PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

BIOLOGY



EXAM QUESTION PACK

TOPIC 1: KEY CONCEPTS IN BIOLOGY (PAPER 2, PACK 1)

SCORE	PERCENTAGE
/133	%

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Q1.

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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Q2.

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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Q3.

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 5 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 5

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

(1)

.....

.....

.....

(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 .....

.....

2 .....

.....

(iii) Both students also included a tube containing 10 cm^3 of starch solution with 5 cm^3 of distilled water instead of 5 cm^3 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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.....

(Total for question = 4 marks)

Q4.

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

Figure 4 shows a potato after being stored in the dark.



© rodimov/Shutterstock

Figure 4

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 5 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 5

(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 .....

.....

2 .....

.....

(iii) The starch grains in the potatoes became smaller as the starch was converted into glucose.

State why the potatoes need glucose.

(1)

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

(2)

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(Total for question = 7 marks)

Q5.

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 ☒.

Birds are classified in the domain Eukarya.

(i) Why are the cells from birds described as eukaryotic?

(1)

☒ **A** they have membrane-bound organelles

☒ **B** they do not have nuclei

☒ **C** they have a rigid cell wall

☒ **D** they have a cell membrane

(ii) Give **one** reason why the three domain classification system was proposed.

(1)

.....

.....

.....

(Total for question = 2 marks)

Q6.

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 ☒.

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

(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)

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(Total for question = 3 marks)

Q7.

Catalase is an enzyme.

Catalase breaks down hydrogen peroxide into oxygen and water.

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 investigation was improved.

The results for the improved method are shown in Figure 9.

	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 9

(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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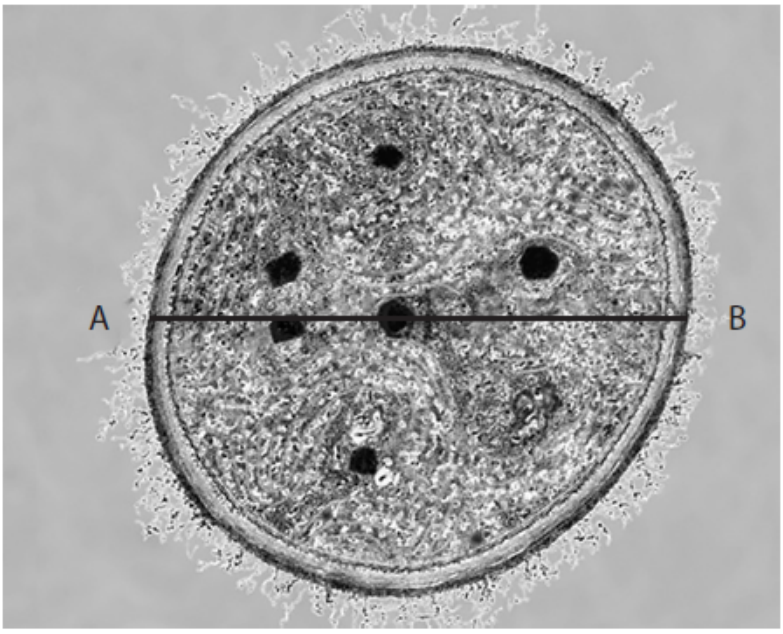
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(Total for question = 4 marks)

Q8.

Figure 2 shows a cyanobacterium magnified 50 000 times.

The line AB shows the diameter of the bacterial cell.



(Source: © The Christian Science Monitor)

Figure 2

(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)

.....

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.....

(Total for question = 6 marks)

Q9.

Figure 8 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 8

(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

(ii) Most neurones in the brain are unmyelinated whereas motor neurones are myelinated.

Explain why myelination is needed on motor neurones but not on neurones in the brain.

(3)

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.....

(Total for question = 5 marks)

Q10.

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

(1)

☒ **A** cytoplasm

☒ **B** a cell membrane

☒ **C** a cell wall

☒ **D** mitochondria

(ii) The actual length of the red blood cell from a turtle is 20.5 µm.

Calculate the length of the magnified image of the red blood cell of the turtle when magnified 400 ×.

(2)

..... µm

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

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

(2)

..... mm

(Total for question = 5 marks)

Q11.

A scientist obtained a mass of 0.0062 nanograms of DNA from a diploid human cell.

Calculate the mass of DNA the scientist should obtain from a haploid human cell.

Give your answer in picograms.

(1 nanogram = 1000 picograms)

(2)

..... picograms

(Total for question = 2 marks)

Q12.

