

Mark Scheme

Predicted Practice Paper — Summer 2027

GCSE Biology 8461/2H

Higher Tier Paper 2

This is an original mark scheme written for a predicted practice paper. It is NOT an official AQA mark scheme and is NOT endorsed by or affiliated with AQA. All questions are original.

For use with the Predicted Practice Paper 2 question paper.

General marking guidance

These notes offer general guidance, but the specific notes for examiners appertaining to individual questions take precedence.

1 Points-based marking.

Award one mark for each marking point listed in the 'Mark scheme points' column. A marking point is awarded only when the candidate's response matches the point or an acceptable alternative given in 'Additional guidance'.

2 Marking of lists — right + wrong = wrong.

Where a question asks for a set number of responses but the candidate gives extra responses, each error or contradiction negates each correct response. If the number of errors equals or exceeds the marks available, no marks are awarded. Responses considered neutral are not penalised.

3 Accept / allow.

'Accept' gives wording that must be present for the mark. 'Allow' indicates creditworthy alternative answers. Alternative words are shown with a solidus, e.g. allow smooth / free movement.

4 Ignore.

'Ignore' is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could still gain the marking point.

5 Do not accept.

'Do not accept' marks a wrong answer which means the mark is not awarded, even if the correct answer is given as well.

6 Brackets.

Words in brackets (like this) are not essential for the mark but help identify the sense of the answer required.

7 Emboldened 'and'.

A bold and in a marking point means both parts of the answer are required to award the mark.

8 Use of symbols / formulae.

A correct chemical symbol or formula may be credited instead of a required name, where appropriate in context.

9 Spelling (phonetic).

Award marks if the spelling is not correct but the intention is clear, unless there is possible confusion with another technical term (e.g. 'cloroplast' for chloroplast is allowed).

10 Interpretation of 'it'.

Answers using the word 'it' are credited only if it is clear that 'it' refers to the correct subject.

11 Marking procedure for calculations.

Award marks for each stage of the calculation completed correctly. A correct numerical answer with no working shown earns full marks. Full marks are not awarded for a correct

final answer from incorrect working.

12 Errors carried forward (ecf).

An error can be carried forward within a question part: an incorrect value in one step of a calculation does not prevent subsequent marks being awarded for correct working from that value. Shown by 'ecf'.

13 Units and significant figures.

Units are required only where the mark scheme states them. Do not penalise a different number of significant figures unless the question asks for a specific precision.

14 Levels of response.

Extended questions are marked on levels of response: read the whole answer, start at the lowest level and use it as a ladder to decide whether the answer meets each descriptor, then award a mark within the band. Indicative content is not exhaustive — credit any valid, relevant point at the appropriate level.

15 Examiners' judgement.

The specific notes for individual questions take precedence over these general notes. Where doubt remains, credit a response only if the science is correct.

Guidance on the use of abbreviations within this mark scheme

accept	wording that must be present for the mark to be awarded
allow	creditworthy alternative answers (solidus shows alternatives)
ignore	information is irrelevant or not enough for the marking point
do not accept	wrong answer: the mark is lost even if the correct answer is also given
ecf	error carried forward from an earlier wrong value
ora	or reverse argument — the converse statement is acceptable
max	maximum mark available (e.g. max 2 if more points are listed)

Question	Answer/marks	Mark scheme points	Additional guidance
1(a)	offspring differ genetically in sexual reproduction; are identical in asexual reproduction (1 mark)	sexual reproduction produces offspring that are genetically different / show variation (1)	allow 'two parents are needed for sexual reproduction and one parent for asexual reproduction'; allow 'no gametes are involved in asexual reproduction'
(b)	meiosis (1 mark)	meiosis (1)	do not accept mitosis
(c)	chromosome number is halved; four haploid cells formed (2 marks)	- the number of chromosomes is halved (1) - four haploid cells are produced (1)	allow 'the cells go from diploid to haploid'
(d)	all the DNA / genetic material of an organism (2 marks)	- all the genetic material / DNA of an organism (1) - including all of its genes (1)	allow 'the complete set of genetic material in a cell'
(e)	asexual reproduction gives identical offspring so the desired characteristic is kept (3 marks)	- asexual reproduction produces genetically identical offspring / clones (1) - so all of the plants will produce large, sweet strawberries (1) - sexual reproduction would produce variation, so some plants would not have the desired characteristics (1)	allow ecf from an incorrect statement in (a) about variation

