Paper Reference(s) 1SC0/1BH
Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Combined Science

PAPER 1

Higher tier

Total Marks

Time: 1 hour 10 minutes

In the boxes below, write your name, centre number and candidate number.

Surname						
Other names						
Centre Number						
Candidate Number						

Q69482A

Pearson

YOU MUST HAVE

Ruler, calculator

YOU WILL BE GIVEN

Diagram Booklet

INSTRUCTIONS

Answer ALL questions.

Answer the questions in the space provided in this Question Paper or in the separate Diagram Booklet – there may be more space than you need.

INFORMATION

The total mark for this paper is 60.

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.

There may be spare copies of some diagrams.

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.

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) DNA molecules contain base pairs.

Describe how the base pairs are bonded together in a DNA molecule.
(2 marks)

(continued on the next page)

1 continued.

(b) Look at Figure 1 for Question 1(b) in the Diagram Booklet. It shows part of a DNA molecule.

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

(continued on the next page)

1 continued.

(ii) Three bases code for each amino acid.

Which is the maximum number of amino acids coded for by this strand of DNA?
(1 mark)

☐ A 3

☐ B 4

☐ C 6

☐ D 12

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

☐ A triple stranded

☐ B single stranded

☐ C single helix

☐ D double helix

(continued on the next page)

1 continued.

(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 marks)

(continued on the next page)

1 continued.

(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 mark)

(Total for Question 1 = 9 marks)

2 (a) Look at Figure 2 for Question 2(a) in the Diagram Booklet. It shows the number of people diagnosed with sexually transmitted infections (STIs) in the UK during 2017.

(i) State the sexually transmitted infection that has the median number of people diagnosed. (1 mark)

(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 marks)

_____ people

(continued on the next page)

2 continued.

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

(iv) Give ONE way the transmission of chlamydia can be prevented.
(1 mark)

(continued on the next page)

2 continued.

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

(continued on the next page)

2 continued.

(b) HIV is another sexually transmitted infection.

Explain how HIV can lead to the onset of AIDS.
(2 marks)

(Total for Question 2 = 9 marks)

3 (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 marks)

(continued on the next page)

3 continued.

(continued on the next page)

3 continued.

(ii) State how the use of antibiotics could contribute to **Klebsiella pneumoniae** bacteria developing resistance to antibiotics. (1 mark)

(continued on the next page)

3 continued.

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

Which is a characteristic feature of a prokaryotic cell?
(1 mark)

- ☐ 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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3 continued.

(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 marks)

(Total for Question 3 = 9 marks)

4 A student investigated the fat content of two types of milk: milk A and milk B.

Look at Figure 3 for Question 4 in the Diagram Booklet. Before starting the investigation, the student added a drop of oil from a pipette into a test tube of water as shown.

The drop of oil rose to the surface of the water.

(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 mark)

(continued on the next page)

4 continued.

(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 marks)

(continued on the next page)

4 continued.

(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 marks)

(continued on the next page)

4 continued.

(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 marks)

(Total for Question 4 = 9 marks)

5 (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 marks)

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5 continued.

(continued on the next page)

5 continued.

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

(continued on the next page)

5 continued.

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

Look at Figure 4 for Question 5(c) in the Diagram Booklet. It shows the number of cells at each stage of the cell cycle.

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 marks)

Mitotic index _____

(continued on the next page)

5 continued.

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

State the effect of cancer on cell division.
(1 mark)

(Total for Question 5 = 11 marks)

6 There is a shortage of kidneys for organ transplants.

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

Look at Figure 5 for Question 6 in the Diagram Booklet. It shows this process.

Step 1. Human stem cells taken from the patient needing a transplant

Step 2. Human cells injected into the early stages of the developing pig embryo. This pig embryo is genetically engineered so it does not grow pig kidneys.

Step 3. Pig grows the human kidneys rather than pig kidneys

Step 4. Kidneys taken from the pig are implanted into the human

(a) (i) State why the embryo of the pig must be engineered so it does not grow pig kidneys. (1 mark)

(continued on the next page)

6 continued.

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

(continued on the next page)

6 continued.

(b) Look at the Figure 6 for Question 6(b) in the Diagram Booklet. It shows the number of organ transplants needed and the number of donors available in the USA from 1991 to 2018.

(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 marks)

(continued on the next page)

6 continued.

(ii) State why scientists are genetically engineering animals for organ transplants. (1 mark)

(continued on the next page)

6 continued.

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

Explain how bacteria can be genetically engineered to produce human insulin.
(6 marks)

(continued on the next page)

6 continued.

(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS

END OF PAPER