

Please check the examination details below before entering your candidate information

Candidate surname		Other names	
Centre Number		Candidate Number	
Pearson Edexcel Level 1/Level 2 GCSE (9–1)			
Time 1 hour 45 minutes		Paper reference 1BI0/1H	
Biology PAPER 1		▲ ▲ Higher Tier	
You must have: Calculator, ruler		Total Marks	

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.
- Calculators may be used.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- Good luck with your examination.

Turn over ►



Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

- 1 (a) Figure 1 shows a diagram of the human eye.

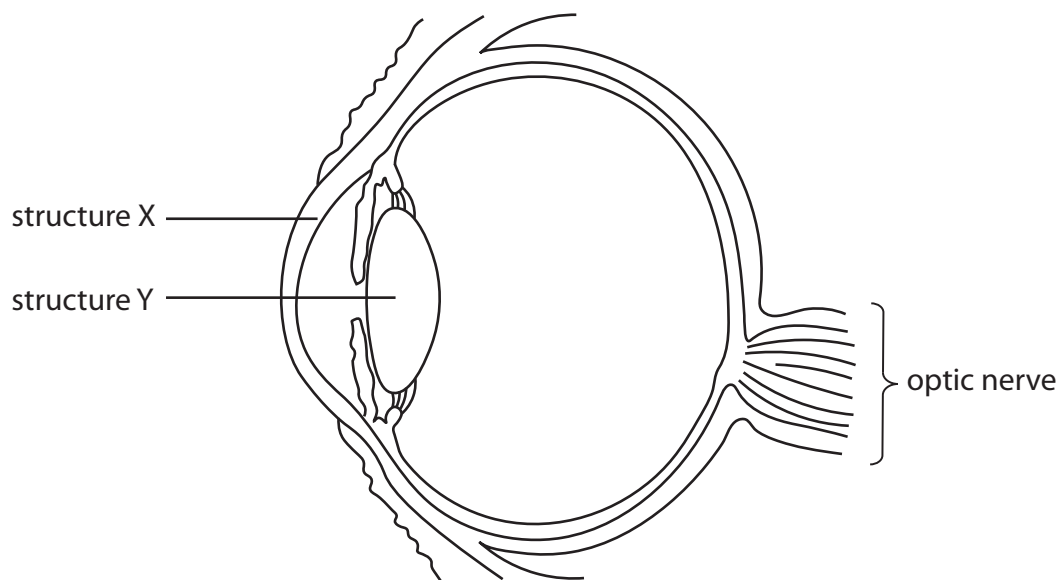


Figure 1

- (i) Which row in the table gives the function of structure X and structure Y?

(1)

	function of structure X	function of structure Y
☐ A	refracts light	detects light
☐ B	detects light	refracts light
☐ C	reflects light	detects light
☐ D	refracts light	refracts light



(ii) Describe the changes that occur in the eye when a bright light is directed into the eye.

(2)

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(b) Eye tests can detect some brain tumours.

(i) State **one** other way that brain tumours can be detected.

(1)

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(ii) Describe why a brain tumour is difficult to treat.

(2)

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(Total for Question 1 = 6 marks)

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2 (a) Figure 2 shows part of a reflex arc in the spinal cord.

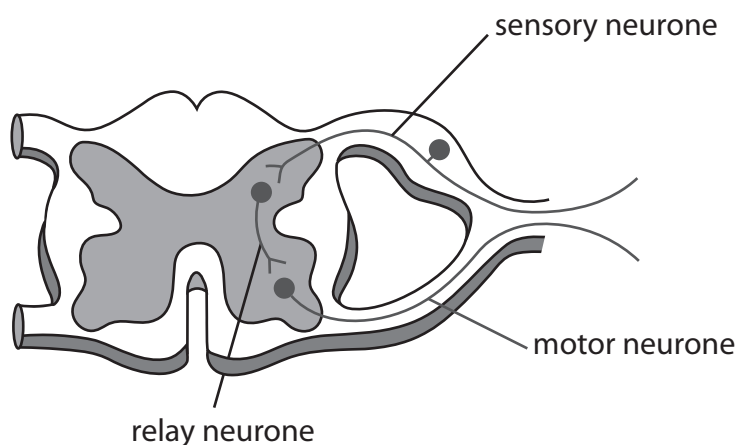


Figure 2

(i) Describe how an impulse passes from the relay neurone to the motor neurone.

