Write your name here

Surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number	Candidate Number

Biology

Paper 1

Higher Tier

Sample Assessment Materials for first teaching September 2016	Paper Reference
Time: 1 hour 45 minutes	**1BI0/1H**

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.*
- Calculators may be used.
- 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.

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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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 Figure 1 shows the times when *Homo sapiens* and some of their ancestral species are thought to have lived.

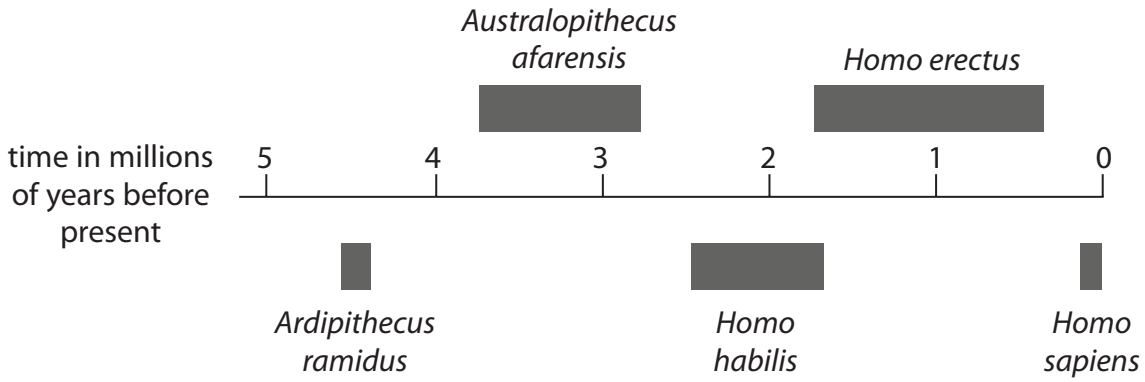


Figure 1

(a) Fossil remains of *Ardipithecus ramidus* were discovered in Ethiopia.

(i) Describe the evidence that scientists might have used to show that *Ardipithecus ramidus* inhabited the Earth earlier than *Homo habilis*.

(2)

(ii) Suggest an explanation for the extinction of *Homo habilis*.

(2)

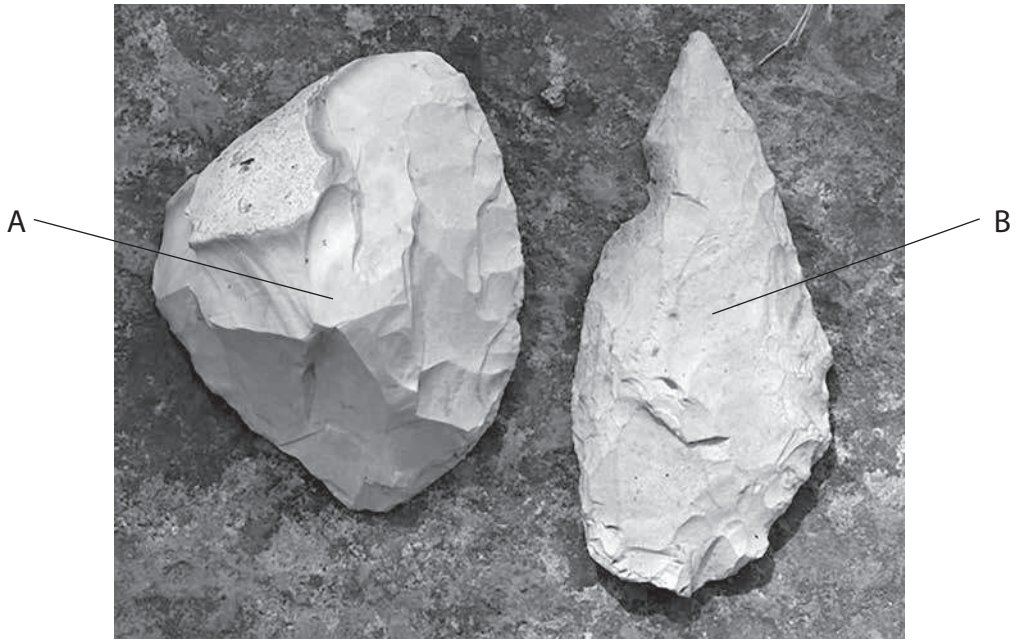
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(iii) Figure 2 shows two stone tools, one used by *Homo habilis* and one used by *Homo erectus*.



