Write your name here

Surname	Other names

Pearson Edexcel Level 3 GCE

Centre Number	Candidate Number

Biology B

Advanced Subsidiary
Paper 1: Core Cellular Biology and Microbiology

Thursday 24 May 2018 – Afternoon **Time: 1 hour 30 minutes**	Paper Reference **8BI0/01**

You must have:
Calculator, HB pencil, 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.
- Show your working in any calculation questions and include units in your answer where appropriate.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- You may use a scientific calculator.
- In question(s) 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.

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

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.

Turn over ▶

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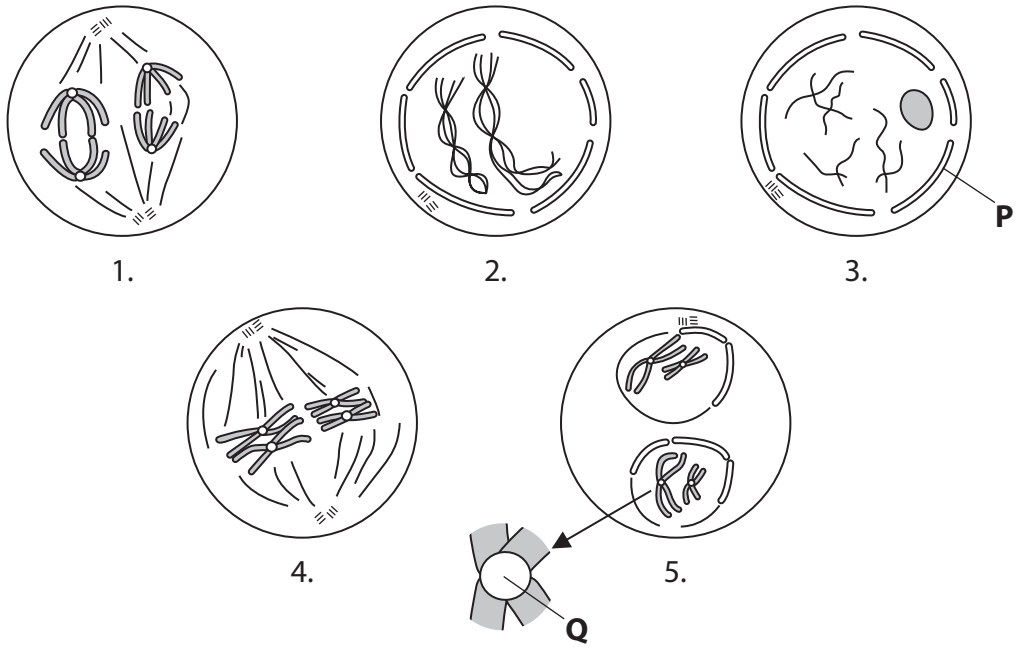
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Answer ALL questions.

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 In some diploid organisms, haploid cells are produced by meiosis.

The diagram shows an animal cell at various stages during the first division of meiosis.



(a) (i) Identify the correct sequence in the diagram that shows the first division of meiosis.

(1)

☒ **A** 1, 2, 3, 4, 5

☒ **B** 2, 5, 4, 1, 3

☒ **C** 3, 2, 4, 1, 5

☒ **D** 5, 4, 1, 2, 3

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(ii) Identify the parts labelled P and Q.

(2)

P .....

Q .....

(b) In mammals, meiosis occurs during oogenesis and spermatogenesis.

Describe how the products of oogenesis differ from the products of spermatogenesis in mammals.

(4)

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(Total for Question 1 = 7 marks)

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2 Enzymes are catalysts that are sensitive to changes in temperature.

(a) The effect of temperature on the activity of a mammalian enzyme was investigated.

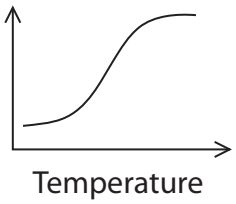
The enzyme was added to a known concentration of the substrate.

The time taken for all of the substrate to be used up was recorded at several temperatures.

