Please check the examination details below before entering your candidate information

Candidate surname	Other names

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

Centre Number | | | | | |

Candidate Number | | | | |

Monday 1 June 2020

Afternoon (Time: 1 hour 10 minutes) | Paper Reference **1SC0/2BH**

Combined Science

Paper 4

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.*
- 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 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.

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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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 Figure 1 shows the leaves and flowers of water lily plants (*Nymphaea odorata*) on a lake.

© Oleksandr Shymanskyi/123RF

Figure 1

(a) Water lilies have stomata on the upper surface of the leaves.

Explain why water lilies have no stomata on the lower surface of the leaves.

(2)

lower surface (of leaf) is not in contact with air / is in water so gas exchange cannot occur

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(b) (i) The white petals of the water lily flowers cannot photosynthesise.

Which structure in leaf cells is the site of photosynthesis?

(1)

- ☒ **A** nucleus
- ☒ **B** vacuole
- ☒ **C** mitochondrion
- ☒ **D** chloroplast

(ii) Glucose is made by photosynthesis.

Glucose is converted to another sugar to be transported in the plant.

What is the name of this sugar?

(1)

- ☒ **A** glycerol
- ☒ **B** ribose
- ☒ **C** sucrose
- ☒ **D** starch

(iii) Describe how this sugar is transported from the leaves to the flowers of the water lily.

(2)

- in the phloem
- dissolved (in water)

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(c) Figure 2 shows water lilies growing in a lake in Europe.

© lynn gladwell/123RF

Figure 2

One water lily plant was brought from America 10 years ago and planted in the lake shown in Figure 2.

Explain why this non-indigenous plant now covers the whole surface of the lake.

(3)

- because {conditions / named conditions} are suitable for {growth / photosynthesis} /conditions similar to native conditions /it is adapted to the conditions
- it outcompeted the natural plants
- therefore, it {grows / reproduces}

(Total for Question 1 = 9 marks)

2 A slide of potato cells was viewed using a light microscope.

Figure 3 is a drawing of the slide showing starch grains in the potato cells.

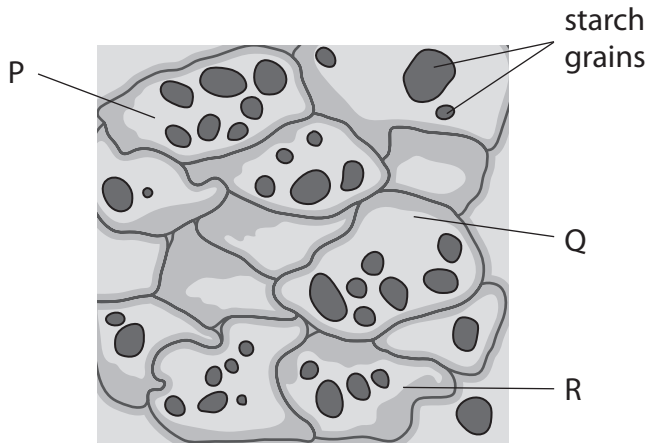

Figure 3

(a) (i) Calculate the mean number of starch grains in potato cells P, Q and R.

(1)

6 starch grains

(ii) Which structures are found in plant cells but are **not** found in animal cells?

(1)

☒ **A** cell membrane, nucleus, chloroplast

☒ **B** cell wall, cell membrane, cytoplasm

☒ **C** nucleus, large vacuole, chloroplast

☒ **D** cell wall, chloroplast, large vacuole

(b) A scientist investigated how the length of starch grains in potatoes changed when the potatoes were stored in the dark.

Figure 4 shows a potato after being stored in the dark.

Figure 4

Three potatoes were used in the investigation.

The length of starch grains in potato 1 were measured at the start.

The length of starch grains in potato 2 were measured after 5 weeks in the dark.

The length of starch grains in potato 3 were measured after 10 weeks in the dark.