(Source: Frederic Surmely/look at sciences/Science Photo Library)

Figure 2

Explain which stone tool was most likely to be used by *Homo erectus*.

Use information from Figure 1 and Figure 2.

(2)

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(b) The population of humans on Earth has increased significantly leading to food shortages.

The growth of drought-resistant crop plants could lead to an increase in food supply.

Describe how drought-resistant crop plants can be produced.

(3)

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(Total for Question 1 = 9 marks)

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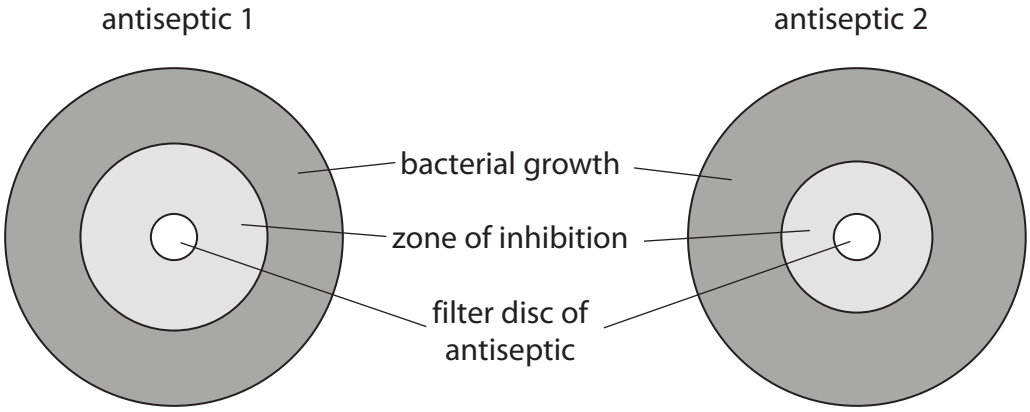
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2 *Streptococcus pyogenes* is a bacterium that causes communicable infections.

(a) Scientists tested the ability of two antiseptics to kill *Streptococcus pyogenes* bacteria.

They spread *Streptococcus pyogenes* bacteria on two agar jelly plates and placed a small disc of filter paper containing antiseptic in the centre of each dish.

Figure 3 shows the results of the test after 24 hours of incubation.



antiseptic 1 zone of inhibition	
radius (mm)	12
area (mm^2)	452

Figure 3

(i) Calculate the area of the zone of inhibition for antiseptic 2.

Give the answer to 3 significant figures.

($\pi = 3.14$)

(3)

zone of inhibition for antiseptic 2 = ... mm^2

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(ii) Explain which antiseptic is the most effective.

(2)

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(iii) After the bacteria were spread on the plates, both plates were incubated for 24 hours at 37 °C.

Give a reason why the plates were incubated at 37 °C.

(1)

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(b) The wire loop used to spread bacteria on an agar plate was heated in a Bunsen burner flame before being used.

Explain why this aseptic precaution was used.

(2)

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(Total for Question 2 = 8 marks)

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3 The ratio of waist-to-hip measurements can be used to determine the risk of a person developing cardiovascular disease.

(a) Calculate the waist-to-hip ratio for a person with a waist measurement of 830 mm and a hip measurement of 0.99 m.

Give your answer to 2 decimal places.

(2)

Answer = ...

(b) Dieting can reduce the effects of cardiovascular disease.

