**(1)**

☒ **A** middle of the root

☒ **B** centre of the stem

☒ **C** middle of the leaf cell

☒ **D** tip of the root

(ii) State why the stain is added to the plant tissue in step 3.

**(1)**

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(iii) The microscope has an eyepiece lens with a ×10 magnification and three objective lenses: ×4, ×10 and ×40.

Describe the best method of using the microscope to focus on the plant tissue and reach a magnification of ×400.

**(3)**

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**(Total for question = 5 marks)**

Q19.

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.

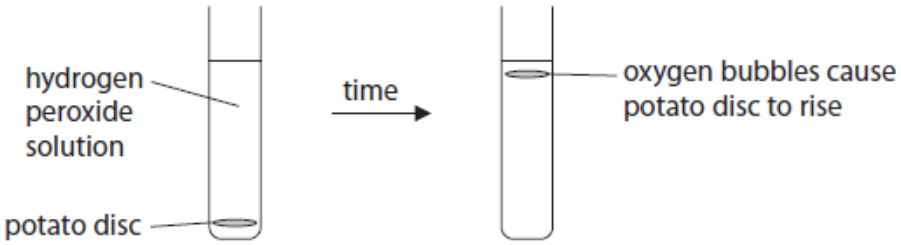



**Figure 15**

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.

(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)**

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

**(2)**

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**(Total for question = 5 marks)**

Q20.

A scientist was planning to compare the effectiveness of the antibiotic myxopyronin on two different species of bacteria.

Figure 18 shows the equipment the scientist can use.

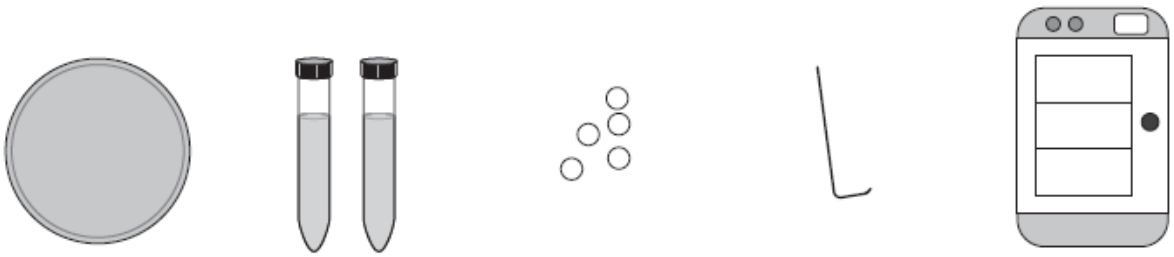



**Figure 18**

(i) Describe how the scientist could determine the effectiveness of myxopyronin on the two species of bacteria.

**(2)**

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(ii) Myxopyronin inhibits bacterial RNA polymerase.

Explain why the antibiotic myxopyronin can be used to treat bacterial infections in humans.

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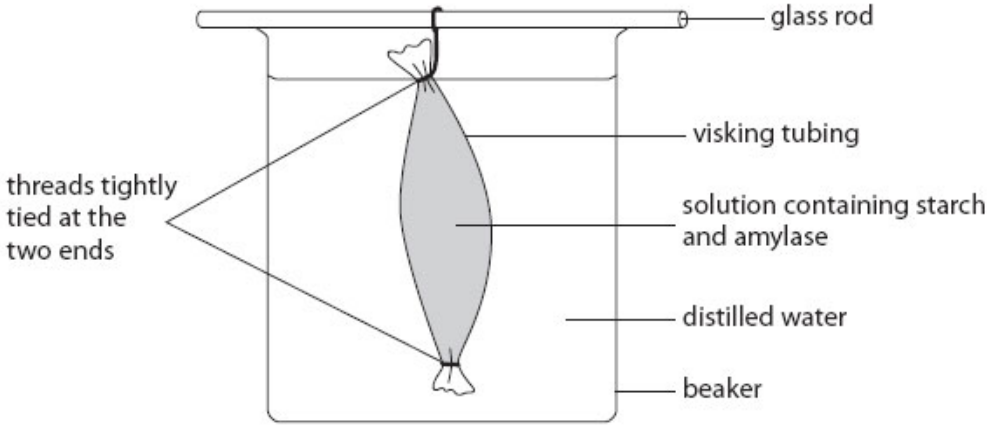
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**(Total for question = 6 marks)**

Q21.

