

Please write clearly in block capitals.

H

Centre number

Candidate
number

Surname

Forename(s)

Candidate signature

I declare this is my own work.

GCSE

BIOLOGY

Higher Tier Paper 2

Practice Paper Series – Set 1

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a ruler
- a scientific calculator.

Instructions

- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 100.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions 09.3 and 11.3 you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully developed
 - shows how the points that you make are related or follow on from each other where appropriate.

For Examiner's Use

Question	Mark
1	
2	
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6	
7	
8	
9	
10	
11	
TOTAL	

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sciencegcse.co.uk | Practice Paper Series – Set 1 | SGC/S1/SB/2H

0 1 Cod are fish that live in the North Sea.

Table 1 shows the mass of cod caught by fishing boats in the North Sea in different years.

Table 1

Year	Mass of cod caught in thousand tonnes
1970	300
1980	250
1990	130
2000	60
2010	35

0 1 . 1 Calculate the percentage decrease in the mass of cod caught between 1970 and 2010. [2 marks]

Percentage decrease = ... %

0 1 . 2 Fish stocks in the North Sea must be maintained at a level where breeding continues, or cod may disappear from the North Sea altogether. [2 marks]

Describe **two** ways in which fishing can be controlled to maintain fish stocks.

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Question 1 continues on the next page

0 1 . 3 The temperature of the North Sea has increased over the last 50 years. [2 marks]

Explain how this increase in temperature could affect the distribution of cod.

0 1 . 4 Mycoprotein is a protein-rich food that can be eaten instead of meat or fish. [3 marks]

Describe how mycoprotein is produced.

0 2 A student ran a race on a hot day.
During the race the student's body temperature rose from 37.0 °C to 38.4 °C.

0 2 . 1 Name the part of the brain that monitors and controls body temperature. [1 mark]

0 2 . 2 This part of the brain contains receptors sensitive to the temperature of the blood. [1 mark]

Give **one** other source of information about temperature that this part of the brain receives.

Question 2 continues on the next page

02.3

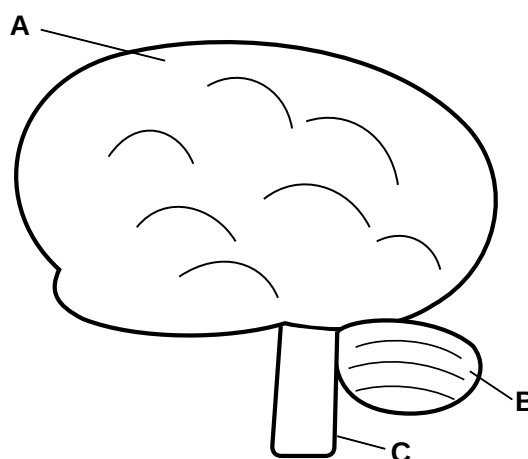
During the race the student sweated and the skin became red.

[3 marks]

Explain how these responses reduce body temperature.

Figure 1 shows the human brain.

Figure 1



02.4

Which letter in **Figure 1** labels the cerebellum?

[2 marks]

Give **one** function of the cerebellum.

Letter

Function

Question 2 continues on the next page

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0 2 . 5 Neuroscientists have mapped many regions of the brain to particular functions. [2 marks]

Describe **two** methods scientists use to find out which region of the brain controls a particular function.

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0 3 The kidneys produce urine.

Table 2 shows the concentrations of three substances in the blood plasma entering a kidney, in the fluid filtered into the kidney tubules, and in the urine.

Table 2

Substance	Concentration in blood plasma in g per 100 cm ³	Concentration in the filtered fluid in g per 100 cm ³	Concentration in urine in g per 100 cm ³
Glucose	0.10	0.10	0.00
Urea	0.03	0.03	2.00
Protein	8.00	0.00	0.00

0 3 . 1 Name the organ in which urea is produced. [1 mark]

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0 3 . 2 Describe how urea is produced in this organ. [2 marks]

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0 3 . 3 Explain why there is no protein in the filtered fluid. [1 mark]

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0 3 . 4 Explain why glucose is present in the filtered fluid but **not** in the urine. [2 marks]

0 3 . 5 After the race in **Question 2**, the student's blood had become too concentrated. [3 marks]

Explain how the body responds to return the concentration of the blood to normal.