(i) Which statement gives a reason why dieting can be used to reduce weight in obese people?

(1)

☒ **A** Dieting increases metabolism and growth rate

☒ **B** Dieting reduces energy consumption

☒ **C** Dieting decreases metabolism

☒ **D** Dieting increases energy consumption

(ii) A scientist is planning to test a new diet for weight loss.

She selects 40 obese people to take part in the test.

All the obese people are between 20 and 30 years of age.

State **two** other factors the scientist should control when selecting the people.

(2)

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(iii) Devise a plan the scientist could use to test the effectiveness of the new diet using the 40 obese people.

(3)

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(Total for Question 3 = 8 marks)

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4 Gregor Mendel investigated the genetics of peas.

He did not know about genes but showed that inherited characteristics can be dominant or recessive.

(a) Explain how Mendel used homozygous tall and homozygous short pea plants to show that the tall allele is dominant to the short allele.

(2)

(b) Figure 4 shows a strawberry plant that has produced several runners and new strawberry plantlets are growing at the end of each runner. This is asexual reproduction.



Figure 4

(i) Explain why asexual reproduction in strawberries is beneficial to strawberry farmers.

(2)

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(ii) Strawberry fruits, containing seeds, are produced after a flower is fertilised.

Explain why seed production is an advantage to the strawberry plant.

(2)

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(c) Duchenne muscular dystrophy is a sex-linked recessive genetic disorder caused by a mutation on a single gene on the X-chromosome.

The letter D can be used for the dominant allele and the letter d for the recessive allele.

Figure 5 shows the inheritance of Duchenne muscular dystrophy in a family.

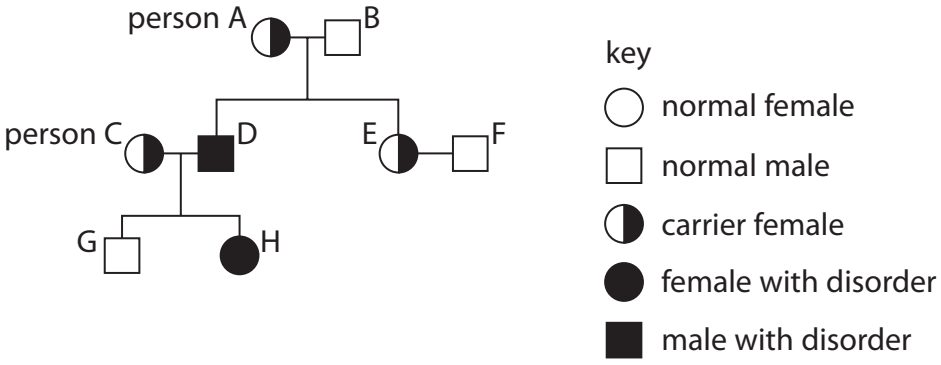


Figure 5

(i) What is the percentage chance of any child from person A inheriting the mutated allele?

(1)

- ☒ **A** 0%
- ☒ **B** 25%
- ☒ **C** 50%
- ☒ **D** 75%

(ii) Explain the conclusion that can be made about the genotype of person C.

(2)

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(Total for Question 4 = 9 marks)

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5 Diffusion, active transport and osmosis can be used to move substances into and out of cells.

(a) A student was investigating osmosis in potato cubes.

He used the following method:

cut a potato into equal-sized cubes

- record the mass of each potato cube
- place each potato cube into different concentrations of salt solution
- remove the potato cubes after 30 minutes
- dry the potato cubes and record the final mass of each cube.

He plots his results on a graph shown in Figure 6.