Figure 5 shows the results.

potato	time after placing in the dark in weeks	mean length of starch grains in μm
1	0	64
2	5	50
3	10	30

Figure 5

(i) Calculate the percentage difference in the mean length of starch grains in potato 2 at 5 weeks and in potato 3 at 10 weeks.

(2)

(50 – 30 =) 20 (1)
(20 ÷ 50 x 100 =) - 40(%)

.....%

(ii) State **two** variables the scientist should have controlled to improve this investigation.

(2)

1 • variety of potato

2 • mass of potato

(iii) The starch grains in the potatoes became smaller as the starch was converted into glucose.

State why the potatoes need glucose.

(1)

for energy / respiration

(iv) Describe how starch is broken down into glucose.

(2)

• enzyme / amylase / carbohydrase
• starch fits into the **active site**

(Total for Question 2 = 9 marks)

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3 Trypsin is a protease enzyme used in the manufacture of food for babies.

(a) (i) Which food group is digested by trypsin?

(1)

- ☐ **A** carbohydrates
- ☐ **B** lipids
- ☐ **C** fibre
- ☒ **D** proteins

(ii) The food is mashed before the trypsin is added.

Explain the advantage of mashing the food before adding the trypsin.

(2)

- to increase the surface area of the food
- so trypsin will break down more protein

(b) A manufacturer of baby food wanted to find out the optimum pH for trypsin.

Equal volumes of different pH solutions were placed in six separate test tubes.

5 cm^3 of 1% trypsin solution was added to each test tube.

1.5 g of mashed food was placed in each test tube.

The time taken to digest the food was recorded.

(i) State **one** other variable that should be controlled in this investigation.

(1)

- temperature

(ii) State how this variable could be controlled.

(1)

use of a water bath/ description of alternative to water bath

(c) The results are shown in Figure 6.

pH	time taken to digest the food in minutes
1	42
2	15
3	9
4	2
5	16
6	40

Figure 6

(i) Describe the trends shown in this data.

(2)

• {as pH increases to pH 4/more acidic/low pH} the time taken for the food to digest {decreased/was shorter}
• The shortest time was pH 4

(ii) At pH 4, the trypsin digested 1.5 g of mashed food at a rate of 0.8 g per minute.

Calculate the rate of digestion at pH 1.

Give your answer to one significant figure.

(2)

1.5 ÷ 42 = 0.035(7142857) (1)

0.04 (g per minute

..... g per minute

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(iii) Explain the difference in the rate of reaction at pH 1 and the rate of reaction at pH 4.

(2)

- the rate of reaction at pH 1 is slower
- because enzymes are becoming denatured /changing the conformation of the active site / stopping enzyme substrate complexes forming

(Total for Question 3 = 11 marks)