0 3 . 6 People whose kidneys have failed can be treated by dialysis or by a kidney transplant. [1 mark]

Give **one** disadvantage of treating kidney failure by dialysis rather than by a kidney transplant.

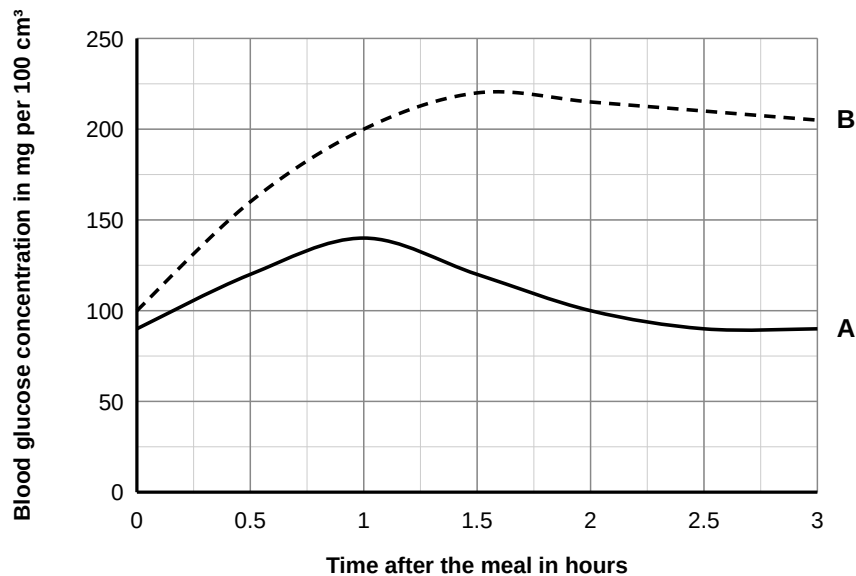
Turn over for the next question

0 4

Two people, **A** and **B**, ate the same meal. Person **B** has Type 1 diabetes.

Figure 2 shows how the blood glucose concentration of each person changed after the meal.

Figure 2



0 4 . 1

Describe **two** differences between the results for person **A** and person **B**. [2 marks]

Use data from **Figure 2**.

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0 4 . 2

Explain how the blood glucose concentration of person **A** was returned to the normal level. [3 marks]

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0 4 . 3

Later in the day person **A** exercised and the blood glucose concentration fell below the normal level.

[2 marks]

Explain how the body responds to a low blood glucose concentration.

0 4 . 4

Person A's blood glucose concentration rose from 90 to 140 mg per 100 cm³. Calculate the percentage increase.

[1 mark]

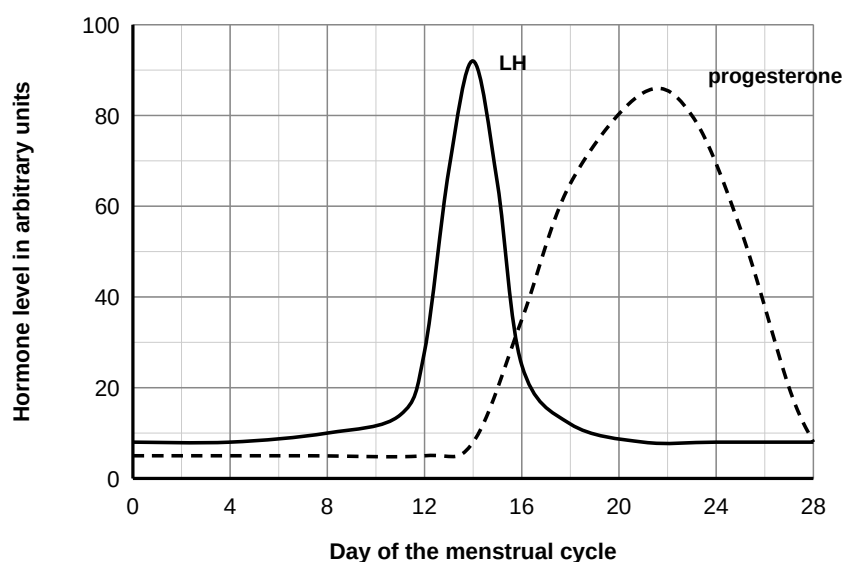
Percentage increase = _____ %

0 5

Several hormones control the menstrual cycle.