(3)

(ii) Explain the function of a reflex arc.

(2)



- (b) A scientist investigated the reaction times of five students using a computer program.

The computer screen showed a blue square at the start.

As soon as the blue square turned yellow, each student had to press a key on the keyboard as fast as possible.

Figure 3 shows the results for the five students.

student	reaction time in milliseconds
1	245
2	200
3	210
4	215
5	225

Figure 3

- (i) Which is the median result for these students?

(1)

- ☐ **A** 200 milliseconds
- ☐ **B** 210 milliseconds
- ☐ **C** 215 milliseconds
- ☐ **D** 225 milliseconds

- (ii) The scientist wanted to investigate if the colours of the squares used on the computer program affected reaction time.

The computer program started with blue squares that turned into yellow squares.

Describe how the scientist could compare the reaction times of these students when they respond to red squares turning into yellow squares.

(3)

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(Total for Question 2 = 9 marks)

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- 3 (a) Name the organisation which defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. (1)

(b) Tuberculosis (TB) is a communicable disease.

- (i) State **two** ways that communicable diseases are different from non-communicable diseases. (2)

1

2

- (ii) Explain **one** way that the spread of tuberculosis (TB) can be reduced or prevented. (2)

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(iii) A student researched the number of people with TB in some countries.

Figure 4 shows the student's data.

	Belgium 1000	Portugal 2400
	UK 5400 people	
	Germany 6100	5800 in France

Figure 4

Complete the table to show the student's data.

(2)

(c) Explain why people with AIDS are more susceptible to TB.

(2)

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(Total for Question 3 = 9 marks)

4 *Streptococcus mutans* is one species of bacteria which causes tooth decay.

A scientist tested the effectiveness of toothpaste at killing this species of bacteria.

The scientist spread the bacteria *Streptococcus mutans* across an agar jelly plate.

(a) (i) Which word describes the techniques used to prevent contamination of the agar jelly plate?

(1)

- ☐ A clinical
- ☐ B diagnostic
- ☐ C aseptic
- ☐ D lysogenic

(ii) Give **two** precautions needed to prevent contamination of the agar jelly plate.

(2)

1

2



- (b) The scientist placed a filter paper disc soaked in toothpaste mixed with saliva (disc A) on one half of the agar jelly plate.

A filter paper disc soaked in only saliva (disc B) was placed on the other half of the agar jelly plate.

The agar jelly plate was kept at 37°C for 24 hours.

Figure 5 shows the results.

