

AQA style

GCSE Combined Science: Trilogy

Biology Paper 1 Higher Tier – Practice Paper

8464/B/1H · Higher Tier · Practice paper

Time allowed: 1 hour 15 minutes

Candidate name	
Centre number	
Candidate number	

Materials

- a ruler
- a scientific calculator
- You may use a 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 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 maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- This paper assesses Topics 1-4: Cell biology; Organisation; Infection and response; Bioenergetics.

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Answer all questions

Time allowed: 1 hour 15 minutes.

01 This question is about cells.

01.1 Which of these cells is a prokaryotic cell?

[1 mark]

Tick (✓) one box.

A	Root hair cell	
B	Escherichia coli cell	
C	Yeast cell	
D	Sperm cell	

01.2 Muscle cells contain many mitochondria.

Explain why.

[2 marks]

01.3 A scientist used an electron microscope to take a photograph of a mitochondrion.

The length of the mitochondrion in the photograph was 18 mm.

The real length of the mitochondrion was $1.5\text{ }\mu\text{m}$.

Calculate the magnification of the photograph.

[3 marks]

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01.4 Embryonic stem cells could be produced by therapeutic cloning.

Explain why stem cells produced by therapeutic cloning would not be rejected by the patient's body.

[2 marks]

01.5 A biologist models a flatworm as a cuboid measuring 4 cm × 2 cm × 1 cm.

Calculate the surface area to volume ratio of the model.

Give your answer in the form x : 1

[3 marks]

01.6 An elephant has a much smaller surface area to volume ratio than a flatworm.

Explain why the elephant needs a transport system but the flatworm does not.

[2 marks]

[Total: 13 marks]

02 A student investigated the effect of salt solution concentration on the mass of carrot tissue.

This is the method used.

1. Cut 15 discs of carrot of the same diameter and thickness.
2. Blot each disc dry and record its starting mass.
3. Place three discs, each in a separate test tube, into 15 cm³ of each concentration of salt solution.
4. After 30 minutes, remove each disc, blot it dry and record its final mass.
5. Calculate the percentage change in mass for each disc.

The table shows the results.

Concentration of salt solution in mol/dm ³	Trial 1 percentage (%) change in mass	Trial 2 percentage (%) change in mass	Trial 3 percentage (%) change in mass	Mean percentage (%) change in mass
0.0	+9.2	+8.8	+9.0	+9.0
0.2	+3.1	+2.7	+3.2	+3.0
0.4	−3.8	−4.4	−1.2	X
0.6	−8.5	−8.9	−8.7	−8.7
0.8	−11.6	−12.0	−11.8	−11.8

02.1 Which result in the table is anomalous?

[1 mark]

Tick (✓) one box.

A	Trial 2 at 0.0 mol/dm ³	
B	Trial 3 at 0.2 mol/dm ³	
C	Trial 3 at 0.4 mol/dm ³	
D	Trial 2 at 0.8 mol/dm ³	

02.2 Calculate value X in the table.

Do not include the anomalous result in your calculation.

[2 marks]

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02.3 Describe the pattern shown by the mean results in the table.

[2 marks]

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02.4 The carrot discs in 0.0 mol/dm³ salt solution (distilled water) increased in mass, but the carrot cells did not burst.

Explain why.

[3 marks]

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02.5 What is the dependent variable in this investigation?

[1 mark]

Tick (✓) one box.

A	Concentration of salt solution	
B	Percentage change in mass of the carrot discs	
C	Volume of salt solution	
D	Diameter of the carrot discs	

02.6 Give one reason why the student carried out three trials at each concentration.

[1 mark]

02.7 Name a piece of equipment the student could use to cut carrot discs with the same diameter.

[1 mark]

[Total: 11 marks]

03 A student investigated the effect of temperature on the rate of activity of amylase.

The student placed tubes of amylase solution and starch solution in water baths at different temperatures. After 5 minutes the student mixed the solutions. Every 15 seconds a drop of the mixture was tested with iodine solution, until the iodine solution stayed orange-brown.

The table shows the results.

Temperature in °C	Time taken for starch to be completely broken down in seconds
20	210
30	105
40	60
50	150
60	Starch still present after 600 seconds

03.1 The rate of reaction can be calculated using the equation:

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

Calculate the rate of reaction at 30 °C.

Give your answer in standard form to 2 significant figures.

[2 marks]

03.2 Explain why the rate of reaction increased between 20 °C and 40 °C.

[2 marks]

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03.3 The student concluded that the optimum temperature for amylase is 40 °C.

