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:
Ruler, calculator

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.*

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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Q:1/1/1/1/1/

Pearson

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 Gregor Mendel studied inheritance in pea plants.

Pea plants can produce either yellow pea pods or green pea pods.

Mendel crossed plants that always produce yellow pea pods with plants that always produce green pea pods.

Symbol **A** represents the dominant allele.

Symbol **a** represents the recessive allele.

(a) Which is the genotype of the pea pods produced from this cross?

(1)

☒ **A** **AA**

☒ **B** **aa**

☒ **C** **Aa**

☒ **D** **YG**

(b) (i) Mendel grew many plants from the seeds in these pea pods.

These plants were then crossed with each other.

The seeds from this second cross produced 5 496 plants with yellow pea pods and 1 832 plants with green pea pods.

Give this as a ratio in its simplest form.

(1)

ratio

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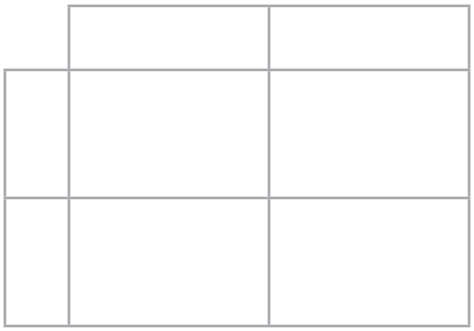
(ii) Complete the Punnett square to show the outcome of a cross where both parent pea plants are heterozygous.

Show the percentage probability of homozygous recessive offspring in your answer.

(3)



percentage probability of homozygous recessive offspring ____ %

(c) (i) Some plants reproduce sexually.

Give **one** advantage of this type of reproduction.

(1)

(ii) Name the process that forms gametes for sexual reproduction.

(1)

(Total for Question 1 = 7 marks)

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2 (a) DNA molecules contain base pairs.

Describe how the base pairs are bonded together in a DNA molecule.

(2)

(b) Figure 1 shows part of a DNA molecule.

T	T	G	A	T	T	G	C	G	T	A	A

Figure 1

(i) Write the code for the complementary DNA strand in Figure 1.

(2)

(ii) Three bases code for each amino acid.

Which is the maximum number of amino acids coded for by this strand of DNA?

(1)

- ☒ **A** 3
- ☒ **B** 4
- ☒ **C** 6
- ☒ **D** 12

(iii) What is the shape of a DNA molecule?

(1)

- ☒ **A** triple stranded
- ☒ **B** single stranded
- ☒ **C** single helix
- ☒ **D** double helix

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(c) A student wanted to extract the DNA from fresh peas.

The student crushed the peas and added washing up liquid and water.

The enzyme protease was then added to this mixture.

(i) Explain why the enzyme protease was added to the mixture.

(2)

(ii) The mixture was then heated and filtered.

Finally, the student poured the filtrate into a test tube and ice cold ethanol was poured down the side of the test tube into the filtrate.

State why ice cold ethanol was poured into the filtrate.

(1)

(Total for Question 2 = 9 marks)

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3 (a) Figure 2 shows the number of people diagnosed with sexually transmitted infections (STIs) in the UK during 2017.

sexually transmitted infection (STI)	number of people diagnosed per 1000 of the population
chlamydia	3.7
gonorrhoea	0.8
genital herpes	0.6
genital warts	1.1
syphilis	0.1

Figure 2

(i) State the sexually transmitted infection that has the median number of people diagnosed.

(1)

(ii) The population of the UK in 2017 was 66 million people.

Calculate the total number of people diagnosed with chlamydia in the UK in 2017.

(2)

people

(iii) State why chlamydia can be described as a communicable disease.

(1)

(iv) Give **one** way the transmission of chlamydia can be prevented.

(1)

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(v) Explain why chlamydia can be treated with antibiotics.

(2)

(b) HIV is another sexually transmitted infection.

Explain how HIV can lead to the onset of AIDS.

(2)

(Total for Question 3 = 9 marks)

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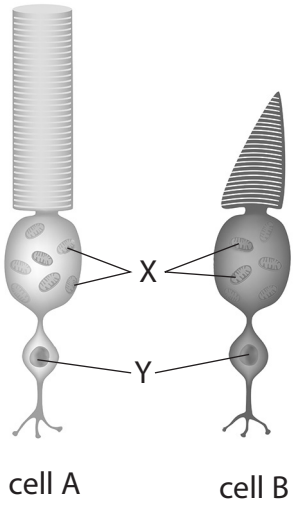
4 (a) Figure 3 shows two light receptor cells from the human eye.