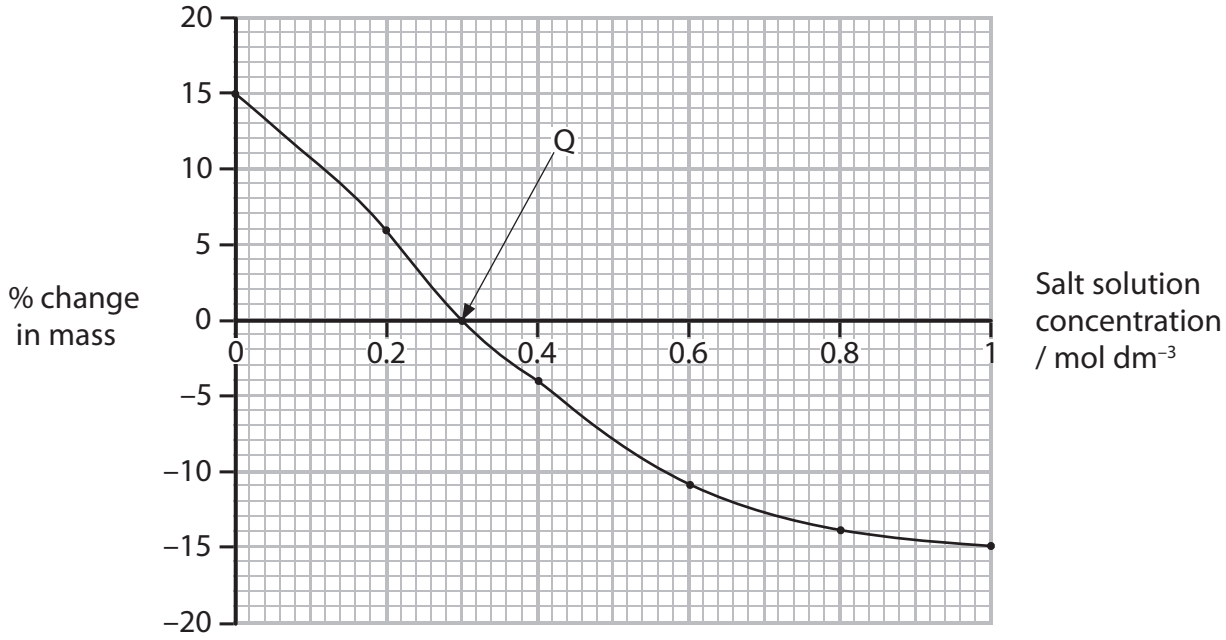


Figure 6

The method controls a number of variables.

(i) Name **one** other variable that needs to be controlled during the student's investigation.

(1)

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(ii) Give a reason why the potato cube must be dried.

(1)

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(iii) Explain the conclusion that can be made about point Q on Figure 6.

(2)

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(iv) Give one way that the student could obtain more data to increase the accuracy of point Q.

(1)

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(b) Osmosis is one method that single-celled organisms, such as bacteria, use to obtain molecules from their environment.

Which of the following is a correct description of a process involving the transport of molecules?

(1)

☒ **A** Diffusion is used to transport molecules against the concentration gradient

☒ **B** Active transport is used to obtain molecules in a low concentration environment

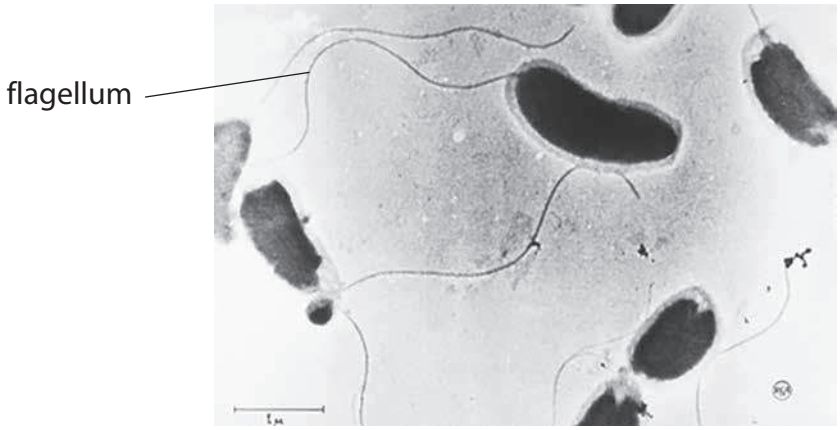
☒ **C** Active transport moves substances along the concentration gradient

☒ **D** Diffusion uses energy to transport molecules into cells

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(c) 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 5 = 9 marks)

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6 (a) 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?