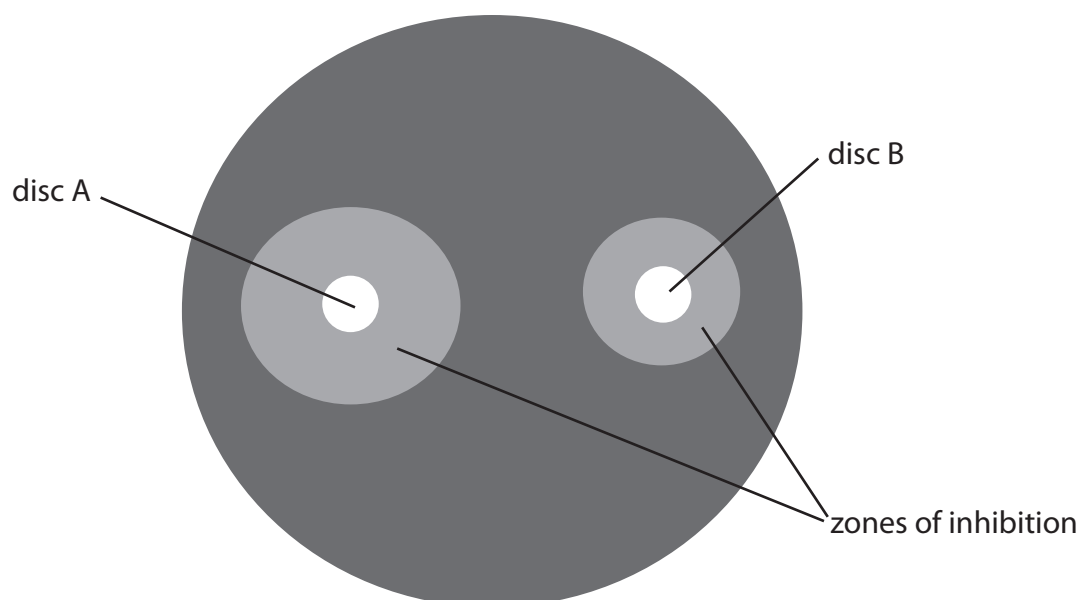


Figure 5

- (i) The diameter of the zone of inhibition around disc A is 9 mm.

Calculate the area of this zone of inhibition using the equation πr^2 .

Use a value of 3.14 for π .

Give your answer to 1 decimal place.

(3)

..... mm²

- (ii) Give a reason why disc B, soaked in only saliva, was included in this test.

(1)

.....

.....



(iii) Suggest **two** reasons why this test does not prove that toothpaste kills all bacteria on teeth.

(2)

1

2

(c) Before a new toothpaste can be sold, the toothpaste has to be tested on cultured human cells.

Cultured human cells were placed into four identical flasks.

Saliva was added to each flask and a different brand of toothpaste was added to each of three flasks.

The human cells were left for two hours and the percentage of cells that were healthy was recorded.

Figure 6 shows the results.

substance added to the human cells	percentage of healthy cells after 2 hours (%)
saliva only	85
toothpaste brand 1	84
toothpaste brand 2	86
toothpaste brand 3	85

Figure 6

Explain the conclusion that can be made from this data.

(2)

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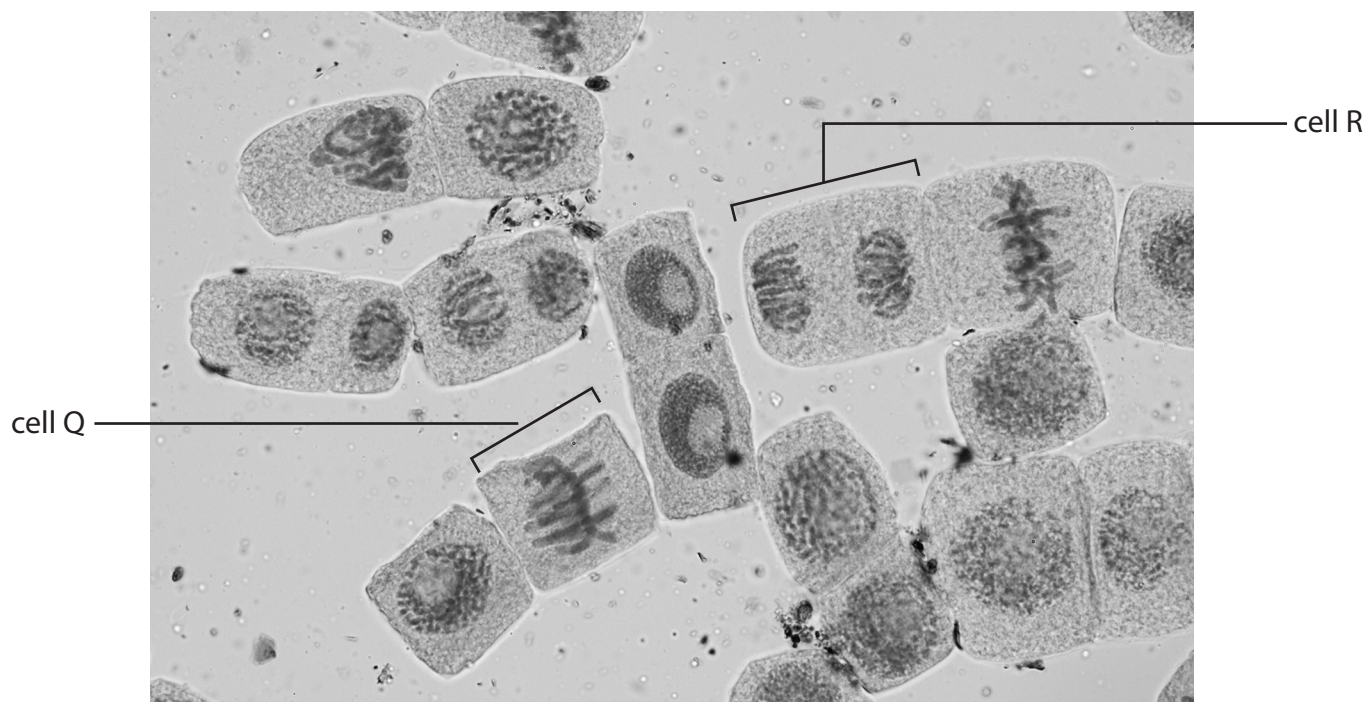
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(Total for Question 4 = 11 marks)