Visking tubing is made of a plastic material through which small molecules can pass.

The diagram shows how the equipment for an investigation using visking tubing was set up.




In this investigation, the concentration of glucose in the distilled water was measured at the start and then every five minutes.

The results are shown in the table.

| time of measuring the glucose concentration in the distilled water / mins | concentration of glucose in the distilled water / g $cm^{-3}$ |
|---|---|
| 0 | 0.00 |
| 5 | 0.07 |
| 10 | 0.39 |
| 15 | 0.52 |
| 20 | 0.79 |
| 25 | 0.79 |

(i) Describe the results of this investigation.

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(ii) Explain the results of this investigation

**(3)**

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*(iii) The diagram shows how visking tubing can be used to model the small intestine.

This model does not fully represent the structure and functions of the small intestine.

Evaluate the strengths and weaknesses of this model.

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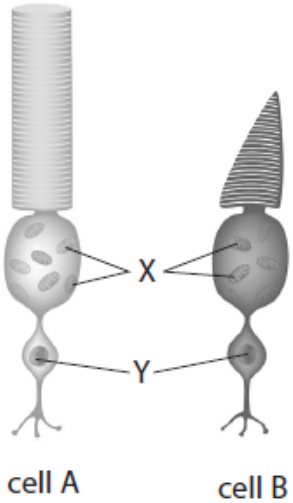
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Q22.

Figure 3 shows two light receptor cells from the human eye.




(Source: © Kokhanchikov/Shutterstock)

**Figure 3**

(i) Which part of the eye contains light receptor cells?

**(1)**

- ☒ **A** cornea
- ☒ **B** iris
- ☒ **C** lens
- ☒ **D** retina

(ii) These cells require energy.

The cell organelles labelled X release energy during respiration.

Name the organelles labelled X.

**(1)**

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(iii) The cell organelle labelled Y contains chromosomes.

Name the organelle labelled Y.

**(1)**

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(iv) Cell A responds to dim light and is responsible for night vision.

Name cell A.

**(1)**

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(v) Describe how the role of light receptor cell B is different from the role of light receptor cell A.

**(2)**

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**(Total for question = 6 marks)**

Q23.

Figure 6 shows a photomicrograph of onion cells.

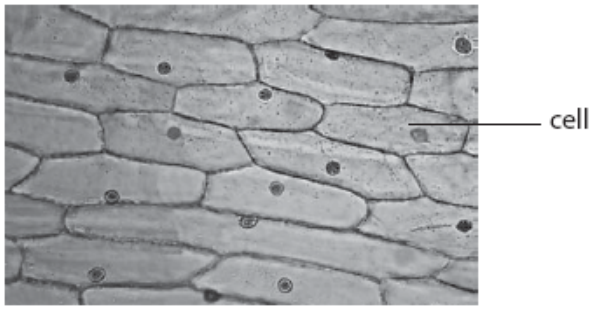



**Figure 6**

(i) The width of the labelled cell in Figure 6 is 6 mm. The cell has been magnified 750 times.

Calculate the actual width of this cell in mm.

Give your answer in standard form.

**(3)**

..... mm

(ii) The most appropriate unit of measurement to record the length of a cell under a light microscope is a

**(1)**

☒ **A** centimetre

☒ **B** micrometre

☒

**C** nanometre

☒ **D** picometre

**(Total for question = 4 marks)**

Q24.