(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)

(iii) The cell organelle labelled Y contains chromosomes.

Name the organelle labelled Y.

(1)

(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)

(b) The optic nerve carries information from the back of the eye to the brain.

The optic nerve is 47 mm in length.

Nerve impulses travel at 75 metres per second.

(i) Calculate the time an impulse takes to travel the length of the optic nerve.

Use the equation: $\text{speed} = \frac{\text{distance}}{\text{time}}$

(3)

seconds

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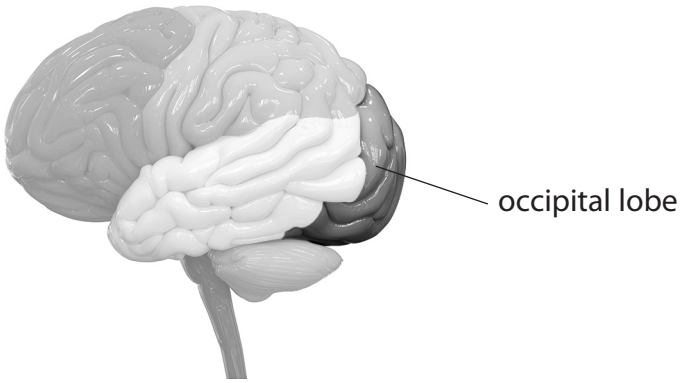
(ii) The impulse travels to the occipital lobe of the brain.
The occipital lobe is labelled in Figure 4.



(Source: © Magic mine/Shutterstock)

Figure 4

Which part of the brain contains the occipital lobe?

(1)

- ☒ **A** cerebral hemispheres
- ☒ **B** medulla oblongata
- ☒ **C** cerebellum
- ☒ **D** hypothalamus

(iii) State the sense most likely to be affected if the occipital lobe is damaged.

(1)

(Total for Question 4 = 11 marks)

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5 (a) In 2017, a new strain of *Klebsiella pneumoniae* bacteria was discovered that was resistant to 26 different antibiotics.

(i) Explain how *Klebsiella pneumoniae* bacteria developed resistance to antibiotics.

(4)

(ii) State how the use of antibiotics could contribute to *Klebsiella pneumoniae* bacteria developing resistance to antibiotics.

(1)

(iii) *Klebsiella pneumoniae* is a prokaryotic cell.

Which is a characteristic feature of a prokaryotic cell?

(1)

☒ **A** it has chloroplasts

☒ **B** it does not have a nucleus

☒ **C** it does not have ribosomes

☒ **D** it cannot reproduce without a host

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(b) New antibiotics are being developed to treat the disease caused by *Klebsiella pneumoniae*.

Describe the stages of antibiotic development that would occur after the discovery of a new antibiotic.

(3)

(Total for Question 5 = 9 marks)

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6 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

(a) 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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(b) 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)

(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)

(Total for Question 6 = 9 marks)

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7 (a) 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)

(b) Describe what is produced when a single cell divides by mitosis.

(3)

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(c) The student observed 89 cells on the microscope slide.

Figure 6 shows the number of cells at each stage of the cell cycle.

stage of cell cycle	number of cells
Interphase	44
Prophase	12
Metaphase	6
Anaphase	18
Telophase	9

Figure 6

Use this equation to calculate the mitotic index for this slide.

$$\text{mitotic index} = \frac{\text{number of cells in mitosis}}{\text{total number of cells}} \times 100$$

Give your answer to three significant figures.

(3)

Mitotic index

(d) The mitotic index is often used in the diagnosis of cancer.

State the effect of cancer on cell division.

(1)

(Total for Question 7 = 11 marks)

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8 Alfred Russel Wallace travelled around Malaysia during the 1800s and wrote to Charles Darwin about the animal species he studied.

His main conclusions were very similar to those of Charles Darwin and they both contributed to the current understanding of evolution.

(a) Describe the theory of evolution by natural selection.

(3)

(b) Wallace and Darwin did not always agree.

Darwin believed that male birds have feathers that are brightly coloured to make them more attractive to female birds.

Wallace thought that female birds have feathers that are less brightly coloured so they are more likely to survive.

(i) Explain why having feathers that are less brightly coloured increases the survival rate of females.

(2)

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(ii) Suggest why it is more important for the survival of the species that the survival rate is higher in female birds than in male birds.

(2)

(c) Figure 7 shows the limbs of five animals.