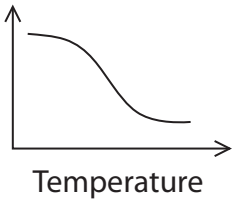
(i) Which graph shows the results of this investigation?

(1)

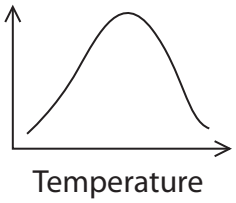
☒ **A**



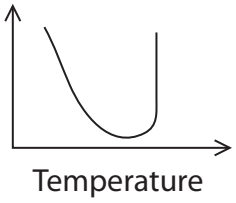
☒ **B**



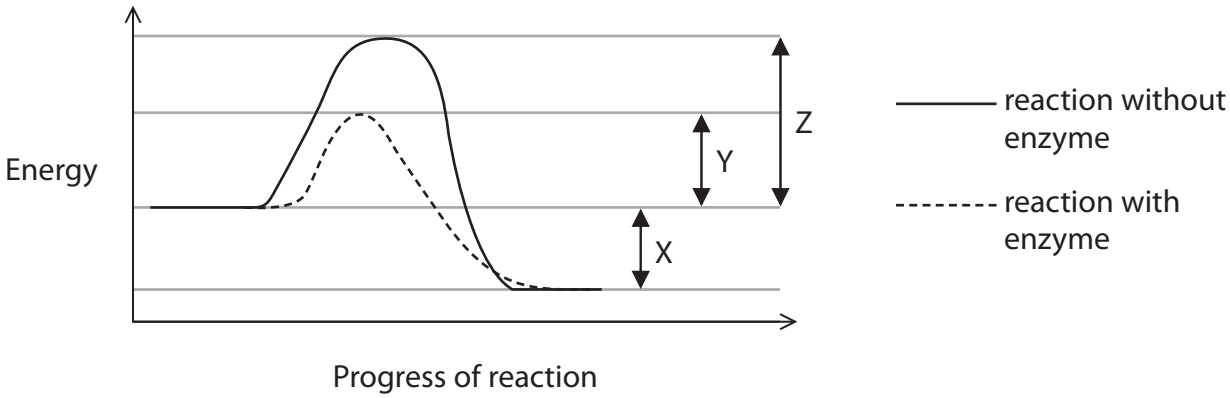
☒ **C**



☒ **D**



(ii) The graph shows the energy changes during a reaction with and without an enzyme.



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Which of the following represents the decrease in the activation energy of this reaction?

(1)

- ☒ **A** X
- ☒ **B** X + Y
- ☒ **C** Z
- ☒ **D** Z – Y

(b) Some antibiotics affect the enzymes involved in the growth of bacteria.

(i) Explain why Gram positive bacteria and Gram negative bacteria react differently to some antibiotics.

(3)

(ii) Explain why viruses are not affected by antibiotics.

(2)

(Total for Question 2 = 7 marks)

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3 Leeches are parasites that feed by sucking blood. When they bite, they secrete saliva into the wound. The saliva contains a globular protein called hirudin.

(a) Explain why this protein is soluble in water.

(3)

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(b) Hirudin is an inhibitor that forms hydrogen bonds with an enzyme.

Explain how hirudin would inhibit the activity of the enzyme.

(3)

(Total for Question 3 = 6 marks)

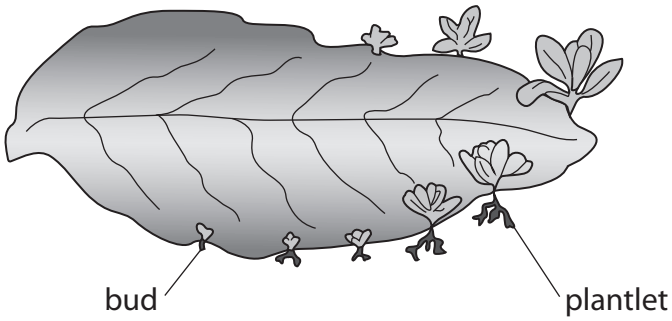
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4 The diagram shows a leaf of *Bryophyllum*.