- 5 (a) 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)

1

.....

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)

(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

(b) 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 $\times 400$.

(2)

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P 6 7 0 6 4 R A 0 1 3 3 2

(c) Arthritis is a condition that occurs when cells in joints get damaged or destroyed.

Stem cell therapy can be used to treat arthritis.

Discuss the benefits and risks of using stem cell therapy to treat arthritis.

(4)

(Total for Question 5 = 11 marks)



- 6 (a) Figure 8 shows how alcohol consumption increases the risk of developing liver cancer.

Someone who does not drink alcohol has a 1.0 risk of developing liver cancer.

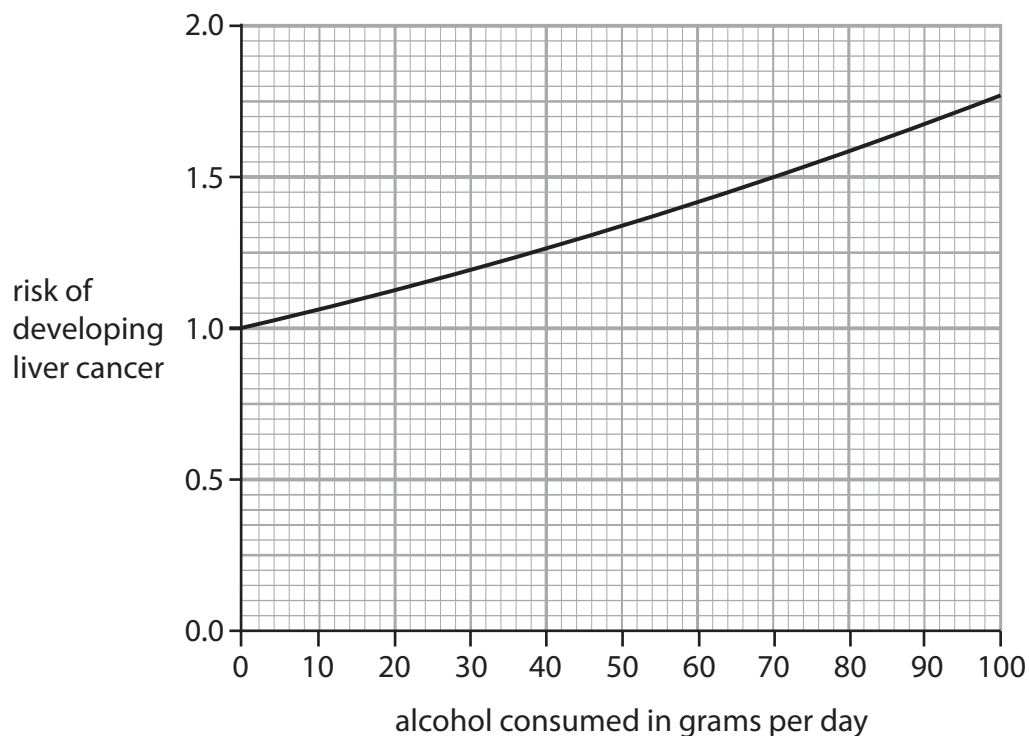


Figure 8

- (i) One unit of alcohol contains 8 grams of alcohol.