Figure 3 is a drawing of a eukaryotic cell.

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

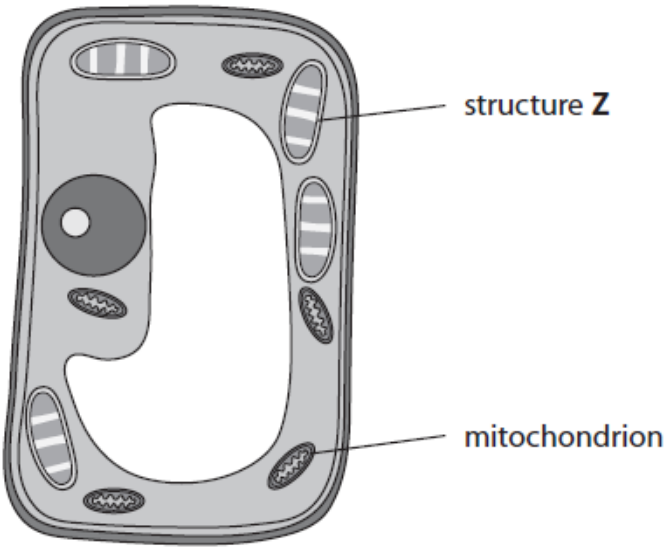



**Figure 3**

(i) Name the structure of **Z**.

**(1)**

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(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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**(Total for question = 4 marks)**

Q25.

Name the product formed when the protein in boiled egg white is broken down.

**(1)**

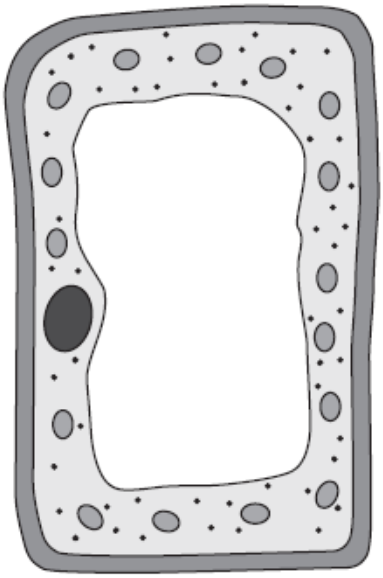
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**(Total for question = 1 mark)**

Q26.

**Photosynthesis**

The diagram shows a plant cell.



(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

This plant cell is a

**(1)**

☒ **A** xylem vessel

☒ **B** phloem vessel

☒ **C** root hair cell

☒ **D** leaf palisade cell

(b) Explain how water moves from cell to cell in a leaf.

**(2)**

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(c) Some small plants can grow on the bark of trees.