Some of the cells at the edges of the leaf divide to form buds. These buds can develop into individual plantlets.



(a) (i) Name the type of nuclear division that produces the plantlets.

(1)

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(ii) State **two** advantages of this type of reproduction.

(2)

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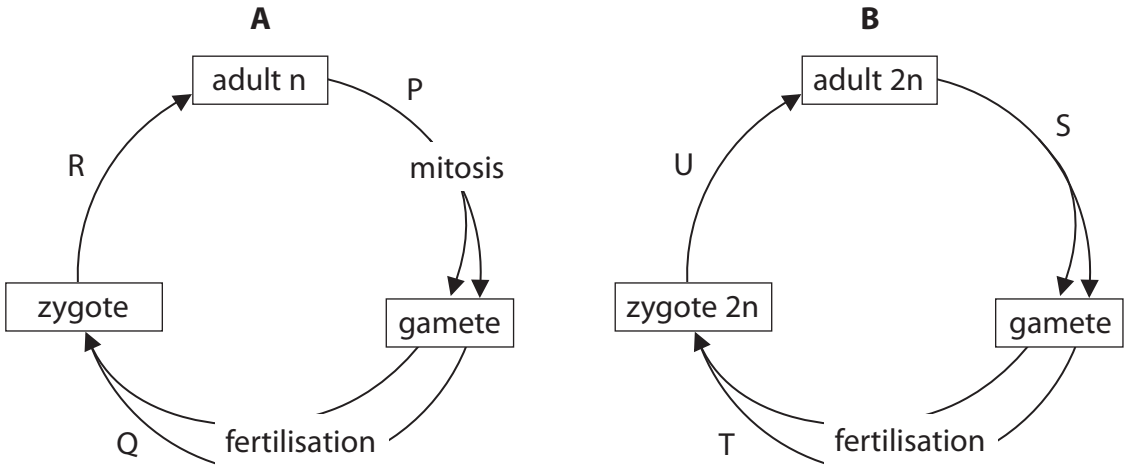
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(b) The diagrams show the life cycles of two organisms, **A** and **B**.



(i) Which row of the table correctly describes the zygote of organism **A** and the gametes of organism **B**?

(1)

		Zygote of organism A	Gametes of organism B
☒	**A**	diploid	diploid
☒	**B**	diploid	haploid
☒	**C**	haploid	diploid
☒	**D**	haploid	haploid

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(ii) Which row in the table shows where meiosis occurs in each life cycle?

(1)

	Life cycle A	Life cycle B
☒ **A**	P	T
☒ **B**	Q	U
☒ **C**	R	S
☒ **D**	R	T

(iii) Explain the significance of meiosis in living organisms.

(3)

(Total for Question 4 = 8 marks)

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5 Cattle with bovine spongiform encephalopathy (BSE) have microscopic holes in their brain tissue.

This disease involves the misfolding of proteins which then form clumps.

Clumps of misfolded proteins can be seen with an electron microscope.

(a) BSE is diagnosed by examination of brain tissue.

(i) Explain why the clumps of misfolded proteins can be seen with an electron microscope, but not with a light microscope.

(2)

(ii) Explain why stains are used when preparing tissue for examination using a light microscope.

(2)

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(b) The misfolded proteins have a changed secondary structure. Therefore they cannot be digested by some protease enzymes.

(i) Describe what is meant by the secondary structure of a protein.

(2)

(ii) Explain why the misfolded protein cannot be digested by some protease enzymes.