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 ☒.

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

Figure 3 is a drawing of the slide showing starch grains in the potato cells.

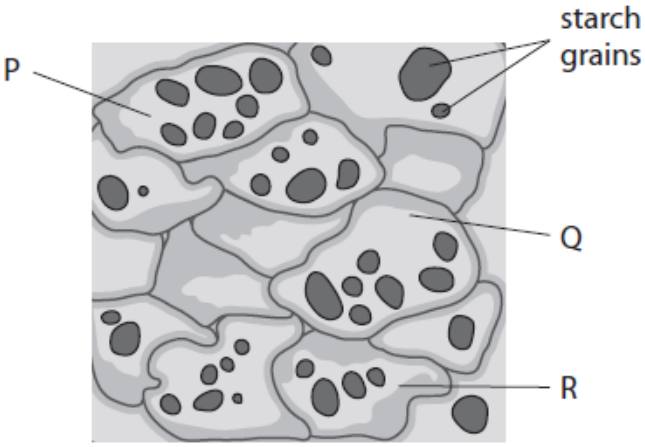


Figure 3

(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

(Total for question = 2 marks)

Q13.

Some students investigated the effect of sucrose concentration on the change in mass of beetroot chips.
A beetroot chip was weighed, immersed in water for 30 minutes and then reweighed.
This was repeated using five more beetroot chips and five different concentrations of sucrose solution.
The results are shown in Figure 6.

chip	concentration of sucrose solution mol per dm^{-3}	starting mass of beetroot chip in grams	end mass of beetroot chip in grams
1	0.0 (water)	2.56	3.89
2	0.2	2.47	2.88
3	0.4	1.99	2.00
4	0.6	2.30	2.12
5	0.8	2.15	1.84
6	1.0	2.22	1.62

Figure 6

(i) Calculate the percentage change in mass for chip 5.

Give your answer to an appropriate number of decimal places.

(3)

..... %

(ii) Explain the difference in the changes in mass of chip 5 and chip 2.

(3)

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(Total for question = 6 marks)

Q14.

A student investigated the time taken for amylase to breakdown a 10% starch solution into glucose at 37°C. The student repeated the investigation five times.

Figure 11 shows the results.

time taken for amylase to produce glucose (s)				
test 1	test 2	test 3	test 4	test 5
120	125	110	115	118

Figure 11

(i) Calculate the rate of amylase enzyme activity for the 10% starch solution.

(3)

rate = ... s^{-1}

The investigation was done at 37°C.

(ii) State **one** other variable that the student should have controlled during this investigation.

(1)

.....

.....

(Total for question = 4 marks)

Q15.

Figure 5 shows two potato chips.

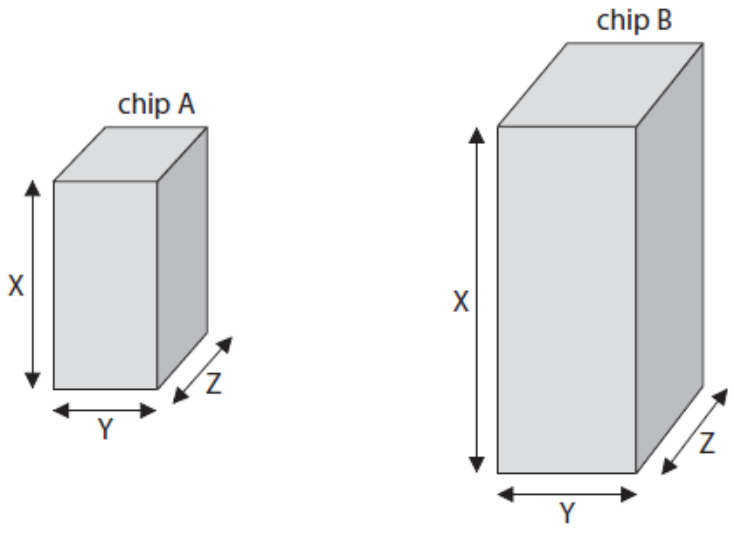


Figure 5

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

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

Total surface area = 2XY + 2XZ + 2YZ

(2)

total surface area = ... cm^2

(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)

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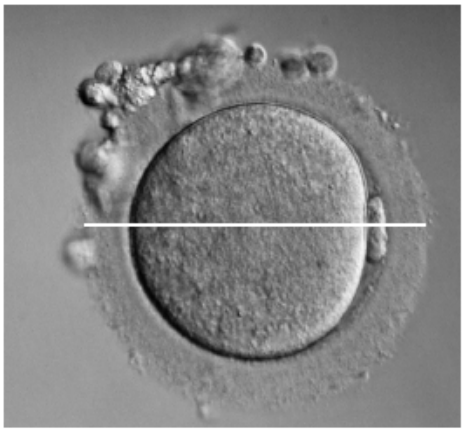
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(Total for question = 7 marks)

Q16.