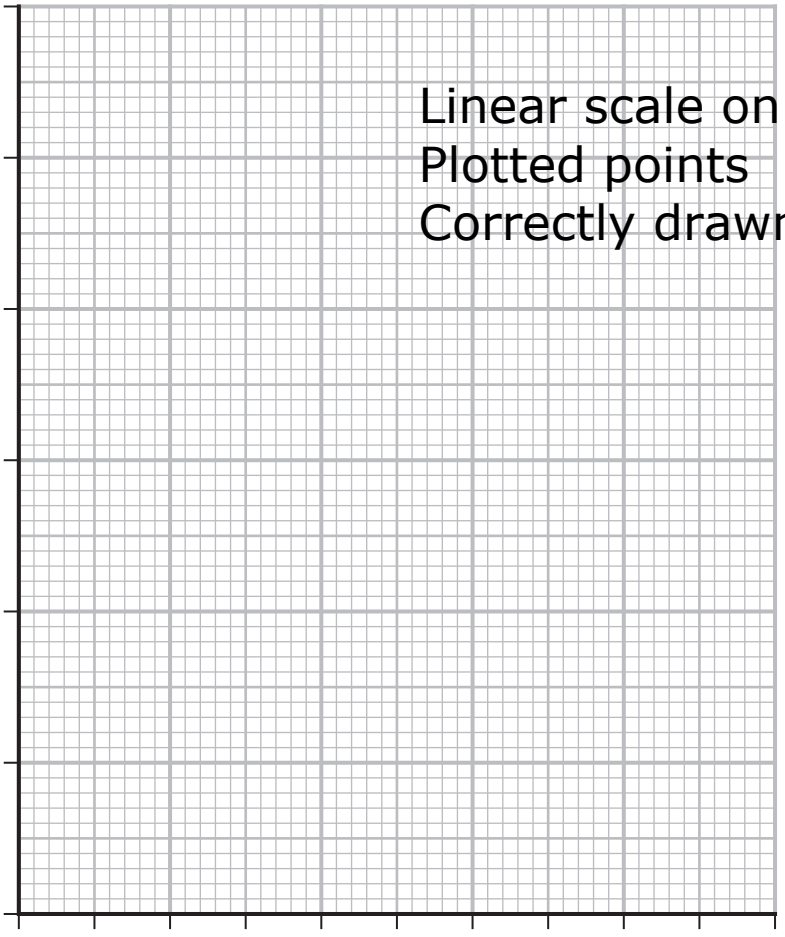
4 (a) Figure 7 shows the time taken for blood to clot at different temperatures.

temperature in °C	time taken for blood to clot in seconds
5	90
15	70
25	55
35	40
45	110

Figure 7

(i) Draw a graph to show the data in Figure 7.

(3)



(ii) Give **two** safety precautions that should be used when handling blood samples.

(2)

1 • wear gloves

2 • wash hands after handling

(b) (i) Which part of the blood causes blood to start clotting?

(1)

- ☒ **A** erythrocytes
- ☒ **B** lymphocytes
- ☒ **C** platelets
- ☒ **D** antibodies

(ii) Give **one** advantage of a blood clot forming.

(1)

to stop blood loss / prevent bacteria entering /stops bleeding

(c) Explain how **one** structure of a vein helps the blood return to the heart.

(2)

• veins contain valves
• which prevent the backflow of blood

(Total for Question 4 = 9 marks)

5 Figure 8 shows the heart rate of person A and person B.

Person A does not do any regular exercise.

Person B has been running regularly for one year.

