

Combined Science
PAPER 1
Higher Tier

Total Marks

Time: 1 hour 10 minutes plus your additional time allowance

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

Surname										
Other names										
Centre Number										
Candidate Number										

YOU MUST HAVE

Calculator, ruler

YOU WILL BE GIVEN

Diagram Booklet

INSTRUCTIONS

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 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 the question 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.

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) Look at Figure 1 for Question 1(a) in the Diagram Booklet. It shows part of a reflex arc in the spinal cord.

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

(continued on the next page)

1 continued.

**(ii) Explain the function of a reflex arc.
(2 marks)**

(continued on the next page)

1 continued.

- (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.

Look at Figure 2 for Question 1(b) in the Diagram Booklet. It shows the results for the five students.

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

☐ **A 200 milliseconds**

☐ **B 210 milliseconds**

☐ **C 215 milliseconds**

☐ **D 225 milliseconds**

(continued on the next page)

1 continued.

- (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 marks)

(continued on the next page)

Turn over

1 continued.

(Total for Question 1 = 9 marks)

- 2 (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 mark)

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

- (i) State TWO ways that communicable diseases are different from non-communicable diseases.
(2 marks)

1

2

2 continued.

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

(continued on the next page)

2 continued.

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

The student wrote down the following notes in a notebook.

Belgium 1000

Portugal 2400

UK 5400 people

Germany 6100

5800 in France

**Look at the table for Question 2(b)(iii) in the Diagram Booklet. Complete the table to show the student's data.
(2 marks)**

(continued on the next page)

2 continued.

- (c) Explain why people with AIDS are more susceptible to TB.
(2 marks)**

(Total for Question 2 = 9 marks)

3 (a) Look at Figure 4 for Question 3(a) in the Diagram Booklet. It shows diagrams of cells from an onion root tip.

**(i) Identify the stages of mitosis shown in cell Q and cell R.
(1 mark)**

	cell Q	cell R
<input type="checkbox"/> A	metaphase	anaphase
<input type="checkbox"/> B	telophase	anaphase
<input type="checkbox"/> C	metaphase	interphase
<input type="checkbox"/> D	telophase	interphase

(continued on the next page)

3 continued.

- (ii) Describe TWO processes that occur in cells during prophase.
(2 marks)**

1 _____

2 _____

- (iii) State the term used to describe the process which occurs after mitosis, when the cell divides into two.
(1 mark)**

(continued on the next page)

Turn over

3 continued.

(iv) The diameter of one cell in Figure 4 is 0·075 mm.

**Which is this diameter in μm ?
(1 mark)**

- ☐ **A 0·75 μm**
- ☐ **B 75 μm**
- ☐ **C 750 μm**
- ☐ **D 75 000 μm**

(continued on the next page)

3 continued.

(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 marks)

(continued on the next page)

3 continued.

(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 marks)

3 continued.

(Total for Question 3 = 11 marks)

- 4 (a) Look at Figure 5 for Question 4(a) in the Diagram Booklet. It 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.

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

Calculate the risk of developing liver cancer for someone who consumes 5 units of alcohol a day.

(2 marks)

_____ risk of developing liver cancer

(continued on the next page)

4 continued.

**(ii) Describe how cancer develops in the liver.
(2 marks)**

(continued on the next page)

4 continued.

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

A person with haemochromatosis is treated by having 0.5dm^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 marks)**

1 _____

2 _____

(continued on the next page)

4 continued.

(ii) Haemochromatosis can be inherited.

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

Look at Figure 6 for Question 4(b)(ii) in the Diagram Booklet. It shows the inheritance of haemochromatosis in a family.

**State and explain the genotype of female Z.
(3 marks)**

(Total for Question 4 = 9 marks)

Turn over

5 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.

Look at Figure 7 for Question 5(a) in the Diagram Booklet. It shows the results.

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

- ☐ **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**

(continued on the next page)

Turn over

5 continued.

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

(continued on the next page)

5 continued.

- (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 marks)**

(continued on the next page)

5 continued.

- (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 mark)

(continued on the next page)

5 continued.

- (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 marks)**

1 _____

2 _____

(continued on the next page)

5 continued.

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

Look at Figure 8 for Question 5(b) in the Diagram Booklet. It shows a bacterial cell.

**Explain how to genetically modify a bacterial cell to produce chymosin.
(3 marks)**

(continued on the next page)

Turn over

5 continued.

(Total for Question 5 = 11 marks)

- 6 (a) Look at Figure 9 for Question 6(a) in the Diagram Booklet. It shows a sperm cell.**

**Describe how structure A and structure B enable fertilisation.
(2 marks)**

structure A

structure B

(continued on the next page)

6 continued.

(b) Look at Figure 10 for Question 6(b) in the Diagram Booklet. It shows a human egg cell, magnified $\times 700$.

Calculate the actual width of the egg cell as indicated by the arrow on Figure 10.

**Give your answer in millimetres, in standard form.
(3 marks)**

_____mm

(continued on the next page)

6 continued.

***(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.

Look at Figure 11 for Question 6(c) in the Diagram Booklet. It shows the results.

Evaluate the results of this investigation.

You should include calculations using the data in Figure 11.

(6 marks)

6 continued.

[illegible]

(continued on the next page)

Turn over

6 continued.

[illegible]

(continued on the next page)

Turn over

6 continued.

[illegible]

(continued on the next page)

Turn over

6 continued.

[illegible]

(Total for Question 6 = 11 marks)

TOTAL FOR PAPER = 60 MARKS
END OF PAPER