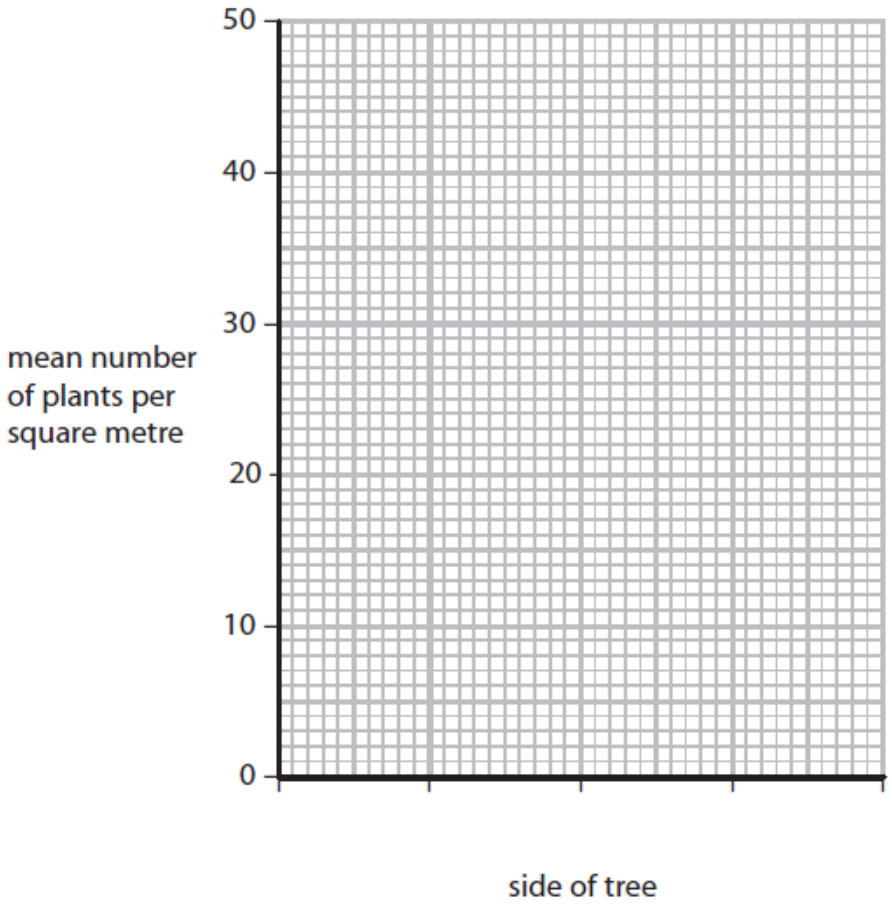
The distribution of two plant species, species A and species B, growing on the north and south side of a tree was investigated.

The results are shown in the table.

| | mean number of plants per square metre | |
|---|---|---|
| side of tree | species A | species B |
| North | 48 | 12 |
| South | 0 | 36 |

(i) Draw a bar chart to illustrate the data in this table.

**(2)**




(ii) Which piece of equipment would be used to measure the distribution of plants on the bark of the tree?

Place a cross (☒) in the box next to your answer.

**(1)**

☒ **A** a pooter

☒ **B** a sweep net

☒ **C** a pitfall trap

☒ **D** a quadrat

(iii) Suggest reasons for the distribution of species B on the north and south sides of the tree.

**(2)**

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**(Total for question = 8 marks)**

Q27.

Proteins are made up of amino acids.

(a) The table shows the DNA bases that code for some of the amino acids found in proteins.

| **DNA bases** | AAA | AAC | CAA | TAC | TTC |
|---|---|---|---|---|---|
| **Amino acid** | phe | leu | val | met | lys |

Part of the DNA coding for a protein is:

T A C C A A T T C

(i) State the order of amino acids coded for by this sequence of DNA.

**(1)**

.....

(ii) These amino acids will be joined together during protein synthesis.

During which stage of protein synthesis will this take place?

**(1)**

.....

(iii) Complete the sentence by putting a cross ( ☒ ) in the box next to your answer.

Amino acids are joined together

**(1)**

☒ **A** at the membrane

☒ **B** in the mitochondria

☒ **C** in the nucleus

☒ **D** at the ribosome

(b) DNA can code for the amino acids in the active site of an enzyme.

Explain the role of the active site of an enzyme.

**(2)**

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(c) Mutations can occur in DNA.

Describe what effect a mutation could have on the action of an enzyme.

**(3)**

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**(Total for Question = 8 marks)**

Q28.

Figure 3 shows how a student set up equipment to investigate the effect of pH on the action of the enzyme pepsin on boiled egg white.