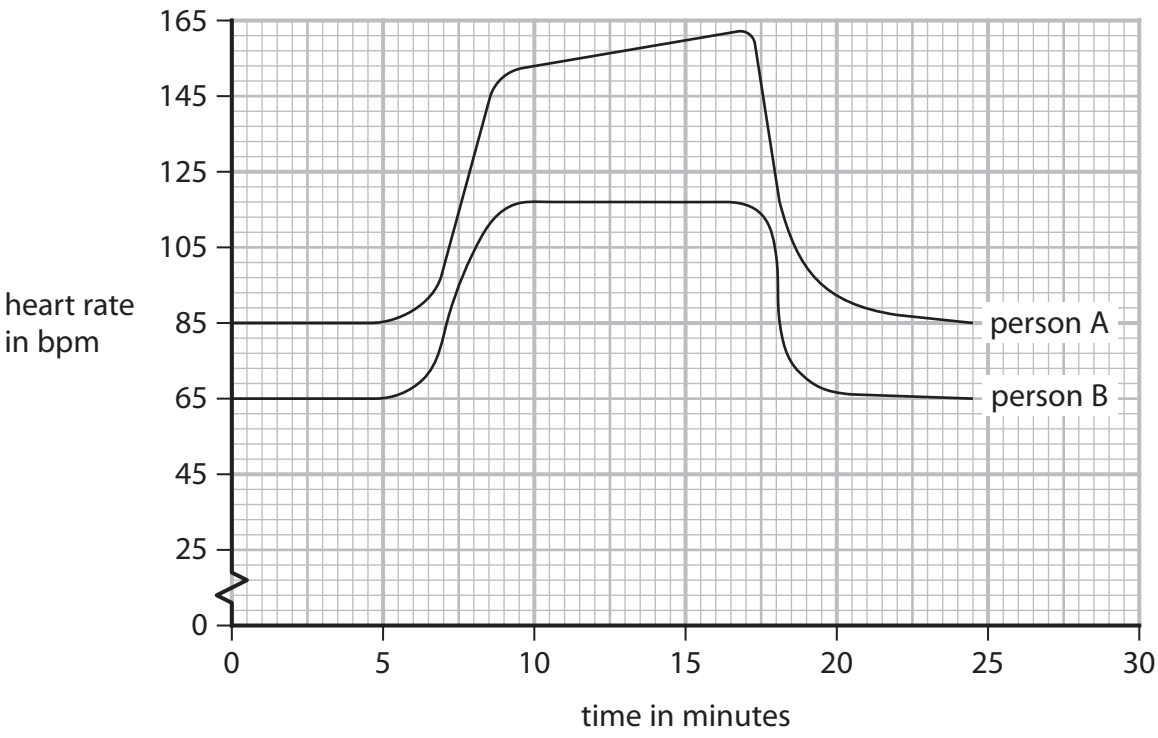


Figure 8

(a) Both people rested for the first 6 minutes, then did the same high intensity exercise for the next 12 minutes, then rested.

Compare the heart rates of person A with the heart rates of person B.

(4)

- the heart rate of person A is higher than the heart rate of person B
- the heart rate of person A increases **more** during exercise than person B
- the heart rate of person B is level during exercise whereas the heart rate of person A keeps increasing
- person B returns to their resting heart rate faster than person A
- comparative data analysis

(b) The stroke volume for person B before exercising was 61 ml per beat.

Calculate the cardiac output for person B before exercising.

Give your answer in litres per minute.

(3)

65 x 61
Evaluation:
= 3 965
Conversion:
3 965 ÷ 1000 = 3.965 (litres per minute)

..... litres per minute

(c) The cardiac output for person A during exercise was 5.5 litres per minute.

Explain why the heart rate for person A needed to be higher than the heart rate for person B during exercise.

(3)

- person A had a lower stroke volume
- pumps less blood out per beat
- so needed to have a higher heart rate to get a similar cardiac output
- in order to exercise at the same intensity
- to supply oxygen/glucose to the muscles

(Total for Question 5 = 10 marks)

6 (a) Hyperthyroidism is caused by an overactive thyroid gland.

Figure 9 shows a person with a normal thyroid gland and a person with hyperthyroidism.

normal hyperthyroidism

Figure 9

(i) State **one** effect of hyperthyroidism on the thyroid gland.

(1)

causes the thyroid gland to enlarge

(ii) The thyroid gland is part of the

(1)

☒ **A** circulatory system

☒ **B** digestive system

☒ **C** endocrine system

☒ **D** urinary system

(b) Explain how negative feedback, involving the thyroid gland, controls metabolic rate.

(4)

- Low levels of thyroxine cause TRH to be produced
- (TRH is produced) in the hypothalamus
- this causes TSH to be released
- (TSH is released) from the pituitary

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*(c) Explain how hormones control the menstrual cycle.

(6)

- There are four hormones involved in the menstrual cycle oestrogen, progesterone, LH and FSH
- At the start of the cycle FSH causes the egg to develop in the follicle
- FSH is released from the pituitary gland
- As progesterone and oestrogen levels are low
- Oestrogen levels start to rise
- Oestrogen is released from the ovaries
- This causes the lining of the uterus to build up
- High levels cause a surge of LH
- Released from the pituitary gland
- Causing ovulation
- An egg is released from the ovary
- Progesterone is produced
- From the corpus luteum
- This caused the lining of the uterus to be maintained
- If an egg is fertilised oestrogen and progesterone levels remain high
- To maintain the lining of the uterus

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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