Figure 10 shows a human egg cell, magnified ×700.



(Source: © Pascal Goetgheluck / Science Photo Library)

Figure 10

Calculate the actual width of the region indicated by the line on Figure 10.

Give your answer in millimetres, in standard form.

(3)

..... mm

(Total for question = 3 marks)

Q17.

Figure 4 shows a photomicrograph of onion cells.

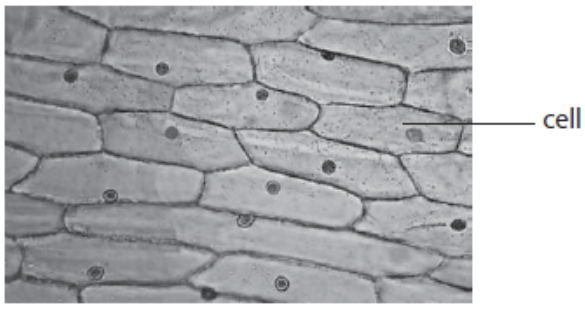


Figure 4

(i) The width of the labelled cell in Figure 4 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

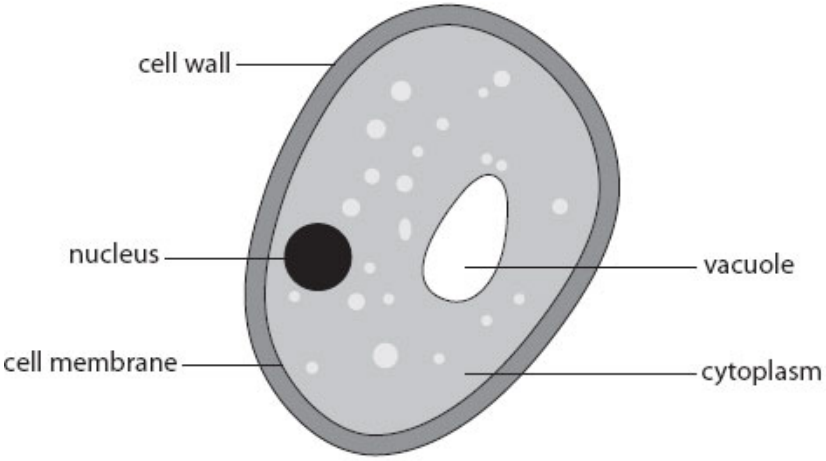
☒ **D** picometre

(Total for question = 4 marks)

Q18.

Yeasts are microorganisms that are used in the brewing and baking industries.

The diagram shows a yeast cell.



(a) (i) State **two** ways in which the structure of this yeast cell differs from the structure of a bacterial cell.

(2)

1 .....

.....

2 .....

.....

(ii) Plant cells can produce glucose.

Suggest why yeast cells cannot produce glucose.

(1)

.....

.....

(b) The table shows the number of different components found in the blood of a healthy person and the blood of two other people.

	number of components per dm^3 of blood		
component of blood	**healthy person**	**person A**	**person B**
red blood cells	5×10^{12}	6×10^{12}	3×10^{12}
white blood cells	7×10^{9}	5×10^{10}	8×10^{10}
platelets	3×10^{11}	3×10^{11}	3×10^{11}

(i) Calculate the difference in the number of white blood cells per dm3 of blood between the healthy person and person A.

(2)

answer = ...

(ii) Describe the functions of white blood cells.

(2)

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(iii) Person B has a low number of red blood cells compared to the healthy person.

Suggest an effect this may have on person B.

(1)

.....