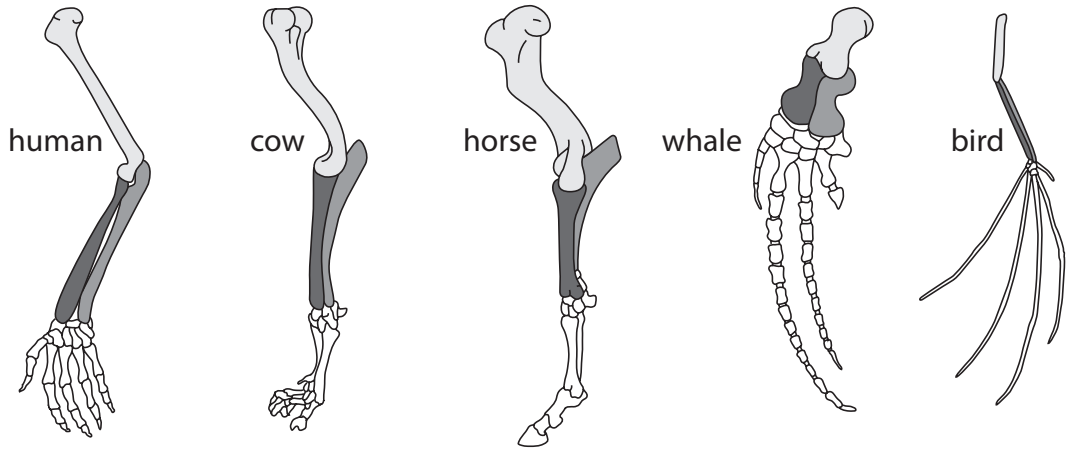

Figure 7

Describe how the structure of these limbs provides scientists with evidence for evolution.

(3)

(Total for Question 8 = 10 marks)

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9 There is a shortage of kidneys for organ transplants.

Scientists are investigating how to grow kidneys using genetically modified pig embryos.

Figure 8 shows this process.

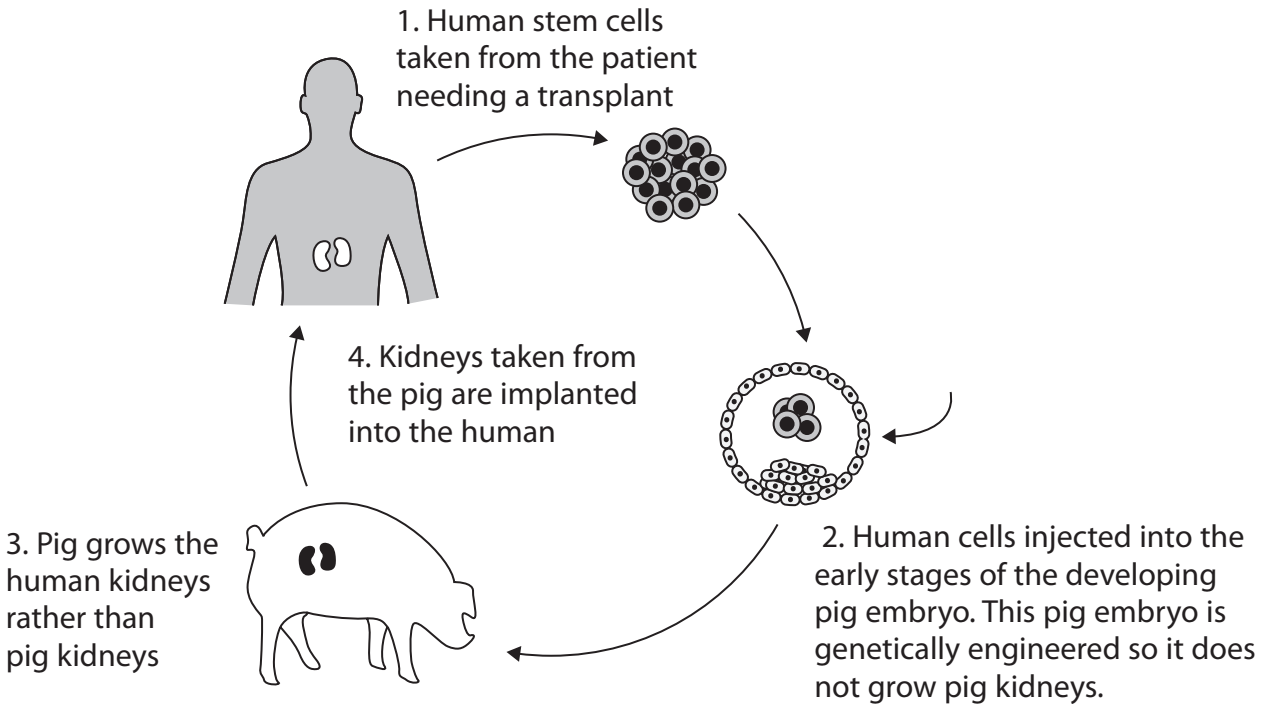

Figure 8

(a) (i) State why the embryo of the pig must be engineered so it does not grow pig kidneys.