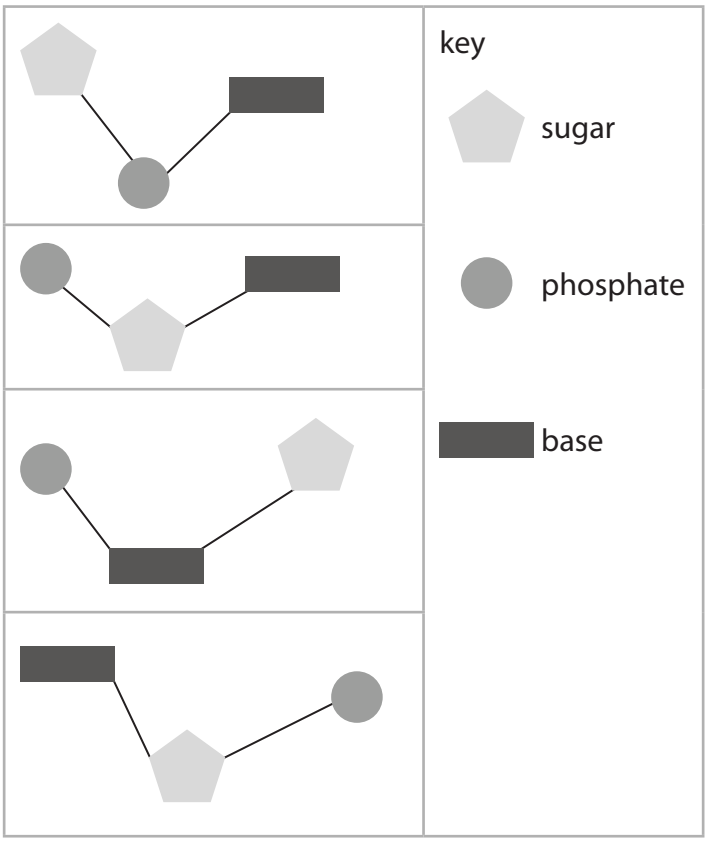
(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**



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

Give the sequence of the complementary DNA sequence.

(1)

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.....

(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

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(b) The DNA of an organism determines its phenotype.

White tigers are produced because of a mutation of a single allele which usually produces the normal orange and yellow fur pigmentation.

The mutated allele is recessive.

Samba, a male white tiger, was bred with Rani. They had three offspring; two offspring have white fur and one has a normal fur pigmentation.

(i) State the genotype of Rani.

(1)

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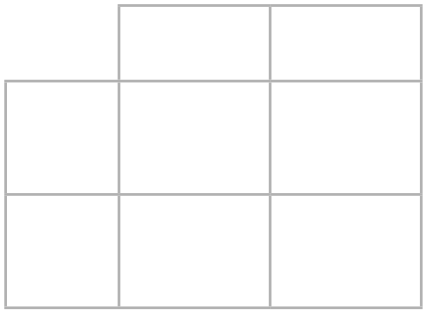
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(ii) The offspring with normal fur pigmentation was bred with a tiger that was heterozygous.

Use A/a to represent the alleles for fur pigmentation.

Predict, using the Punnett square, the percentage probability of the offspring from this cross having normal fur pigmentation.

(2)



percentage probability = ... %

(c) Explain how two parents with a dominant phenotype can produce offspring expressing a recessive characteristic.

(2)

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(Total for Question 6 = 9 marks)

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7 Figure 8 shows a diagram of the human eye.