Figure 3 shows how the levels of two of these hormones change during one cycle.

Figure 3



0 5 . 1

An egg is released from an ovary on day 14 of the cycle.

[1 mark]

Which hormone stimulates the release of the egg?

Use **Figure 3**.

Do not write outside the box

0 5 . 2 Describe **two** roles of follicle stimulating hormone (FSH) in the menstrual cycle. [2 marks]

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2

0 5 . 3 Oestrogen and progesterone interact with FSH. [2 marks]
Describe how oestrogen **and** progesterone affect the release of FSH.

0 5 . 4 In vitro fertilisation (IVF) can be used to treat infertility. [3 marks]
Describe how IVF is carried out **and** give **one** disadvantage of IVF treatment.

Turn over for the next question

06

A student investigated the effect of light on the growth of newly germinated seedlings. This is the method used.

1. Put 10 seedlings on damp cotton wool in each of three Petri dishes, **A**, **B** and **C**.
2. Put dish **A** in a box with a hole in one side, so that light reached the seedlings from one side only.
3. Put dish **B** in a box with a hole in the top, so that light reached the seedlings from above.
4. Put dish **C** in a closed box, so that the seedlings received no light.
5. Measure each shoot's initial length, then its length and growth direction after 3 days.

Figure 4 shows dish **A** after 3 days.

Figure 4

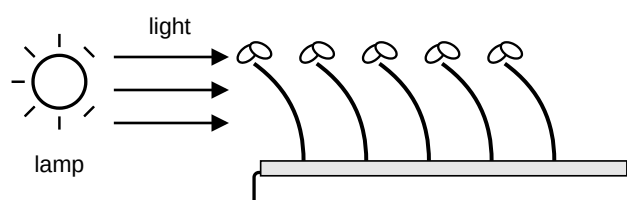


Table 3 shows the results.

Table 3

Dish	Light	Mean increase in shoot length over 3 days in mm	Direction of growth of the shoots
A	from one side	30	towards the light
B	from above	30	straight up
C	none	45	straight up

06.1

Give **one** variable the student should have kept the same for all three dishes. [1 mark]

06.2

The student used 10 seedlings in each dish. [1 mark]
Give **one** reason why.

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- 0 6 . 3** Calculate the mean rate of growth of the shoots in dish **A**. [1 mark]
Give your answer in mm per day.

Mean rate of growth = _____ mm per day

- 0 6 . 4** Explain why the shoots in dish **A** grew towards the light. [3 marks]

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- 0 6 . 5** The seedlings in dish **C** were taller than the seedlings in the other dishes. [2 marks]

The seedlings in dish **C** were also yellow instead of green.

Suggest **one** reason for **each** of these observations.

Taller

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.....

Yellow

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- 0 6 . 6** Plant hormones are also used in horticulture. [2 marks]

Give **one** use of gibberellins **and one** use of ethene.

Gibberellins

Ethene

Turn over for the next question

0 7 Rock pocket mice live in deserts. Some areas of the desert have pale sand and some areas have dark rock.

The mice are eaten by owls, which hunt by sight.

Table 4 shows the percentage of mice with dark fur in the two areas.

Table 4

Area	Percentage of mice with dark fur
Pale sand	7
Dark rock	86

0 7 . 1 Explain how natural selection has led to most of the mice living on the dark rock having dark fur. [4 marks]

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0 7 . 2 Fossils provide evidence for evolution. [2 marks]
Explain why scientists cannot be certain about how life on Earth began.