Suggest how the student could find the optimum temperature more precisely. **[1 mark]**

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03.4 The pancreas produces several digestive enzymes.

Which enzymes are produced by the pancreas? **[1 mark]**

Tick (✓) one box.

A	Amylase, protease and lipase	
B	Amylase only	
C	Bile and lipase	
D	Protease only	

03.5 Describe how the student could test a sample of fruit juice for sugars.

Give the result of a positive test. **[3 marks]**

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[Total: 9 marks]

04 This question is about transport systems in humans and plants.

04.1 Which blood vessel carries deoxygenated blood from the heart to the lungs? **[1 mark]**

Tick (✓) one box.

A	Aorta	
B	Pulmonary artery	
C	Pulmonary vein	
D	Vena cava	

04.2 A student used a potometer to measure water uptake by a leafy shoot.
An air bubble in the capillary tube moved 36 mm in 4 minutes.
The radius of the capillary tube was 0.5 mm.

The volume of water taken up can be calculated using the equation:

$$\text{volume} = \pi \times \text{radius}^2 \times \text{distance moved by the bubble}$$

Calculate the mean rate of water uptake in mm³ per minute.

Give your answer to 3 significant figures.

[3 marks]

04.3 The student placed an electric fan next to the leafy shoot.

Explain why the rate of water uptake increased.

[2 marks]

04.4 Faulty heart valves can be replaced with mechanical valves or biological valves.

The table shows information about the two types of valve.

Evaluate the use of mechanical valves and biological valves to replace a faulty heart valve.

Use information from the table and your own knowledge.

[6 marks]

Feature	Mechanical valve	Biological valve
What it is made from	Metal and carbon	Tissue from a pig or cow heart, chemically treated
How long it usually lasts	More than 25 years	10 to 15 years
Medication needed after	Anticoagulant (blood-thinning)	Usually none in the long term

B	By spores carried in the environment by wind or water	
C	By contaminated soil entering the roots	
D	By the bite of an infected mosquito	

05.2 Salmonella bacteria cause food poisoning.

Explain how bacteria such as Salmonella make a person feel ill.

[2 marks]

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05.3 Before a vaccination programme started in one country there were 30 000 cases of measles each year.

Ten years after the programme started there were 7200 cases of measles each year.

Calculate the percentage decrease in measles cases.

[2 marks]

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05.4 Some people in the country were not vaccinated against measles, but most of them still did not catch measles.

Explain why.

[2 marks]

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05.5 Which drug was first extracted from foxgloves?

[1 mark]

Tick (✓) one box.

A	Aspirin	
B	Digitalis	
C	Penicillin	
D	Morphine	

05.6 Describe how the trachea and bronchi help to defend the body against pathogens.

[2 marks]

05.7 HIV is a virus.

Explain why a person with untreated HIV may develop serious infections from other pathogens.

[2 marks]

[Total: 12 marks]

06 A student investigated the effect of carbon dioxide concentration on the rate of photosynthesis in pondweed.

The student placed the pondweed in solutions with different concentrations of sodium hydrogencarbonate. Sodium hydrogencarbonate releases carbon dioxide into the water. The lamp was kept 15 cm from the pondweed. The student collected the oxygen released in a gas syringe for 5 minutes at each concentration.

The table shows the results.

Concentration of sodium hydrogencarbonate in %	Volume of oxygen collected in 5 minutes in cm ³
0.0	0.2
0.2	0.9
0.4	1.6
0.6	1.9
0.8	2.0
1.0	2.0
1.2	2.0

06.1 Calculate the rate of photosynthesis at a concentration of 0.8% sodium hydrogencarbonate.

Give your answer in cm³ of oxygen per hour.

[2 marks]

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06.2 Explain why the rate of photosynthesis did not increase when the concentration of sodium hydrogencarbonate was increased above 0.8%.

[2 marks]

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06.3 Before each measurement the student left the pondweed in the new solution for 5 minutes.

Suggest why.

[1 mark]

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06.4 A tomato grower burns fuel in a greenhouse to increase the concentration of carbon dioxide.

Without the extra carbon dioxide, the yield is 180 kg of tomatoes per week.

With the extra carbon dioxide, the yield is 216 kg of tomatoes per week.

The tomatoes sell for £1.20 per kg.

The fuel costs £30.00 per week.

Calculate the extra profit the grower makes each week by adding carbon dioxide.

[2 marks]

06.5 Explain how a plant uses the glucose produced in photosynthesis.

In your answer you should explain why plants also need to absorb nitrate ions from the soil.

[6 marks]

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[Total: 13 marks]

END OF QUESTIONS