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Question	Answer/marks	Mark scheme points	Additional guidance
2(a)	any one abiotic factor, e.g. light intensity (1 mark)	any one: light intensity; temperature; pH of the soil; mineral / ion content of the soil; wind speed (1)	do not accept water / moisture; do not accept biotic factors
(b)	to identify anomalies and calculate a mean (2 marks)	- to identify any anomalous results (1) - to calculate a mean (1)	allow 'to improve reliability' for 1 mark
(c)	24 daisies per quadrat (2 marks)	$(24 + 27 + 21) \div 3$ (1) $= 24$ (1)	award 1 mark for the correct method with a wrong final answer
(d)	positive correlation; more water available for growth (3 marks)	- as soil moisture increases, the mean number of daisies increases / there is a positive correlation (1) - e.g. at 8% moisture there are 4 daisies per quadrat and at 29% moisture there are 24 (1) - more water is available for growth / photosynthesis, so more daisies survive and grow (1)	allow ecf on the trend they describe from Figure 1
(e)	control other factors, e.g. check light intensity is similar at each position (2 marks)	- any one improvement, e.g. measure light intensity at each position to check it is similar (1) - so that soil moisture is the only factor varying / other factors do not affect the results (1)	accept any valid improvement with a linked reason, e.g. use more positions along the transect (1) to give more data for the trend (1)

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Question	Answer/marks	Mark scheme points	Additional guidance
3(b)	shoots bend towards the light; auxin causes unequal cell elongation (3 marks)	• the shoots bend towards the light / show positive phototropism (1) • auxin made in the shoot tip moves to the shaded side of the shoot (1) • auxin causes more cell elongation on the shaded side, so the shoot bends towards the light (1)	allow 'auxin is redistributed to the dark side'
(c)	synthetic auxin disrupts growth of broad-leaved weeds; grass is unaffected (3 marks)	• the synthetic hormone disrupts the normal growth of the broad-leaved weeds (1) • causing rapid, uncontrolled growth which kills the weeds (1) • the grass is not affected because it responds differently to / breaks down the hormone (1)	allow 'selective weedkillers only affect broad-leaved plants' for the third marking point

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Question	Answer/marks	Mark scheme points	Additional guidance
4(a)	receptor → sensory neurone → relay neurone → motor neurone → effector (2 marks)	• receptor → sensory neurone → relay neurone → motor neurone → effector (2)	award 1 mark if three or four stages are in the correct order
(b)	0.25 s (2 marks)	• $(0.24 + 0.27 + 0.23 + 0.25) \div 4 = 0.2475$ (1) • = 0.25 (s) to 2 significant figures (1)	the anomalous result 0.45 must be excluded; award 1 mark for a correct mean of 0.292 including the anomaly with working shown; do not accept 0.24
(c)	to identify anomalies and calculate a reliable mean (2 marks)	• to identify anomalous results (1) • to calculate a reliable mean (1)	allow 'to improve reliability' for 1 mark
(d)	two improvements each with a reason, e.g. larger sample and control of other variables (4 marks)	• e.g. repeat the investigation with more students / a larger sample (1) • so the results are more representative (1) • e.g. control other variables such as the time of day, the volume or concentration of the drink, or how tired the students are (1) • so that caffeine is the only variable affecting reaction time (1)	accept any two valid improvements, each with a linked reason; e.g. blind testing (1) to remove bias / placebo effect (1); max 2 marks per improvement

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Question	Answer/marks	Mark scheme points	Additional guidance
5(a)	insulin; pancreas (2 marks)	• insulin (1) • pancreas (1)	allow phonetic spelling of 'insulin'
(b)	pancreas releases insulin; glucose taken up / stored as glycogen; negative feedback (3 marks)	• the pancreas releases insulin (1) • insulin causes glucose to be taken up by liver and muscle cells / converted to glycogen (1) • blood glucose concentration falls back to the normal level (negative feedback) (1)	allow 'stored as glycogen in the liver and muscles'
(c)	8.3 mmol/dm ³ (2 marks)	• 14.5 – 6.2 (1) • = 8.3 (mmol/dm³) (1)	award 1 mark for the correct method using their readings from Figure 1 (ecf)
(d)	pancreas releases glucagon; glycogen converted to glucose in the liver (2 marks)	• the pancreas releases glucagon (1) • glucagon causes glycogen to be converted to glucose in the liver (1)	do not accept 'insulin' for the hormone
(e)	FSH matures eggs; IVF fertilises outside the body and the embryo is inserted into the uterus (3 marks)	• FSH stimulates an egg / eggs to mature in the ovary (1) • in IVF, eggs are collected from the ovary and fertilised by sperm outside the body (1) • the embryo is inserted into the uterus / womb (1)	allow 'fallopian tube' for where fertilisation would naturally occur — not required here