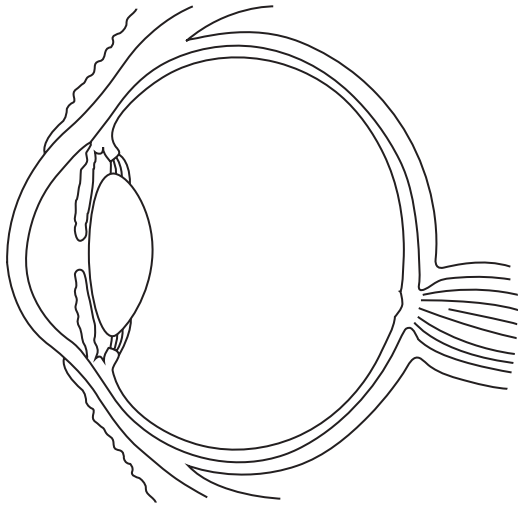


Figure 8

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

(1)

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

(ii) The optic nerve transfers electrical signals from the eye to the central nervous system.

(1)

The optic nerve is a

- ☒ **A** relay neurone
- ☒ **B** motor neurone
- ☒ **C** sensory neurone
- ☒ **D** reflex neurone

(iii) Name the region of the central nervous system responsible for vision.

(1)

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(b) Macular degeneration is a defect of the eye that occurs when some cells of the retina begin to break down.

Embryonic stem cell therapy has been used to improve the vision of some patients with macular degeneration.

Explain how embryonic stem cells could be used to treat macular degeneration.

(2)

(c) Some research has shown that increased use of computers and other digital media can affect eyesight and reaction times.

A scientist wanted to test if prolonged use of a computer affected reaction time.

The scientist tested the reaction times of 10 people under the same environmental conditions.

These people then used a computer for three hours.

The scientist tested their reaction time again.

Give **three** ways that the scientist could improve this method to determine if prolonged use of a computer affects reaction time.

(3)

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(d) Figure 9 shows the reaction times of five people.

person	1	2	3	4	5
reaction time/seconds	0.258	0.685	0.236	0.246	0.268

Figure 9

(i) Calculate the mean reaction time in milliseconds.

(2)

..... ms

(ii) Give the name of the mathematical term which is used to describe the reaction time value of person 1.

(1)

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(Total for Question 7 = 11 marks)

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8 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.

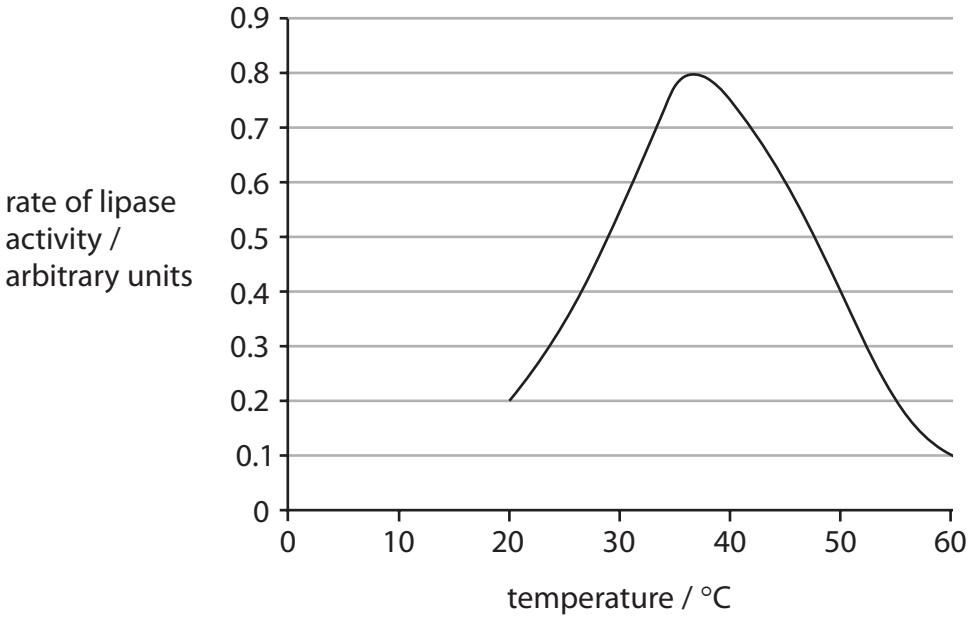


Figure 10

(a) (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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(b) 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}

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The investigation was done at 37 °C.