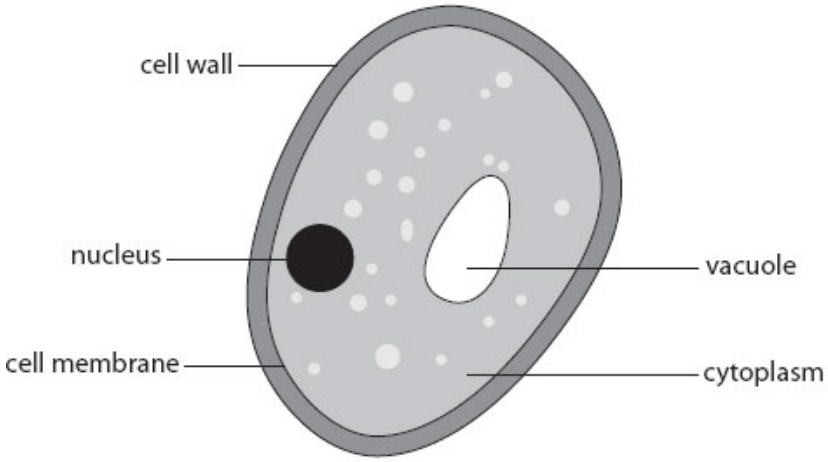
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(Total for Question = 8 marks)

Q19.

Yeasts are microorganisms that are used in the brewing and baking industries.

The diagram shows a yeast cell.



(a) (i) State **two** ways in which the structure of this yeast cell differs from the structure of a

bacterial cell.

(2)

1 .....

.....

2 .....

.....

(ii) Plant cells can produce glucose.

Suggest why yeast cells cannot produce glucose.

(1)

.....

.....

(b) The table shows the number of different components found in the blood of a healthy person and the blood of two other people.

	number of components per dm^3 of blood		
component of blood	**healthy person**	**person A**	**person B**
red blood cells	5×10^{12}	6×10^{12}	3×10^{12}
white blood cells	7×10^{9}	5×10^{10}	8×10^{10}
platelets	3×10^{11}	3×10^{11}	3×10^{11}

(i) Calculate the difference in the number of white blood cells per dm3 of blood between the healthy person and person A.

(2)

answer = ...

(ii) Describe the functions of white blood cells.

(2)

.....

.....

.....

.....

(iii) Person B has a low number of red blood cells compared to the healthy person.

Suggest an effect this may have on person B.

(1)

.....

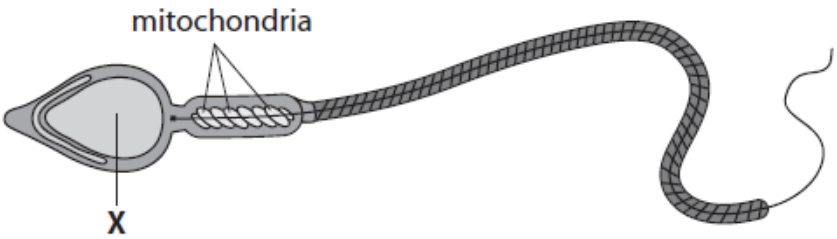
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(Total for Question = 8 marks)

Q20.

Cells

The diagram shows a human sperm cell.



(a) (i) Structure **X** on the diagram contains DNA.

Name structure **X**.

(1)

.....

(ii) Which statement is true for DNA?

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

(1)

☒ **A** DNA is made up of amino acids and bases.

☒ **B** DNA is made up of amino acids which give instructions to make proteins.

☒ **C** In DNA, the bases A and T are complementary.

☒ **D** Every gene in a DNA molecule contains only three bases.

(b) Sperm cells are involved in fertilisation.

Define fertilisation.

(2)

.....

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(c) (i) Describe the function of mitochondria.

(2)

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(ii) Gene mutations in DNA can produce abnormal mitochondria.

Explain how a gene mutation can produce a different protein.

(2)

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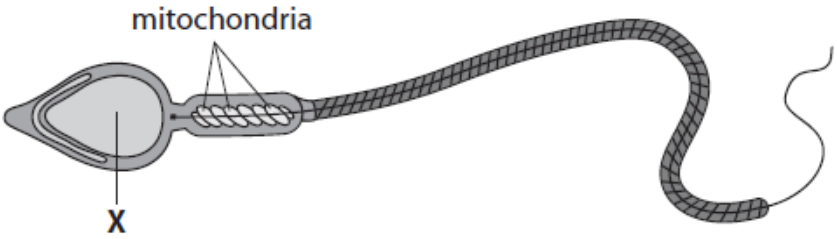
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(Total for question = 8 marks)

Q21.

The diagram shows a human sperm cell.



(a) (i) Structure **X** on the diagram contains DNA.

Name structure **X**.

(1)

.....

(ii) Which statement is true for DNA?

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

(1)

☒ **A** DNA is made up of amino acids and bases.

☒ **B** DNA is made up of amino acids which give instructions to make proteins.