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Question	Answer/marks	Mark scheme points	Additional guidance
6(a)	Pp, Pp, pp, pp (2 marks)	all four genotypes correct: Pp, Pp, pp, pp (2)	award 1 mark for two or three correct genotypes
(b)	50 % (2 marks)	2 in 4 / 1 in 2 of the possible children have polydactyly (1) = 50 (%) (1)	allow ecf from their Punnett square in (a)
(c)	each fertilisation is random and independent (2 marks)	- each fertilisation is a random / independent event (1) - the outcome of one pregnancy does not affect the next (1)	allow 'the gametes combine at random'
(d)	Pp; if X were PP all children would have polydactyly (2 marks)	- genotype Pp / heterozygous (1) - if X were PP, all of the children would inherit a P allele and have polydactyly; since none do, X must be heterozygous (1)	the explanation must refer to the children not having polydactyly
(e)	carriers are Cc; Punnett square gives CC, Cc, Cc, cc; 1 in 4 is cc (3 marks)	- both parents are carriers, genotype Cc (1) - a Punnett square of Cc × Cc gives the genotypes CC, Cc, Cc, cc (1) 1 in 4 of the offspring is cc and will have cystic fibrosis (1)	the drawn Punnett square must show the four genotypes for the second marking point

Paper: 8461/2H			
Question	Answer/marks	Mark scheme points	Additional guidance
7(b)	e.g. hand washing; kills bacteria so they are not transferred (2 marks)	- any one measure, e.g. washing hands / using alcohol gel, isolating infected patients, screening patients for MRSA (1) - kills / removes the bacteria so they are not transferred to other patients (1)	the explanation must link the measure to reduced transfer between patients
(c)	buried in sediment; hard parts preserved / replaced by minerals (2 marks)	- the animal is buried in sediment / mud (1) - the soft parts decay and the hard parts / bones are preserved / replaced by minerals over a long time (1)	allow 'parts of the organism that do not decay'
(d)	any two reasons for extinction (2 marks)	any two: a new predator; a new disease; destruction of habitat; climate / environmental change; increased competition (2 × 1)	do not accept the same reason twice

Paper: 8461/2H			
Question	Answer/marks	Mark scheme points	Additional guidance
8(b)	8 % (2 marks)	• $720 \div 9000 \times 100$ (1) • = 8 (%) (1)	award 1 mark for the correct method with a wrong final answer
(c)	biomass / energy lost, e.g. in respiration and movement (2 marks)	• any two: energy is lost through respiration; through movement; in urine / excretion; in faeces / egestion; not all of the organism is eaten (2 × 1)	allow 'lost as heat' for respiration
(d)	burning releases CO ₂ ; fewer trees remove less CO ₂ by photosynthesis (2 marks)	• burning releases carbon dioxide (1) • fewer trees means less carbon dioxide is removed by photosynthesis (1)	allow 'more greenhouse gases enhance the greenhouse effect' for 1 mark

Paper: 8461/2H			
Question	Answer/marks	Mark scheme points	Additional guidance
9(a)	mouse injected with antigen; lymphocytes fused with tumour cells; clones produce identical antibodies (2 marks)	• any two: a mouse is injected with the antigen (1); lymphocytes producing the specific antibody are fused with tumour cells to form hybridomas (1); the hybridomas divide to form clones that produce large amounts of identical antibody (1)	max 2 marks
(b)	antibodies bind specifically to insulin; labelled antibodies detected (2 marks)	• the monoclonal antibodies bind specifically to insulin molecules (1) • the antibodies are labelled, so the amount detected shows the level of insulin (1)	allow 'attach to insulin'
(c)	insulin causes glucose uptake / storage as glycogen; blood glucose falls to normal (2 marks)	• insulin causes glucose to be taken up by cells / converted to glycogen in the liver and muscles (1) • blood glucose concentration decreases to the normal level (1)	

Levels-of-response mark scheme

Extended 6-mark questions are marked with levels of response. Read the whole answer, choose the level that best describes it overall, then award a mark within that band. Indicative content lists points that may appear — it is not exhaustive.

Question 3(a) (6 marks)

Describe how the student could investigate the effect of light on the growth of newly germinated seedlings. You should include details of the different light conditions, the measurements taken and the variables to control.

Level	Marks	Descriptor
Level 3	5–6	A detailed, logically sequenced method covering at least two different light conditions (including a dark control), how growth will be measured, and the variables to control.
Level 2	3–4	A method covering two light conditions with some detail of the measurements or the variables to control, but not fully sequenced.
Level 1	1–2	Simple statements about light conditions or measurements, with little detail.
No relevant content	0 marks	

Indicative content:

- germinate cress seeds, e.g. on damp cotton wool, and select seedlings of a similar size
- group 1: light from one side only (e.g. a lamp to one side); group 2: kept in the dark as a control
- keep the temperature and watering the same for all groups
- after a fixed time (e.g. 4 days), measure the angle the shoot has bent using a protractor, or measure the shoot length
- repeat with several seedlings and calculate a mean

Question 7(a) (6 marks)

Explain how a population of bacteria can become resistant to an antibiotic.