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

(1)

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(c) Different enzymes catalyse specific reactions.

Explain why enzymes can only catalyse specific reactions.

(2)

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(Total for Question 8 = 12 marks)

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9 When bacteria divide they replicate their genome and synthesise their cell wall.

Figure 12 outlines the stages of bacterial replication.

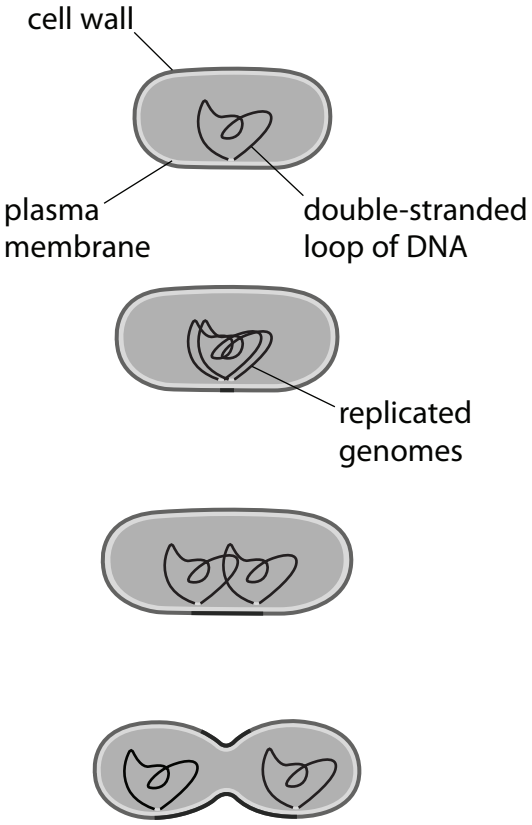


Figure 12

(a) Penicillin inhibits the synthesis of the cell wall in bacteria.

Explain the effect of penicillin on bacterial and human cells.

(3)

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(b) Penicillin, isolated from a fungus, was the first antibiotic used to treat bacterial infections and is still widely used today.

Scientists have genetically engineered bacteria to produce large amounts of penicillin.

Describe how scientists would produce a genetically modified bacterium that produces penicillin.

(4)

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*(c) MRSA is a bacterium that has evolved to become resistant to antibiotics.

With reference to Darwin's theory of evolution by natural selection, explain how MRSA bacteria have evolved to become resistant to antibiotics.

(6)

(Total for Question 9 = 13 marks)

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10 There are different types of white blood cell in the body. One type is called CD4+ T-Helper cells.

The normal range of these cells in the blood is between 5×10^8 and 1.2×10^9 cells/dm^3

An AIDS patient has a CD4+ T-Helper cell count of 1.5×10^8 cells/dm^3

(a) Explain why the CD4+ count of 1.5×10^8 cells/dm^3 has led to the diagnosis of AIDS.

(2)

*(b) Some sexually transmitted infections (STIs) can be diagnosed by testing urine samples.

These tests use monoclonal antibodies that bind to an antigen on the pathogen.

Describe how a monoclonal antibody can be developed and used to detect an STI using a urine sample.

(6)

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(c) The antigens on pathogens can be proteins with a specific amino acid sequence.

Explain how the order of amino acids in a protein is determined by the sequence of the gene.

(4)

(Total for Question 10 = 12 marks)

TOTAL FOR PAPER = 100 MARKS

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