Calculate the risk of developing liver cancer for someone who consumes 4 units of alcohol a day.

(2)

..... risk of developing liver cancer

(ii) Describe how cancer develops in the liver.

(2)

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(b) Haemochromatosis is a disease that occurs when iron accumulates in the liver.

A person with haemochromatosis is treated by having 0.5 dm^3 of their blood removed each week.

This lowers the level of iron in their blood.

(i) Give **two** safety precautions needed when blood is removed from this person.

(2)

1

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2

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(ii) Haemochromatosis can be inherited.

Haemochromatosis occurs when a person inherits two copies of a recessive allele.

Figure 9 shows the inheritance of haemochromatosis in a family.

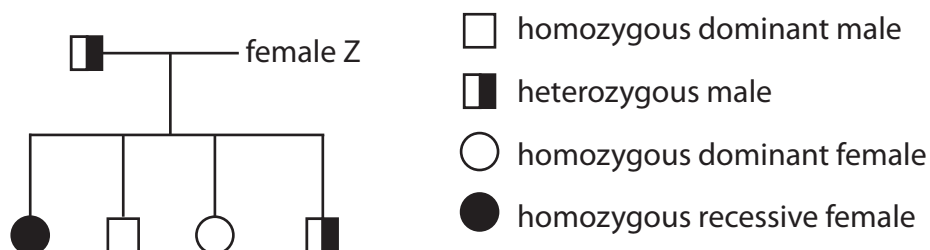


Figure 9

State and explain the genotype of female Z.

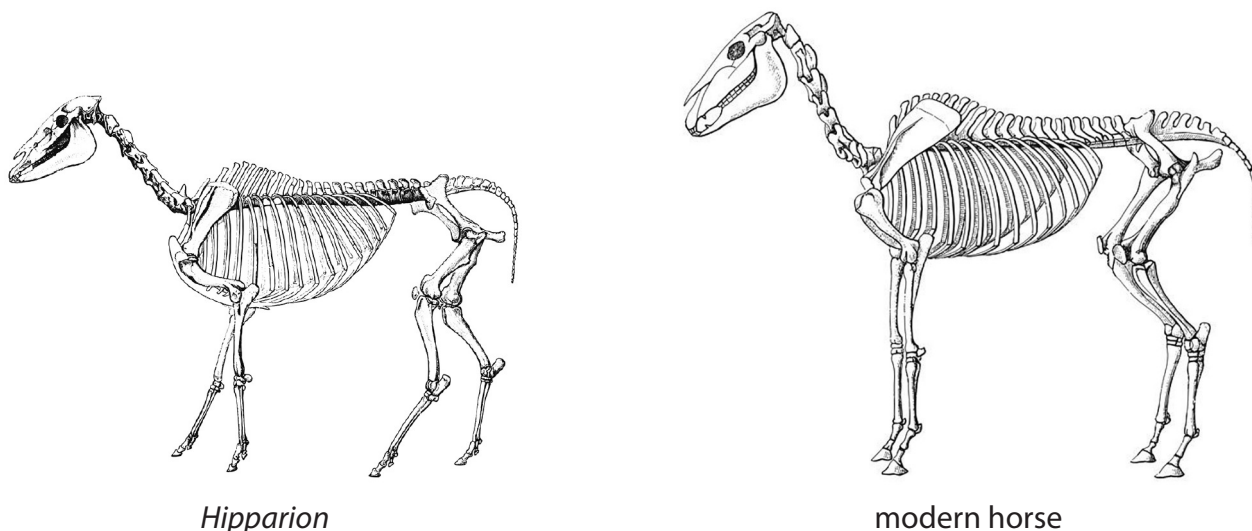
(3)

(Total for Question 6 = 9 marks)



- 7 *Hipparion* is an extinct genus of horse that lived between approximately 20 million and 0.8 million years ago.

Figure 10 shows the skeletons of a *Hipparion* and a modern horse.