☒ **C** In DNA, the bases A and T are complementary.

☒ **D** Every gene in a DNA molecule contains only three bases.

(b) Sperm cells are involved in fertilisation.

Define fertilisation.

(2)

.....

.....

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.....

(c) (i) Describe the function of mitochondria.

(2)

.....

.....

.....

.....

(ii) Gene mutations in DNA can produce abnormal mitochondria.

Explain how a gene mutation can produce a different protein.

(2)

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(Total for question = 8 marks)

Q22.

A student compared the number of stomata on the upper and lower surfaces of a leaf.

She completed a leaf peel as shown in Figure 5.

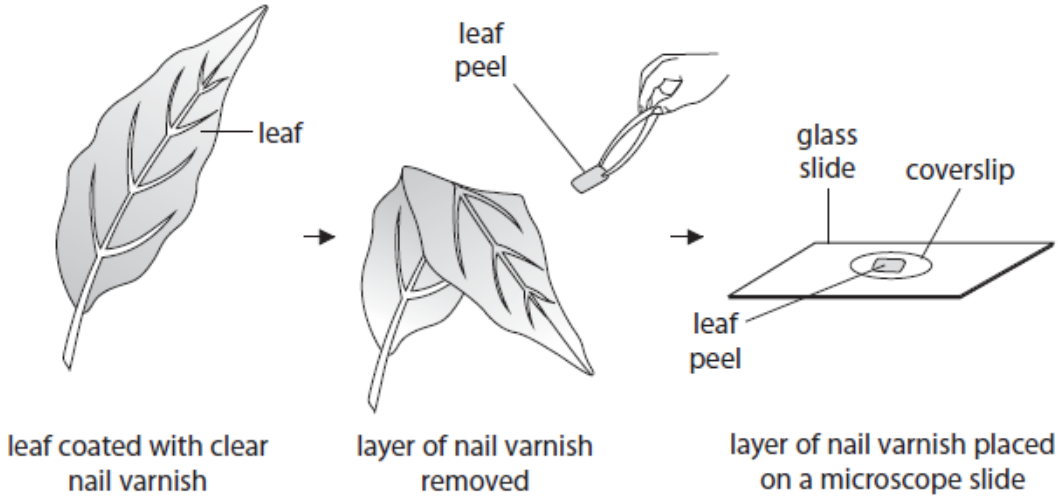


Figure 5

The layer of nail varnish shows an impression of the cells on the surface of the leaf.

(i) State why a coverslip is placed on top of the leaf peel.

(1)

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(ii) Explain why the leaf peel rather than the whole leaf was viewed with a microscope.

(2)

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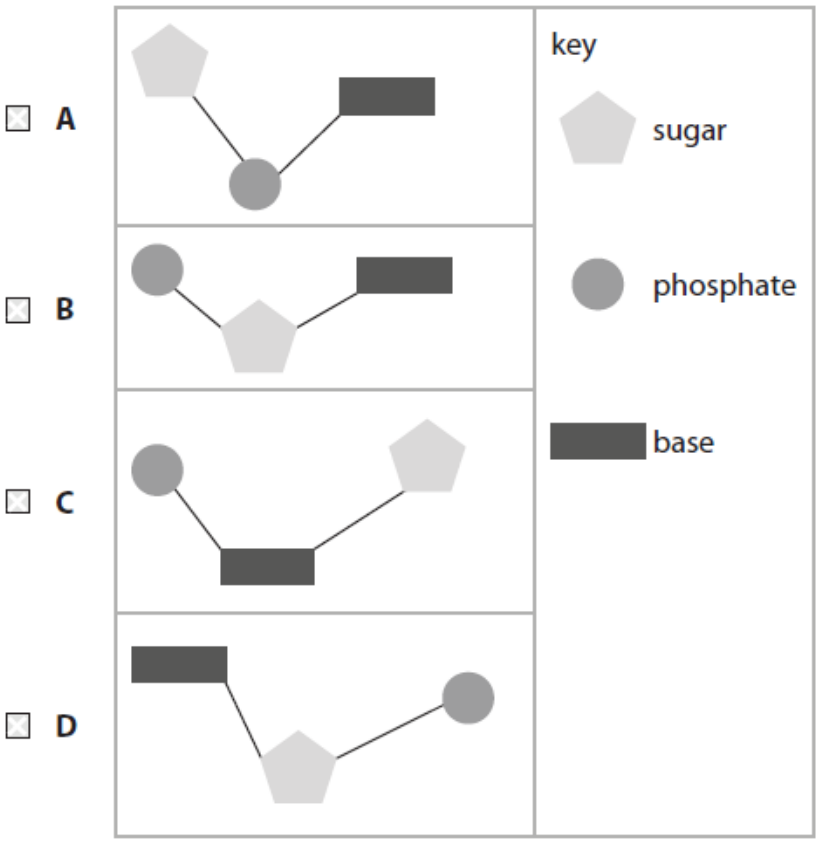
(Total for question = 3 marks)

Q23.