(3)

(Total for Question 5 = 9 marks)

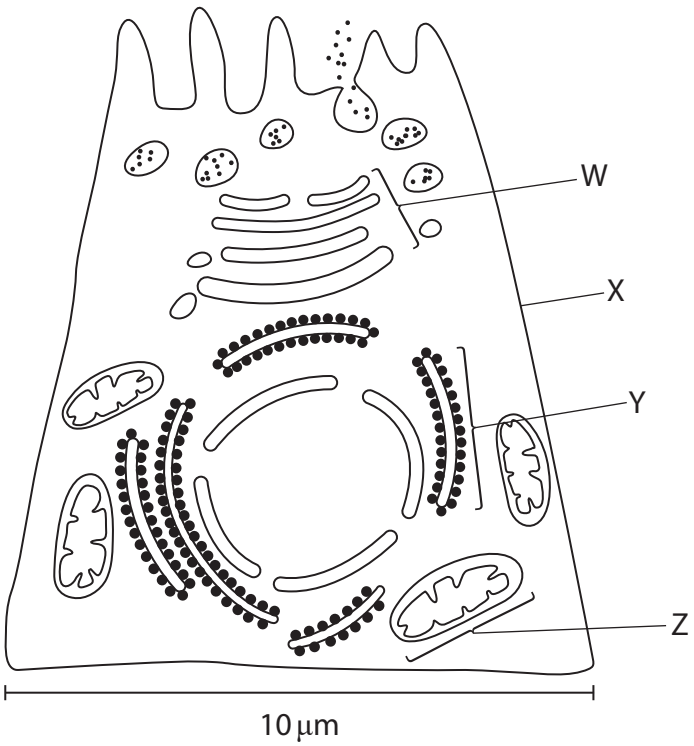
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6 Some of the cells in the pancreas secrete proteins.

The diagram represents a pancreatic cell.



(a) (i) The structure labelled **Y** represents the

(1)

- ☒ **A** centrioles
- ☒ **B** Golgi apparatus
- ☒ **C** rough endoplasmic reticulum
- ☒ **D** smooth endoplasmic reticulum

(ii) The structure also found in a prokaryotic cell is labelled

(1)

- ☒ **A** W
- ☒ **B** X
- ☒ **C** Y
- ☒ **D** Z

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(iii) Calculate the magnification of this cell.

(2)

Answer .....

(iv) Explain why these pancreatic cells contain large numbers of organelle **Z**.

(3)

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(b) The secreted proteins are made from amino acids.

Two amino acids join together to form a dipeptide.

Draw a diagram to show the structure of a dipeptide.

(3)

(Total for Question 6 = 10 marks)

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7 Only monosaccharides and most disaccharides are reducing sugars.

Reducing sugars produce a red precipitate when heated with blue Benedict's reagent.

(a) Identify the row that shows the correct results after heating three carbohydrates, maltose, amylose and fructose, with Benedict's reagent.

(1)

	maltose	amylose	fructose
☒ **A**	no precipitate	no precipitate	no precipitate
☒ **B**	red precipitate	no precipitate	red precipitate
☒ **C**	red precipitate	red precipitate	no precipitate
☒ **D**	red precipitate	red precipitate	red precipitate

(b) The Benedict's test can be made quantitative and used to determine the concentration of a glucose solution.

The red precipitate formed is removed by filtration. The precipitate is dried and the mass recorded.

The table shows the mass of precipitate formed from a range of glucose concentrations heated with 5 cm^3 of Benedict's reagent.

Glucose concentration / mg cm^{-3}	Mass of precipitate formed / g
0	0.00
2	0.28
4	0.57
6	0.92
8	1.33
10	1.63
12	1.92
14	1.98
16	2.00
18	2.00
20	2.00

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(i) Analyse the data to explain the relationship between the glucose concentration and the mass of precipitate formed.

(4)

(ii) When the investigation was repeated, the mean error for each measurement was calculated.

The mean error for each measurement was 0.05 g.

Calculate the percentage error for the mass of precipitate measured at the glucose concentration of 2 mg cm^{-3}.

(1)

Answer ..... %

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(iii) Explain one way in which the mean error in measuring the mass of precipitate could be reduced.

(2)

(Total for Question 7 = 8 marks)

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8 Some viruses cause infections in humans.

Antiviral drugs affect the virus without affecting the cells of the host.