(Sources: © Morphart Creation/Shutterstock and © Hein Nouwens/Shutterstock)

Figure 10

- (a) (i) Give **one** method that can be used to date a fossil of a *Hipparion*.

(1)

- (ii) Give **one** reason why scientists have concluded that the modern horse has evolved from *Hipparion*.

(1)



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(6)

(Total for Question 7 = 11 marks)



8 Chymosin is an enzyme that causes milk to curdle.

When milk curdles the proteins in the milk clump together and become solid.

- (a) As part of an investigation, milk was heated in test tubes to different temperatures using a Bunsen burner.

Two drops of chymosin solution were added to each test tube and the time taken for the milk to curdle was recorded.

Figure 11 shows the results.

temperature of the milk in °C	time taken for milk to curdle in seconds
25	125
30	105
35	90
40	70
45	75

Figure 11

- (i) Which variables need to be kept constant in this investigation?

(1)

- ☐ **A** the volume of milk and the time
- ☐ **B** the temperature and the time
- ☐ **C** the volume of milk and the concentration of chymosin
- ☐ **D** the temperature and the concentration of chymosin

- (ii) Explain why the time taken for the milk to curdle decreases from 30°C to 40°C.

(2)

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(iii) Explain what the expected result would be if two drops of chymosin were added to the milk at 70°C in the test tube.

(2)

(iv) As part of this investigation, test tubes containing only milk were heated to each temperature and no chymosin solution was added.

State why these test tubes containing only milk were used.

(1)

(v) Describe **two** improvements that could be made to the method of this investigation so that the optimum temperature for chymosin can be found.

(2)

1

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(b) Chymosin can be produced by genetically modified bacteria.

Figure 12 shows a bacterial cell.

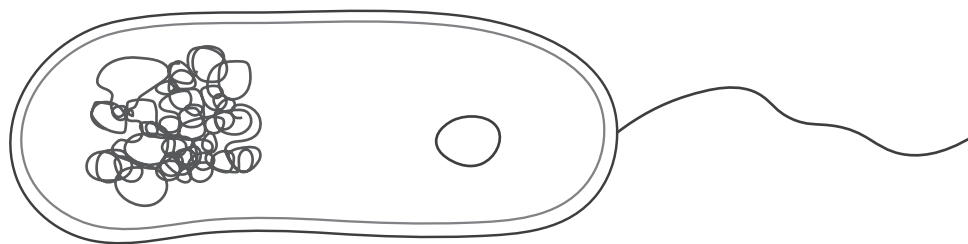


Figure 12

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

(3)

(Total for Question 8 = 11 marks)



- 9 (a) Figure 13 shows a sperm cell.

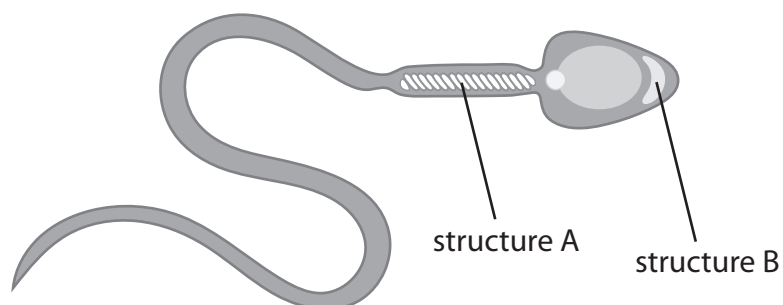


Figure 13

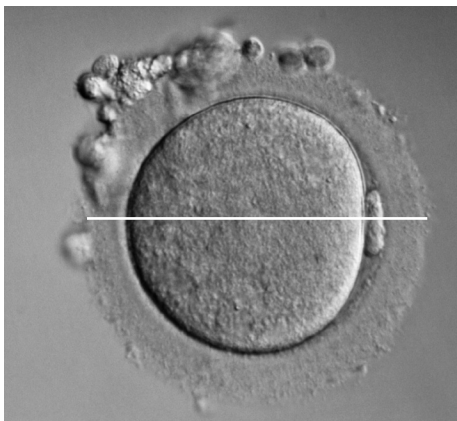
Describe how structure A and structure B enable fertilisation.