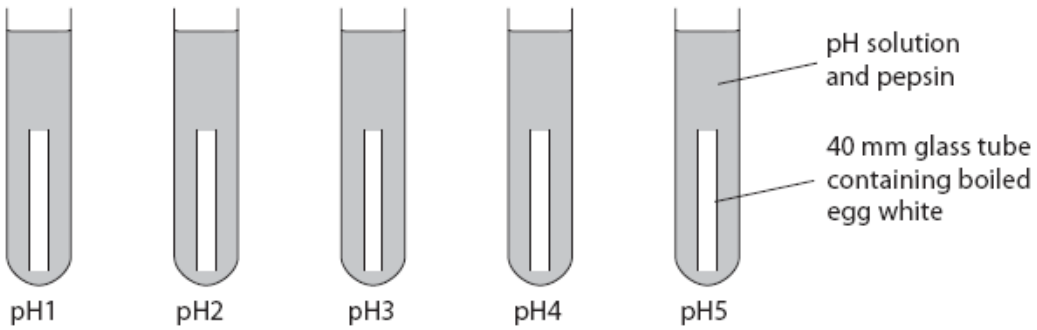
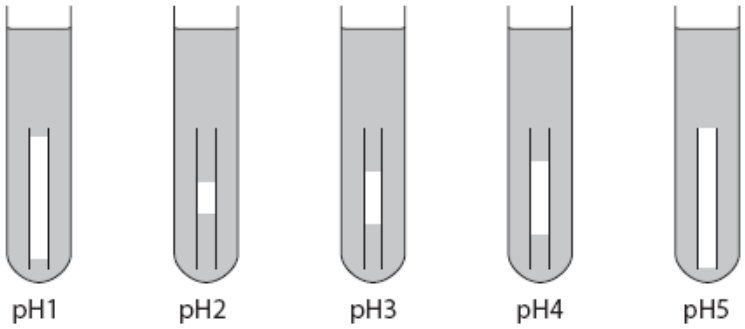


**Figure 3**

The length of egg white in each of the tubes was measured after 24 hours.

The results are shown in Figure 4.




| pH of the solution | length of egg white in glass tube after 24 hrs / mm |
|---|---|
| 1 | 36 |
| 2 | 10 |
| 3 | 24 |
| 4 | 28 |
| 5 | 40 |

**Figure 4**

(i) State the pH at which pepsin was most effective.

**(1)**

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(ii) State how the pH of a solution can be measured.

**(1)**

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(iii) The student noticed that the boiled egg white in some of the tubes also became thinner.

Describe how the method could be improved to obtain a more accurate measure of how much boiled egg white was digested by the pepsin.

**(2)**

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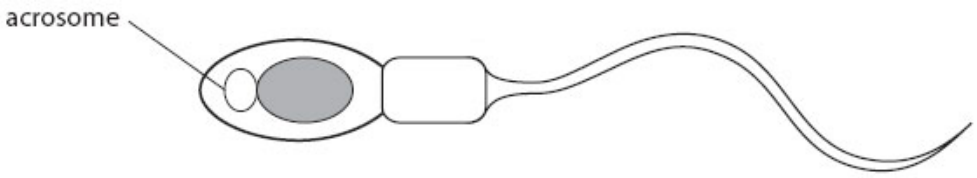
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**(Total for question = 4 marks)**

Q29.

The diagram shows a sperm cell.




Complete the sentence by putting a cross ( ☒ ) in the box next to your answer.

The acrosome contains

**(1)**

☒ **A** enzymes to help get through the membrane of the egg cell

☒ **B** mitochondria to supply energy to swim

☒ **C** muscle fibres to swim

☒ **D** 23 chromosomes

Q30.

Catalase is an enzyme.

Catalase breaks down hydrogen peroxide into oxygen and water.

(a) The effect of pH on the activity of catalase was investigated. The volume of oxygen produced in one minute at each pH was recorded.

The results can be seen in Figure 11.

