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 10 minutes

Paper reference **1SC0/1BH**

Combined Science

PAPER 1

Higher Tier

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.*
- 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 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.
- 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.

Turn over ▶

E:1/1/1/1/

P 6 6 6 2 1 R A 0 1 2 0

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 (a) Figure 1 shows part of a reflex arc in the spinal cord.

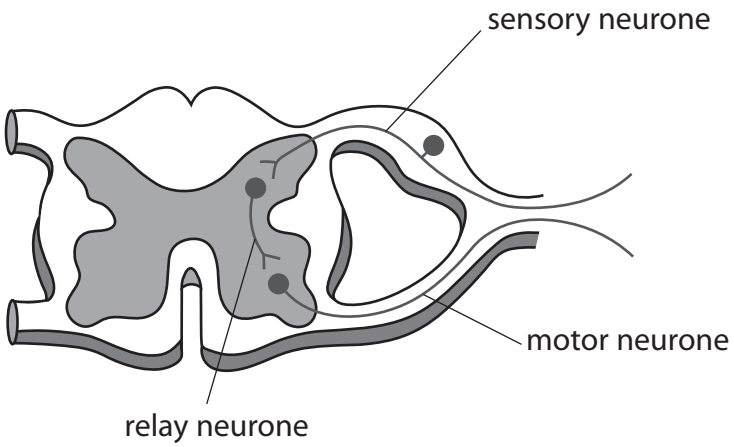

Figure 1

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

(3)

A description including three from:

• the impulse (in the relay neurone) triggers the release of a chemical (1)

• neurotransmitter (1)

• (neurotransmitter) diffuses (1)

(ii) Explain the function of a reflex arc.

(2)

• a process that occurs in response to danger (1)

• which bypasses the {brain / parts of the brain} / is an {involuntary process / subconscious process} (1)

(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.

Figure 2 shows the results for the five students.

student	reaction time in milliseconds
1	245
2	200
3	210
4	215
5	225

Figure 2

(i) Which is the median result for these students?

(1)

☒ **A** 200 milliseconds

☒ **B** 210 milliseconds

☒ **C** 215 milliseconds

☒ **D** 225 milliseconds

(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)

measure their reaction time using red squares (1)

• keep everything else the same (as using blue squares) (1)

• repeat measurements (for each student) (1)

(Total for Question 1 = 9 marks)

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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)

World Health Organization / WHO

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

(i) State **two** ways that communicable diseases are different from non-communicable diseases.

(2)

1 (communicable) is passed from person to person (1)

2 • (communicable) caused by {pathogens / example of pathogen} (1)

(ii) Explain **one** way that the spread of tuberculosis (TB) can be reduced or prevented.

(2)

vaccination / immunisation (1)

• to provide immunity / reduces the chance of a person getting infected (1)

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

Figure 3 shows the student's data.

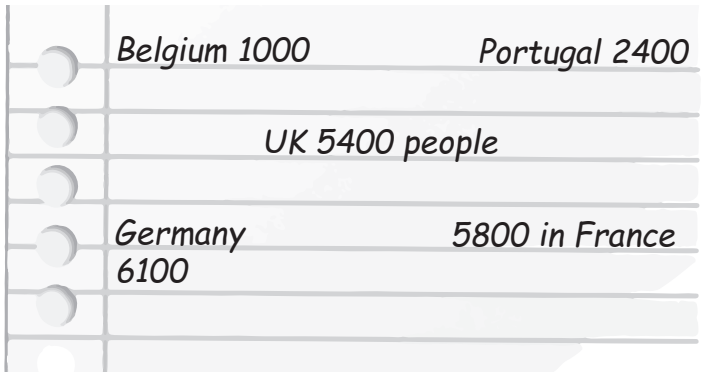


Figure 3

Complete the table to show the student's data.

(2)

suitable heading for each column, with country in the left column (1)

• all data entered accurately (1)

(c) Explain why people with AIDS are more susceptible to TB.