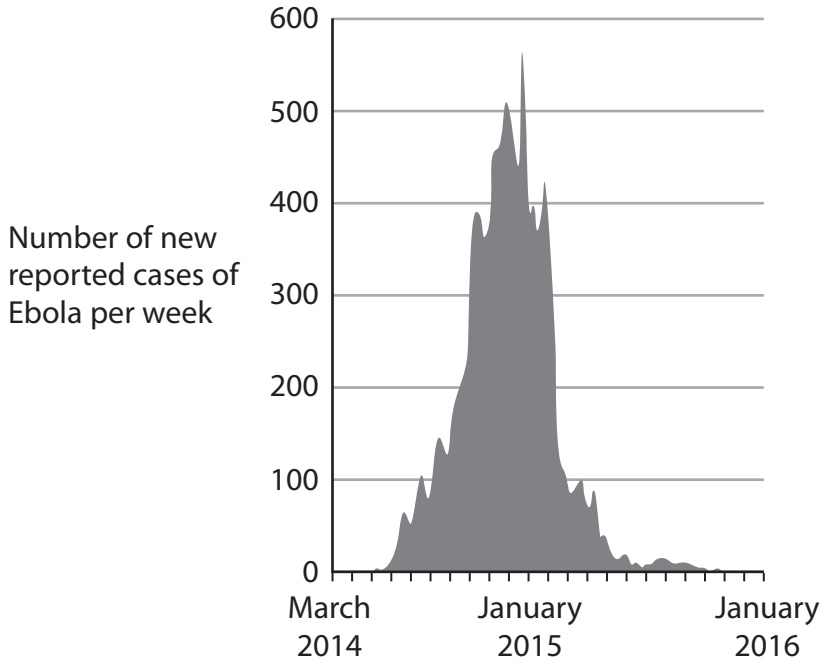
(a) Explain why viruses are dependent on living cells.

(2)

(b) Ebola is a disease that has a high mortality rate.

In 2014, there was an outbreak of Ebola in West Africa resulting in the deaths of over 11 000 people.