Level	Marks	Descriptor
Level 3	5-6	A detailed explanation logically linking variation, selection and inheritance: a mutation produces resistant bacteria; the antibiotic kills bacteria without resistance; resistant bacteria survive, reproduce and pass on the resistance allele, so the proportion of resistant bacteria increases over generations.
Level 2	3-4	Some relevant points with partial linking, e.g. resistant bacteria survive and reproduce, but the role of mutation or inheritance is not fully linked.
Level 1	1-2	Simple statements, e.g. that bacteria become immune to the antibiotic, with little explanation.
No relevant content	0 marks	

For Level 3, the answer must link variation (mutation), selection by the antibiotic and inheritance of the resistance allele.

Indicative content:

- a mutation produces variation: a few bacteria have an allele for antibiotic resistance
- the antibiotic kills bacteria without the resistance allele
- the resistant bacteria survive and reproduce
- they pass the resistance allele on to their offspring
- over generations, the proportion of resistant bacteria in the population increases

Question 8(a) (6 marks)

Evaluate the effects of clearing the rainforest to grow crops on biodiversity.

Level	Marks	Descriptor
Level 3	5-6	A judgement on the overall effect on biodiversity, supported by a range of logically linked reasons covering both the negative effects on biodiversity and the reasons for clearing the forest.
Level 2	3-4	Some logically linked reasons covering negative effects and/or benefits, but the judgement is simple or incomplete.
Level 1	1-2	Simple statements about the effects of deforestation, with little linking.
No relevant content	0 marks	

For Level 3, the answer must include a judgement and consider both the negative effects on biodiversity and the reasons for clearing.

Indicative content:

- habitats are destroyed, so fewer species can survive there
- animals that depended on the trees for food or shelter die or move away
- food chains / webs are disrupted
- species may become extinct, so biodiversity decreases
- however, the land can be used to grow crops to feed people and provide income
- judgement: e.g. clearing reduces biodiversity overall, and the short-term economic benefit is outweighed by the long-term loss of species — accept any justified judgement

Question 9(d) (6 marks)

Evaluate the use of this monoclonal antibody treatment for type 1 diabetes. In your answer, compare it with the current treatment of daily insulin injections.

Level	Marks	Descriptor
Level 3	5-6	A judgement comparing the two treatments, supported by a range of logically linked reasons covering both advantages and disadvantages of the monoclonal antibody treatment.
Level 2	3-4	Some logically linked reasons for and/or against the treatment, but the judgement is simple or incomplete.
Level 1	1-2	Simple statements about the treatment or insulin injections, with little linking.
No relevant content	0 marks	

For Level 3, the answer must include a judgement and cover both advantages and disadvantages of the monoclonal antibody treatment.

Indicative content:

- the treatment could stop the destruction of insulin-producing cells, preserving the body's own insulin production
- this could reduce or remove the need for daily insulin injections
- better control of blood glucose could reduce long-term complications of diabetes
- however, suppressing immune cells increases the risk of infections
- long-term side effects are unknown and the treatment is likely to be expensive
- it can only help while some insulin-producing cells remain; it cannot reverse damage already done
- judgement: e.g. promising for newly diagnosed patients, but daily injections remain the practical treatment for most people — accept any justified judgement

Worked answers — calculation questions

Full worked solutions for every calculation question. Method marks are shown at each step; ecf applies as described in the general guidance.

Question 2(c) — Mean number of daisies

add the three counts: $24 + 27 + 21 = 72$ (method mark)

divide by 3: $72 \div 3$ (method mark)

Answer: 24 daisies per quadrat

Question 4(b) — Mean reaction time to 2 significant figures

exclude the anomalous result 0.45 s

add the remaining results: $0.24 + 0.27 + 0.23 + 0.25 = 0.99$ s (method mark)

divide by 4: $0.99 \div 4 = 0.2475$ s (method mark)

round to 2 significant figures: $0.2475 \rightarrow 0.25$

Answer: 0.25 s

Question 5(c) — Difference in blood glucose concentration at 60 minutes

read from Figure 1: person B = 14.5 mmol/dm^3 , person A = 6.2 mmol/dm^3
(method mark)

subtract: $14.5 - 6.2$ (method mark)

Answer: 8.3 mmol/dm^3

Question 6(b) — Probability of polydactyly

from the Punnett square, 2 of the 4 possible genotypes are Pp (method mark)

probability = $2 \div 4 = 1 \div 2$ (method mark)

as a percentage: 0.5×100

Answer: 50 %

Question 8(b) — Percentage efficiency of biomass transfer

efficiency = (biomass of primary consumers $\div$ biomass of producers) $\times 100$
(method mark)

= $720 \div 9000 \times 100$ (method mark)

Answer: 8 %