DNA is composed of four different DNA nucleotides.

(i) Which diagram represents the arrangement of the sugar, phosphate and the base in a DNA nucleotide?

(1)



(ii) An allele starts with the DNA sequence ATGCATGTACCG.

Give the sequence of the complementary DNA sequence.

(1)

.....

.....

(iii) The length of one DNA nucleotide was measured at 3.3×10^{-10} metres.

Calculate the approximate length of a gene containing 250 nucleotides in nanometres.

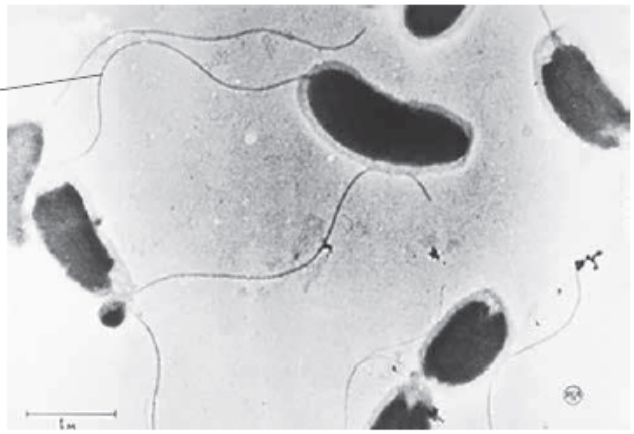
(2)

..... nm

(Total for question = 4 marks)

Q24.

Figure 7 shows some *Vibrio cholerae*, the bacteria that cause cholera.



Magnification ×8000

(Source: Corbis)

Figure 7

The length of one flagellum on Figure 7 is 68 mm.

Calculate the length of the flagellum in µm.

(3)

..... µm

(Total for question = 3 marks)

Q25.

State why egg cells have a large amount of cytoplasm.

(1)

.....

.....

Q26.

State why egg cells have a large amount of cytoplasm.

(1)

.....

.....

Q27.

Phenolphthalein is an indicator. It is pink in alkaline solutions and turns colourless as the pH decreases.

It can be used to measure the activity of the enzyme lipase on the breakdown of lipids.

Samples of milk containing phenolphthalein were incubated with lipase at different temperatures.

The time taken for the phenolphthalein to turn colourless was recorded and used to calculate the rate of enzyme activity.

Figure 10 shows these results.

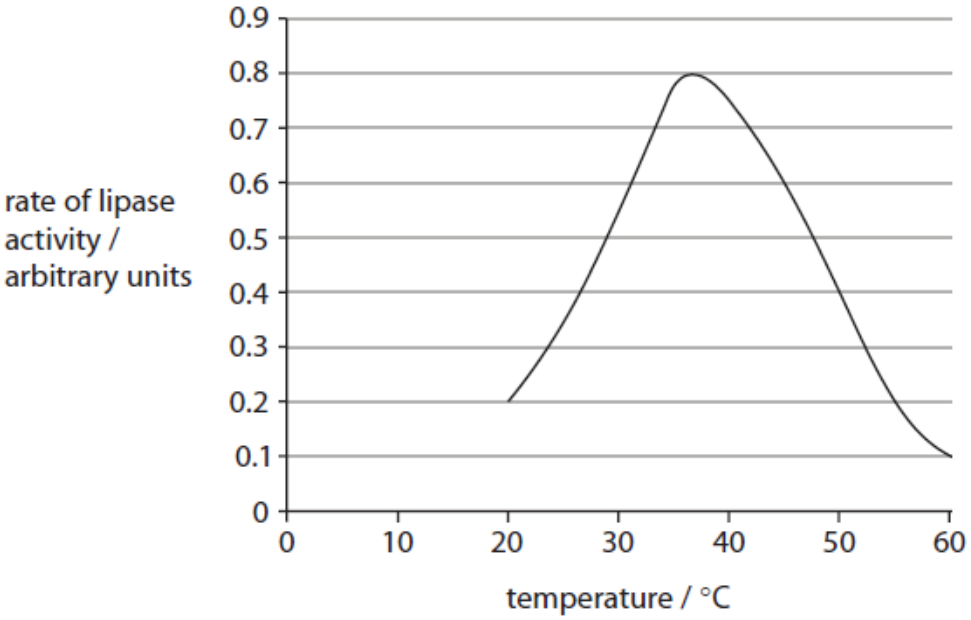


Figure 10

(i) Explain why phenolphthalein turns colourless when lipase breaks down the lipids in milk.