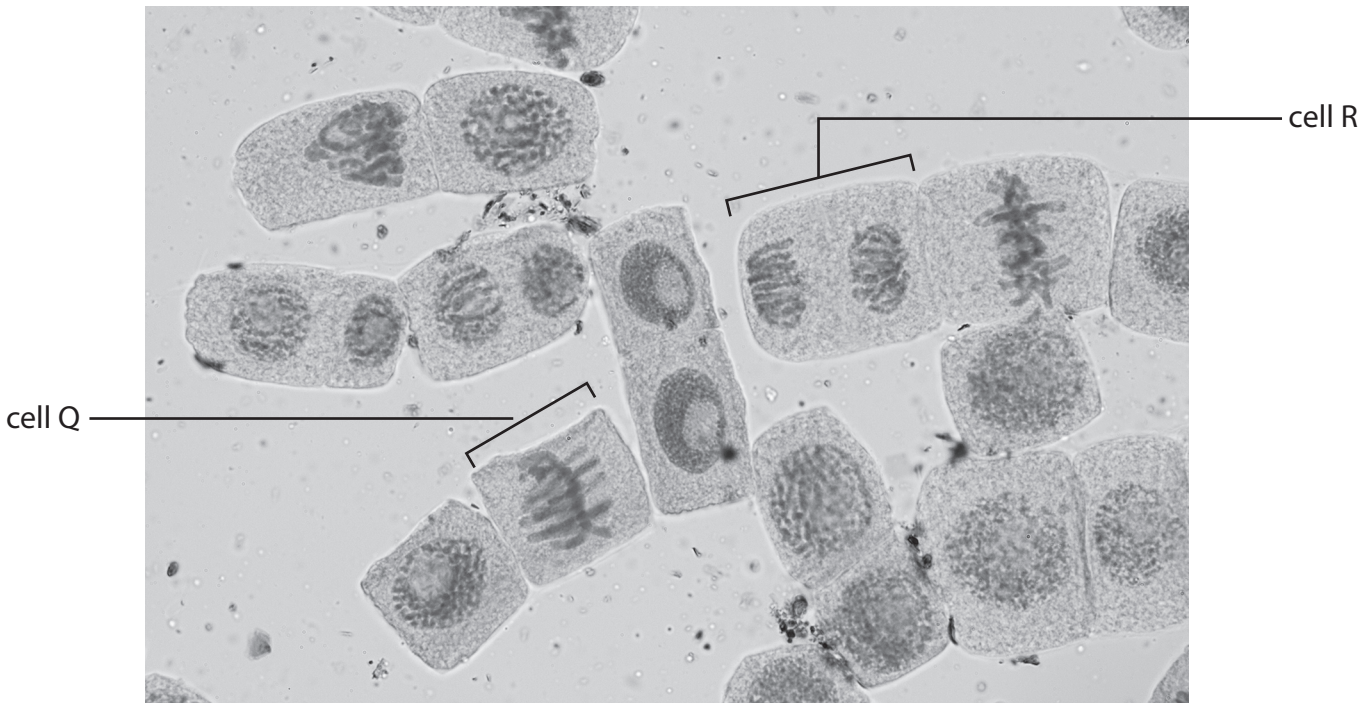
(2)

HIV destroys white blood cells / HIV weakens the immune system (1)

• so the body is unable to {destroy the TB pathogen / prevent the pathogen invading the body} (1)

(Total for Question 2 = 9 marks)

3 (a) Figure 4 shows cells from an onion root tip as seen using a light microscope.



(Source: © Rattiya Thongdumhyu/Shutterstock)

Figure 4

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

(1)

	cell Q	cell R
☒ **A**	metaphase	anaphase
☒ **B**	telophase	anaphase
☒ **C**	metaphase	interphase
☒ **D**	telophase	interphase

(ii) Describe **two** processes that occur in cells during prophase.

(2)

1 chromatids condense (1)

2 • identical chromatids are joined (1)

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

(1)

cytokinesis

(iv) The diameter of one cell in Figure 4 is 0.075 mm.

Which is this diameter in µm?

(1)

- ☒ **A** 0.75 µm
- ☒ **B** 75 µm
- ☒ **C** 750 µm
- ☒ **D** 75 000 µm

(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 ×400.

(2)

use the x40 objective lens (1)

• use the x10 eye piece lens (1

(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)

Benefits

- stem cells can differentiate / become specialised (1)
- replace (damage) cells (1)

Risks

- new cells do not function correctly (1)
- stem cells continue to divide (1)

(Total for Question 3 = 11 marks)

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4 (a) Figure 5 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.