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Question 7 continues on the next page

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0 7 . 3 Carl Woese developed the three-domain system of classification. [2 marks]
Name the three domains.

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0 8 DNA is a polymer made from four different nucleotides.

0 8 . 1 Describe the structure of a nucleotide. [2 marks]

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0 8 . 2 Part of one strand of a DNA molecule has the base sequence: [1 mark]

A T G C C A

Write the base sequence of the complementary strand.

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0 8 . 3 How many bases code for one amino acid? [1 mark]

Tick (✓) **one** box.

One ☐

Two ☐

Three ☐

Four ☐

0 8 . 4 An enzyme is a protein. [3 marks]

Describe how an enzyme is made from the gene that codes for it.

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08.5 A mutation changes one base in the gene. [2 marks]

Explain how this mutation could stop the enzyme from working.

08.6 In the mid-19th century Gregor Mendel carried out breeding [1 mark]

experiments on plants. He concluded that characteristics are determined by 'units' that are passed on to offspring unchanged.

The importance of Mendel's work was not recognised until after his death.

Suggest **one** reason why.

09 Strawberry plants reproduce sexually, by producing seeds, and asexually, by growing runners that form new plants.

09.1 Give **two** advantages to the strawberry plant of reproducing asexually. [2 marks]

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09.2 Give **one** advantage to the strawberry plant of reproducing sexually. [1 mark]

Question 9 continues on the next page

A farmer has one cow that produces much more milk than the other cows in the herd.

The farmer wants to produce a clone of this cow by adult cell cloning.

Describe how adult cell cloning would be carried out **and** explain why the calf produced would be a clone of the cow.

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1 0

A student investigated milk fat breakdown using lipase as a model of decay.

This is the method used.

1. Put 5 cm³ of milk, 7 cm³ of sodium carbonate solution and 5 drops of phenolphthalein indicator into a test tube. The mixture is alkaline, so the indicator is pink.
2. Put the test tube and a test tube containing lipase solution into a water bath at 10 °C for 5 minutes.
3. Add 1 cm³ of the lipase solution to the milk and start a stopwatch.
4. Record the time taken for the pink colour to disappear.
5. Repeat at 20 °C, 30 °C, 40 °C and 50 °C.

Table 5 shows the results.

Table 5

Temperature in °C	Time for the pink colour to disappear in seconds
10	400
20	200
30	100
40	60
50	350

1 0 . 1

The pink colour disappears because the pH of the mixture falls.

[2 marks]

Explain why the pH falls in this lipase model.

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1 0 . 2

Calculate the rate of fat breakdown at 20 °C.

[2 marks]

Use the equation:

$$\text{rate} = \frac{1}{\text{time}}$$

Give your answer in standard form.

Rate = ... per second

1 0 . 3 Explain the results in **Table 5**.

[3 marks]

1 0 . 4 A gardener makes compost from garden waste.

[2 marks]

In dry weather the gardener adds water to the compost heap. The gardener also turns the compost heap over with a fork every week.

Explain why the gardener does these two things.

1 1 **Table 6** shows the biomass of the organisms in a food chain in a grassland.

Table 6

Organism	Trophic level	Biomass in kg
Grass	1	5000
Rabbits	2	550
Foxes	3	40

1 1 . 1 Calculate the percentage of the biomass in the rabbits that is transferred to the foxes.

[2 marks]

Give your answer to 2 significant figures.

Percentage transferred = ... %

Question 11 continues on the next page

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- **free-range** chickens live outdoors and can move around freely
- **intensively reared** chickens live indoors in heated sheds with limited space to move.

Table 7

	Free-range	Intensively reared
Time taken for a chicken to reach 2 kg in days	81	35
Mass of feed needed to produce 1 kg of chicken in kg	3.5	1.7
Space for each chicken in m ²	4.0	0.07
Cost of producing 1 kg of chicken in £	4.20	1.90

Use **Table 7** and your own knowledge.

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END OF QUESTIONS

Additional page, if required.

Write the question numbers in the left-hand margin.

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