(2)

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(ii) Describe the effect of temperature on the activity of lipase, as shown in Figure 10.

(2)

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(iii) Explain why the activity of lipase changes above a temperature of 40°C.

(2)

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(Total for question = 6 marks)

Q28.

Figure 9 shows a sperm cell.

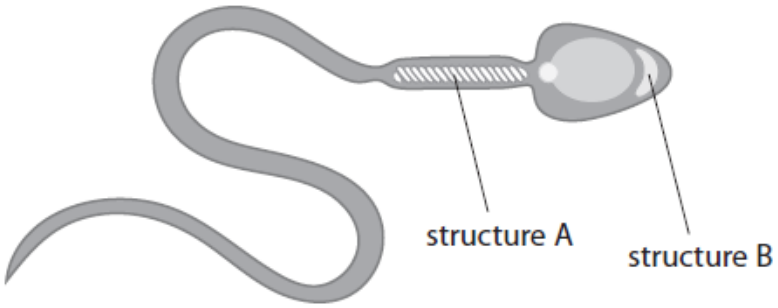


Figure 9

Describe how structure A and structure B enable fertilisation.

(2)

structure A

.....

.....

structure B

.....

.....

(Total for question = 2 marks)

Q29.

A student was investigating mitosis in the roots of a garlic plant.

Describe how the student could prepare a microscope slide to show mitosis in the growing roots of a garlic plant.

(4)

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(Total for question = 4 marks)

Q30.

A student placed a prepared slide on the stage of a light microscope.

Describe how to adjust the microscope to view the slide at a magnification of ×400.

(2)

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.....

(Total for question = 2 marks)

Q31.

Catalase is an enzyme.

Catalase breaks down hydrogen peroxide into oxygen and water.

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 8.