(2)

structure A

structure B

(b) Figure 14 shows a human egg cell, magnified $\times 700$.



(Source: © Pascal Goetgheluck / Science Photo Library)

Figure 14

Calculate the actual width of the region indicated by the line on Figure 14.

Give your answer in millimetres, in standard form.

(3)

..... mm



*(c) A student investigated the movement of water.

Hens' eggs were placed in vinegar for two days to dissolve the shell.

This makes the eggs permeable to water.

The eggs were then weighed and placed in different solutions.

After 24 hours the eggs were weighed again.

Figure 15 shows the results.

solution	mass of the egg at the start in grams	mass of the egg after 24 hours in grams
tap water	77	84
5% salt	77	77
10% salt	77	75

Figure 15

Evaluate the results of this investigation.

You should include calculations using the data in Figure 15.

(6)

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(Total for Question 9 = 11 marks)



10 (a) One gene can have several different alleles.

Explain why these alleles can produce proteins with different structures.

(3)

(b) Monoclonal antibodies are proteins.

Figure 16 shows the process of monoclonal antibody production.

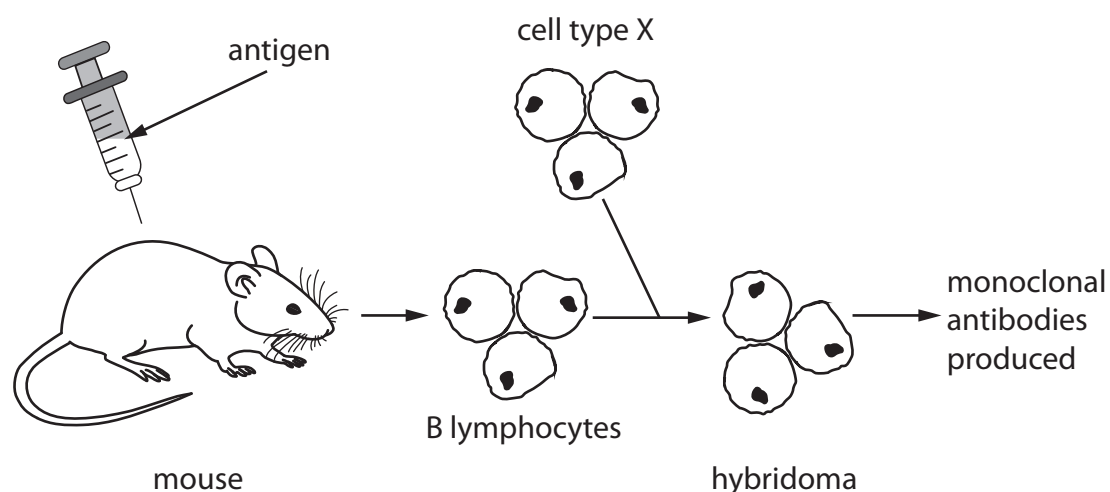


Figure 16

(i) Which type of cell is added to the B lymphocytes to produce the hybridoma?

(1)

- ☐ A phagocytic cell
- ☐ B red blood cell
- ☐ C cancer cell
- ☐ D epithelial cell

- (ii) A person with blood group A has the A antigen on the surface of their red blood cells.

Monoclonal antibodies can be used to detect the A antigen on red blood cells to determine the blood group of a person.

Explain why monoclonal antibodies, used to detect blood group A, would not react with the blood of a person with blood group B.

(3)

- (c) The allele for blood group A and the allele for blood group B are codominant.

Gregor Mendel investigated the inheritance of alleles using flowering plants.

He showed that the allele for red flowers (I^R) is codominant with the allele for white flowers (I^W).

A heterozygous plant produces pink flowers.

- (i) Give the genotype for a plant producing white flowers.

(1)



(ii) Explain the outcome if two plants that produce pink flowers are crossed.

You should complete the Punnett square as part of your answer.

(4)

(Total for Question 10 = 12 marks)

(TOTAL FOR PAPER = 100 MARKS)



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