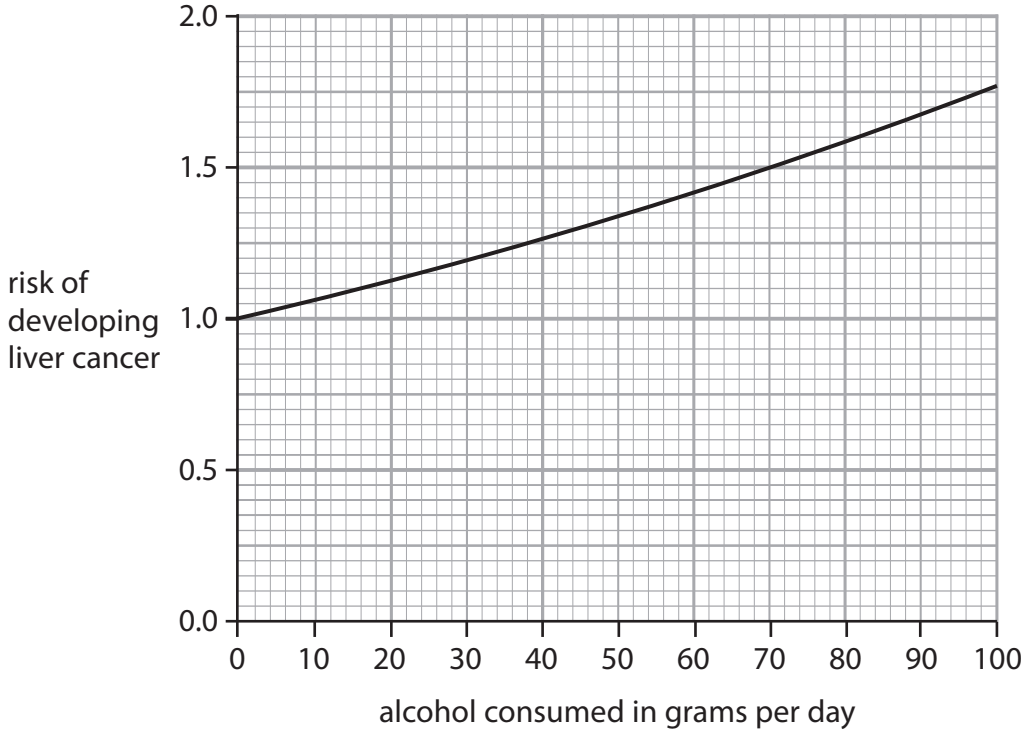

Figure 5

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

Calculate the risk of developing liver cancer for someone who consumes 4 units of alcohol a day.

(2)

(8 x 4) = 32 (grams of alcohol) (1)

1.2 / 1.20 (x risk)

..... risk of developing liver cancer

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(ii) Describe how cancer develops in the liver.

(2)

mutations in DNA (1)

• cell division is uncontrolled (1

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

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

1 wear gloves (1)

2 • clean the area of skin where blood being removed (1)

(ii) Haemochromatosis can be inherited.

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

Figure 6 shows the inheritance of haemochromatosis in a family.

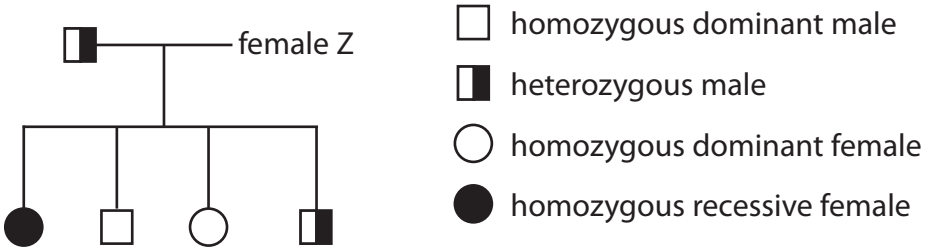

Figure 6

State and explain the genotype of female Z.

(3)

heterozygous

- affected offspring must have inherited the recessive allele (1)
- unaffected offspring must have inherited dominant allele (1)

(Total for Question 4 = 9 marks)

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.

Figure 7 shows the results.

temperature of the milk in °C	time taken for milk to curdle in seconds
25	125
30	105
35	90
40	70
45	75

Figure 7

(i) Which variables need to be kept constant in this investigation?

(1)

☒ **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

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

(2)

40°C is the {optimum / closer to the optimum} / there is a faster rate of reaction (1)

• because as temperature increases (kinetic) energy increases (1)

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(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)

time taken would be longer / the milk would not curdle (1)

• because the enzyme is denatured / the active site has changed shape (1)

(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)

it is a control (1)

(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)

1 use a smaller interval between the temperatures (1)

2 • measure temperatures between the range of 35°C and 45°C (1)

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

Figure 8 shows a bacterial cell.