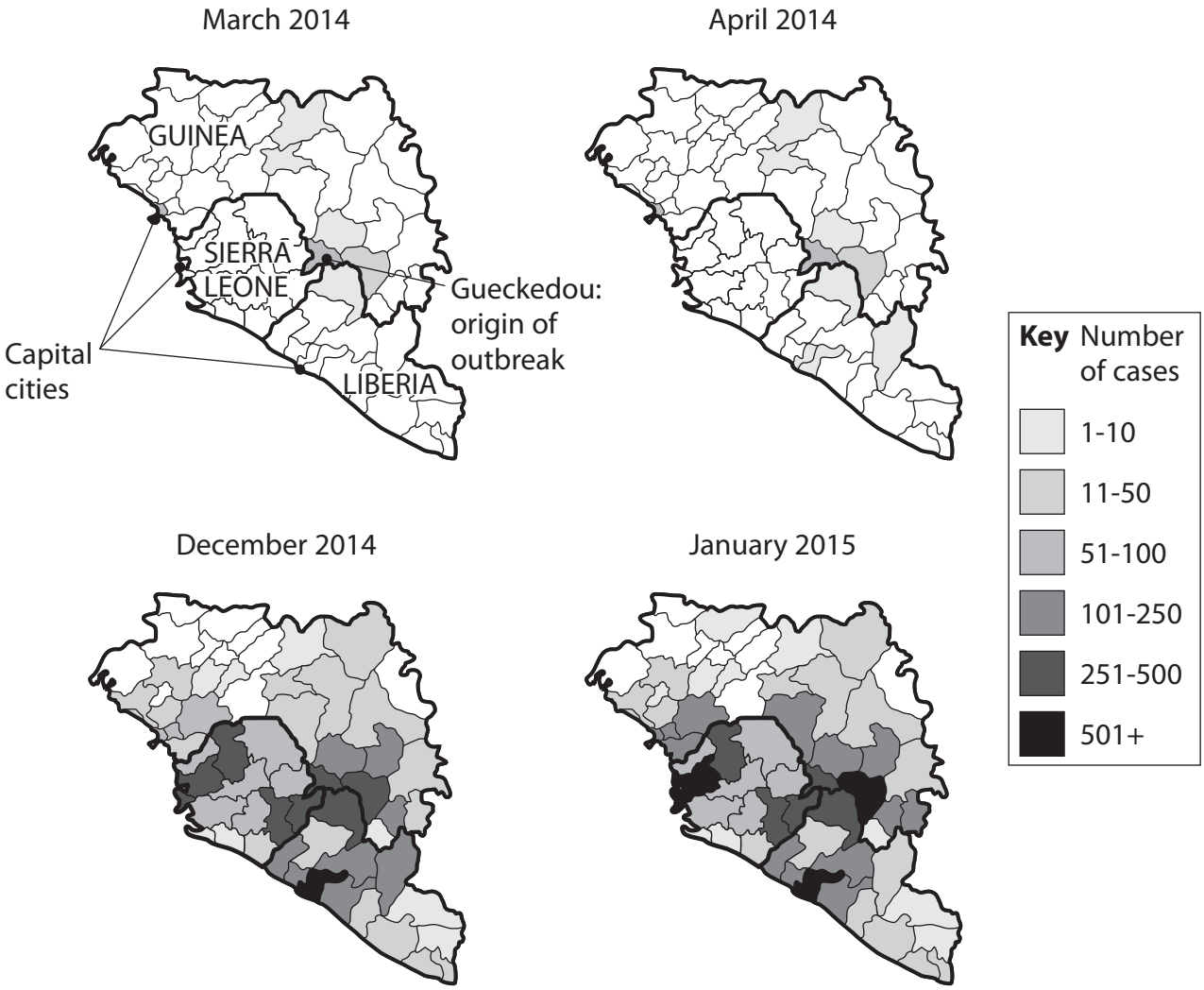
The graph shows the number of reported cases in Sierra Leone from March 2014 to January 2016.



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The maps show the number of reported cases in districts of Sierra Leone, Guinea and Liberia in four months recorded during the outbreak.

The capital cities of these three countries are also shown.



*(i) Analyse the information in the graph and maps to comment on the spread of Ebola in West Africa.

(6)

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(ii) Describe the methods used to prevent the spread of Ebola.

(3)

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(c) During this outbreak of Ebola, no vaccine had been developed.

The World Health Organisation recommended that untested antiviral drugs could be used to treat patients, due to the scale of the outbreak.

Evaluate the ethical implications of using an untested drug during this outbreak.

(4)

(Total for Question 8 = 15 marks)

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9 Chymosin is an enzyme used to clot milk for the production of cheese.

A farmer investigated the effect of chymosin concentration on the rate of milk clotting.

1 cm^3 of a 0.2% chymosin solution was added to 9 cm^3 milk and the time taken for the milk to clot was recorded. This was repeated using five other concentrations of chymosin.

The results are shown in the table.

Chymosin concentration (%)	Time for milk to clot / min		Mean rate of milk clotting / min^{-1}
	Trial 1	Trial 2	
0.2	7.0	7.5	0.14
0.5	3.5	3.0	
1.0	1.5	1.5	0.67
1.5	1.0	1.5	0.80
2.0	0.8	0.7	1.33
3.0	0.5	0.3	2.50

(a) (i) Calculate the mean rate of milk clotting at a chymosin concentration of 0.5%.

(3)

Answer..... min^{-1}

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(ii) Give one reason why the information in the table is insufficient to conclude which concentration of chymosin would be best for cheese production.

(1)

(b) The chymosin used for the investigation costs 3.6p to treat 100 cm^3 of milk.

Calculate how much it would cost to treat 200 dm^3 milk.

(2)

Answer £.....

(c) Devise a valid investigation to compare the effect of chymosin on the clotting time of milk from two different breeds of cattle.

(4)

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TOTAL FOR PAPER = 80 MARKS

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