(1)

(ii) Explain why human stem cells are used for this process.

(2)

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(b) Figure 9 shows the number of organ transplants needed and the number of donors available in the USA from 1991 to 2018.

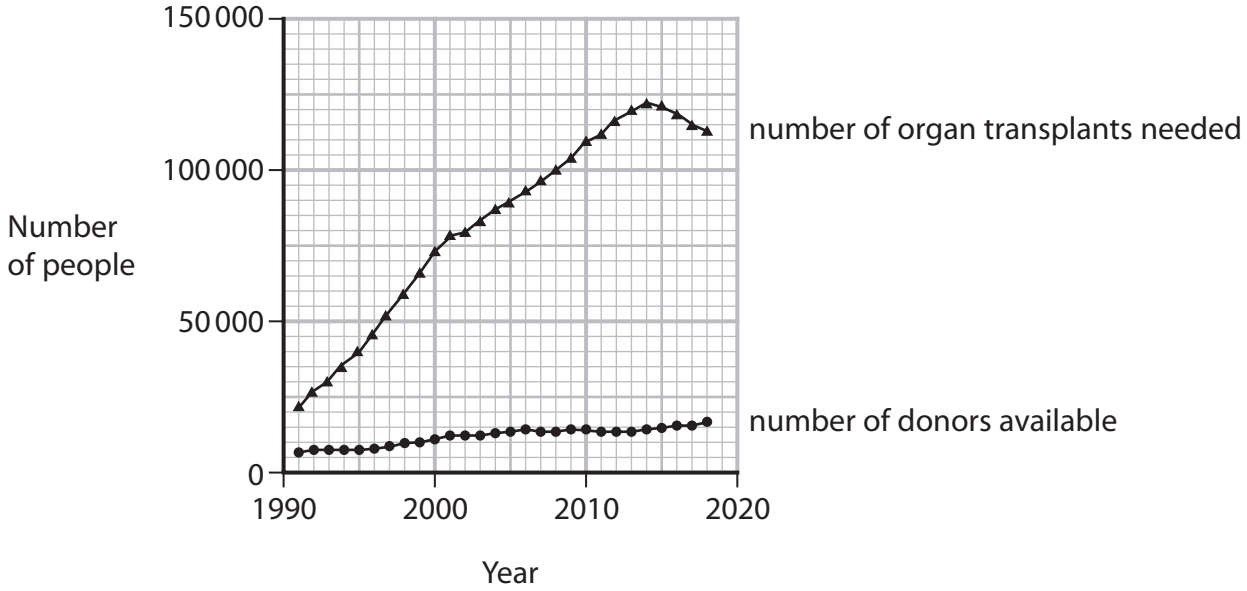

Figure 9

(i) Compare the number of donors available with the number of organ transplants needed from 1991 to 2018.

Use information from the graph to support your answer.

(3)

(ii) State why scientists are genetically engineering animals for organ transplants.

(1)

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*(c) Bacteria have been genetically engineered to produce human insulin since 1978.

Explain how bacteria can be genetically engineered to produce human insulin.

(6)

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10 (a) Figure 10 shows part of a method used to produce a bacterial culture on a Petri dish.

Step 1. Sterilise Petri dish and agar before use

Step 2. Pass inoculating loop through a flame

Step 3. Allow inoculating loop to cool

Step 4. Use inoculating loop to collect bacterial sample

Step 5. Use inoculating loop to spread bacteria onto agar

Figure 10

(i) State why step 1 and step 2 are necessary.

(1)

(ii) Give **one** reason why step 3 is included.

(1)

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*(iii) A student wanted to investigate how effective three different antiseptics were at killing bacteria.

The student was provided with:

- an inoculated Petri dish prepared using the method in Figure 10
- three different antiseptics
- filter paper discs
- sticky tape.

Devise a plan for the student to complete this investigation.

Include a control and any variables that the student would need to consider.

(6)

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(b) Viruses can cause disease.

Describe how the lytic pathway is involved in the reproduction of viruses.

(4)

(Total for Question 10 = 12 marks)

TOTAL FOR PAPER = 100 MARKS

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