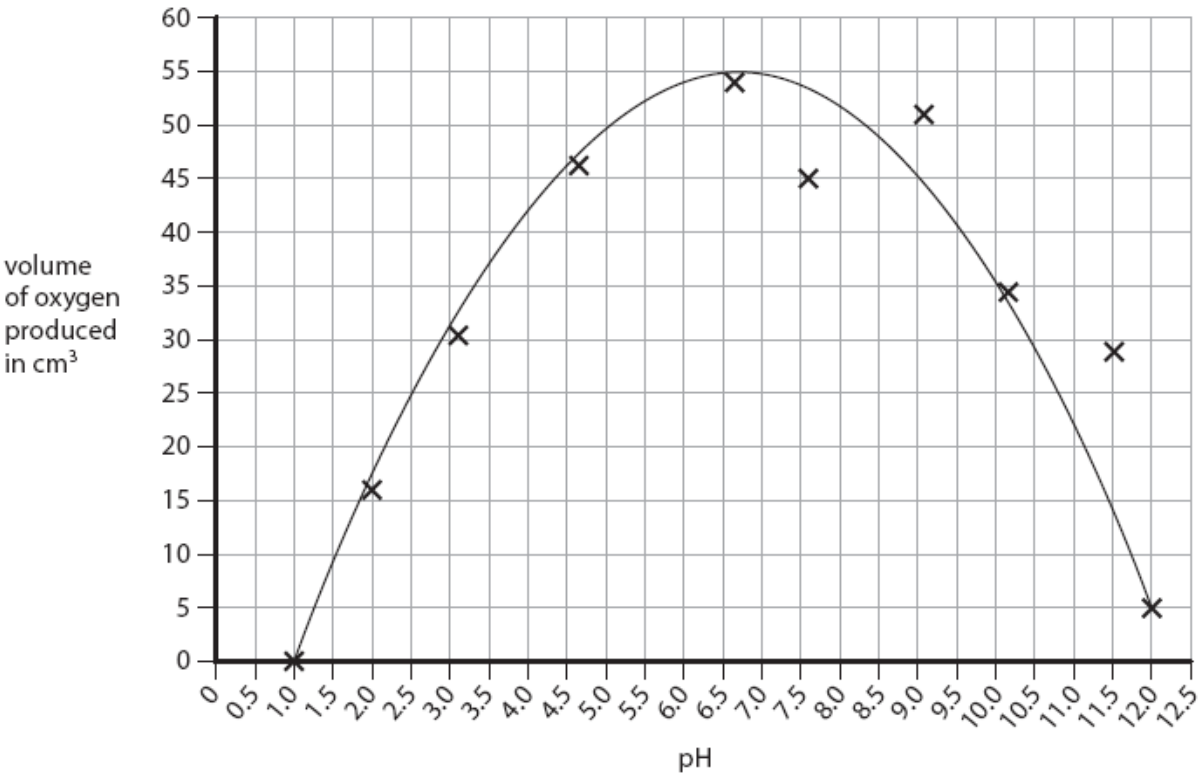



**Figure 11**

(i) Describe the effect of pH on the activity of catalase.

**(2)**

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(ii) Explain why the volume of oxygen produced changes above pH 7.

**(3)**

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(iii) The investigation was improved.

State **two** variables that should be controlled in the improved method.

**(2)**

1 .....

2 .....

(b) The results for the improved method are shown in Figure 12.

| | volume of oxygen produced in $cm^3$ | | | | |
|---|---|---|---|---|---|
| pH | repeat 1 | repeat 2 | repeat 3 | repeat 4 | mean |
| 1 | 1.2 | 1.6 | 1.4 | 1.8 | 1.5 |
| 4 | 37.7 | 48.3 | 38.1 | 39.9 | 38.6 |
| 7 | 53.0 | 51.2 | 52.8 | 61.0 | |
| 10 | 29.0 | 28.5 | 29.6 | 28.7 | 29.3 |
| 12 | 5.2 | 1.8 | 1.0 | 1.4 | 1.4 |

**Figure 12**

(i) Calculate the most appropriate mean volume of oxygen produced at pH 7.

**(2)**

..... $cm^3$

(ii) Describe how the method could be developed to find the optimum pH for catalase activity.

**(2)**

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**(Total for question = 11 marks)**