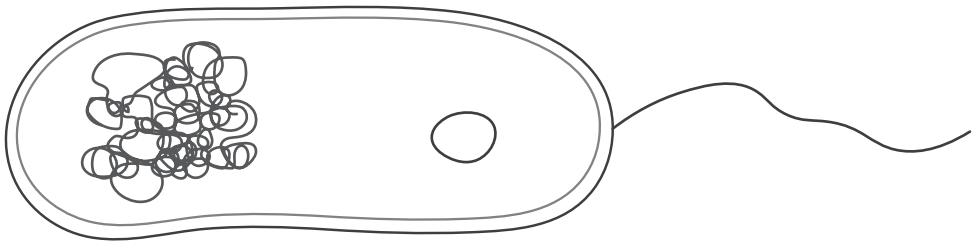

Figure 8

Explain how to genetically modify a bacterial cell to produce chymosin.

(3)

plasmid is cut with restriction enzymes/ chymosin gene is cut with a restriction enzyme (1)

• sticky ends are complementary (1)

• ligase is used to connect the chymosin gene and the plasmid (1)

(Total for Question 5 = 11 marks)

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6 (a) Figure 9 shows a sperm cell.

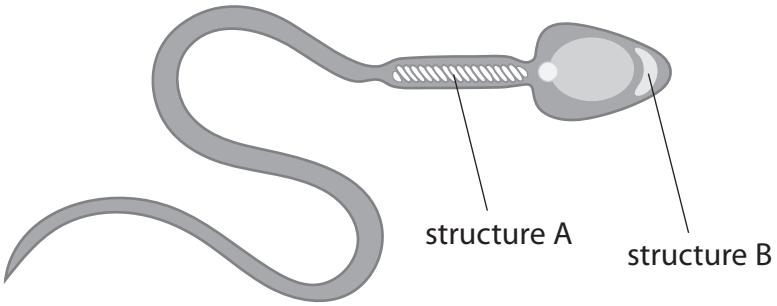


Figure 9

Describe how structure A and structure B enable fertilisation.

(2)

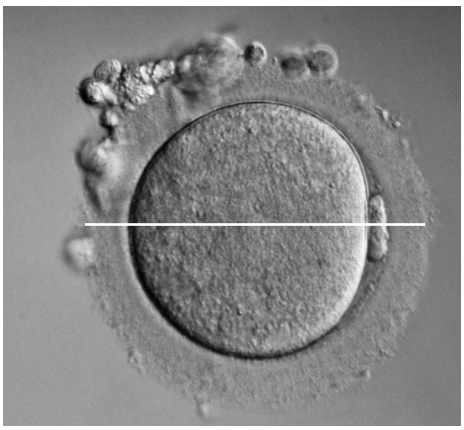
structure A

• the mitochondria {release energy / for respiration} (1)

structure B

• {acrosome / contains enzymes} to digest the egg cell membrane (1)

(b) Figure 10 shows a human egg cell, magnified ×700.



(Source: © Pascal Goetgheluck / Science Photo Library)

Figure 10

Calculate the actual width of the region indicated by the line on Figure 10.

Give your answer in millimetres, in standard form.

(3)

measurement
45 (mm) / 4.5 cm (1)

calculation
(45 ÷ 700) = 0.0643 (1)

conversion into standard form and millimetres

6.43 x 10-2 / 6.4 x 10-2

..... mm

*(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.

Figure 11 shows the results.

solution	mass of the egg at the start in grams	mass of the egg after 24 hours in grams
tap water	77	84
5% salt	77	77
10% salt	77	75

Figure 11

Evaluate the results of this investigation.

You should include calculations using the data in Figure 11.

(6)

Analysis of data
- the egg in the water has gained mass / water
- the egg in the 5% salt has no mass change
- the egg in the 10% salt has lost mass / water
- mass increase is 7 g for the egg in water
- mass increase is 0 g for 5% salt
- the mass decrease is 2g for 10% salt
- % mass change +9% / 0% / -3%

Water movement

- osmosis is the movement of water
- across a partially permeable membrane
- from a high concentration of water molecules to a low concentration of water molecules
- 5% salt is an isotonic solution

(Total for Question 6 = 11 marks)

TOTAL FOR PAPER = 60 MARKS

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