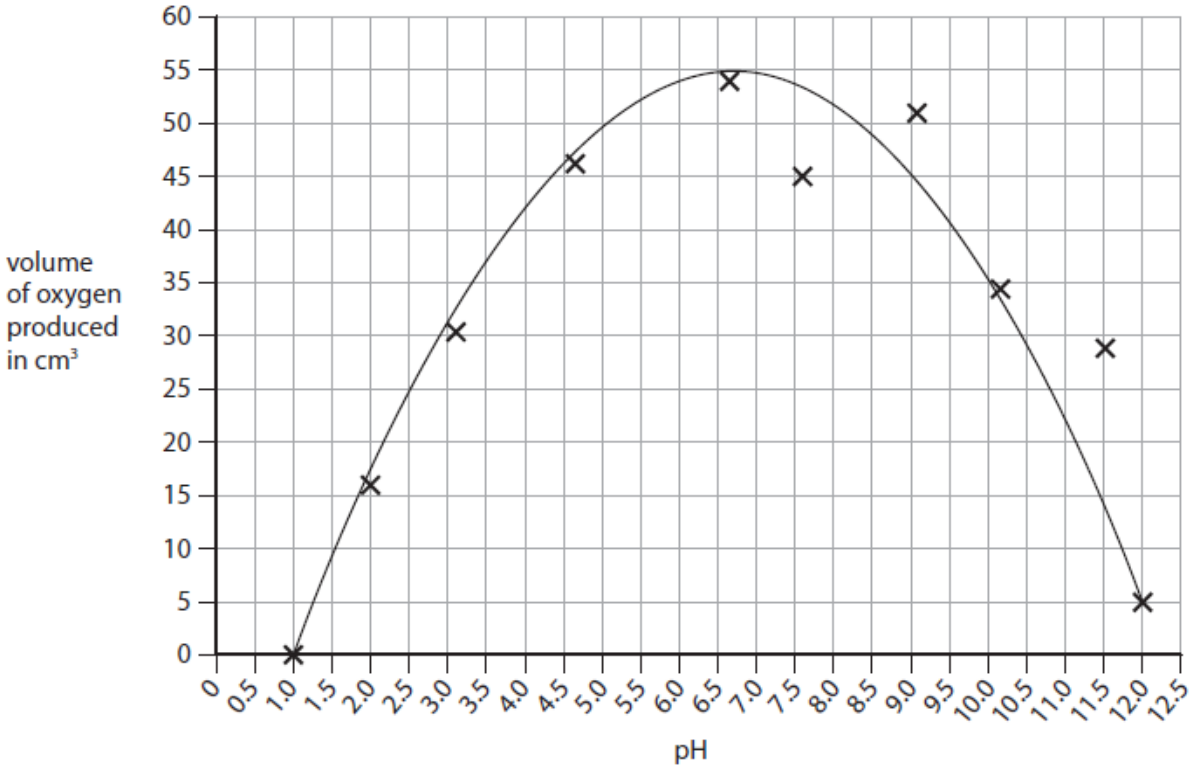


Figure 8

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

(2)

.....

.....

.....

.....

(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 .....

(Total for question = 7 marks)

Q32.

Figure 2 shows a banana plantation.



© warmer/Shutterstock

Figure 2

After the bananas have been harvested, the old plants are cut down.

The suckers then develop into mature plants producing the next crop of bananas.

The tip of each sucker contains a group of cells called a meristem.

(i) Describe the function of a meristem in the growth of a plant.

(2)

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(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)

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(Total for question = 5 marks)

Q33.

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

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 cm^3 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.

The results are shown in Figure 6.

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

Figure 6

(i) Describe the trends shown in this data.

(2)

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(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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(Total for question = 6 marks)

Q34.

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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(Total for question = 3 marks)

Q35.

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

(3)

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(Total for question = 3 marks)

Q36.

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

Food is moved through the digestive system by

(1)

☒ **A** diffusion

☒ **B** digestion

☒ **C** peristalsis

☒ **D** active transport

(b) State **two** roles of bile in digestion.

(2)

1 .....

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2 .....

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*(c) Describe the roles of the enzymes involved in digestion.

(6)

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(d) Explain how the structure of the villi allows efficient absorption in the small intestine.

(3)

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(Total for Question is 12 marks)

Q37.

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

Food is moved through the digestive system by

(1)

☒ **A** diffusion

☒ **B** digestion

☒ **C** peristalsis

☒ **D** active transport

(b) State **two** roles of bile in digestion.

(2)

1 .....

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2 .....

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*(c) Describe the roles of the enzymes involved in digestion.

(6)

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(d) Explain how the structure of the villi allows efficient absorption in the small intestine.

(3)

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(Total for Question is 12 marks)

Q38.

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

Food is moved through the digestive system by

(1)

- ☒ **A** diffusion
- ☒ **B** digestion
- ☒ **C** peristalsis
- ☒ **D** active transport

Q39.

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

Food is moved through the digestive system by

(1)

- ☒ **A** diffusion
- ☒ **B** digestion
- ☒ **C** peristalsis
- ☒ **D** active transport

Q40.

Figure 3 shows ciliated epithelial cells from the airways of a human as seen using a light microscope.



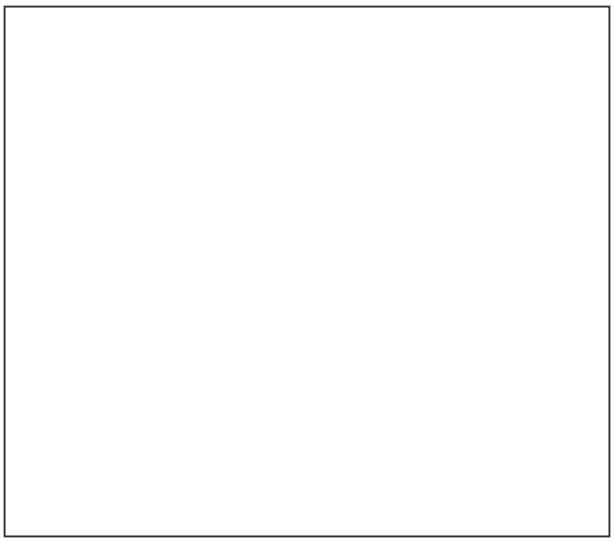
(Source: © Jose Luis Calvo/Shutterstock)

Figure 3

(i) Draw the cell labelled A in the space below.

Label **three** parts of this cell on your diagram.

(4)



(ii) State the function of the ciliated epithelial cells in the airways of the human breathing system.

(1)

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(Total for question = 5 marks)