AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.2.1

Levels of organisation

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**21**
Available paper years	**2007–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.7.2.1 Levels of organisation

Answer 01 · Mark scheme January 2007 | BLY1H | Original Q1 | Legacy

Question 1

	answers	extra information	mark
(a)(i)	20		1
(ii)	12000		1
(b)	area of strips **or** length / width / size of transect **or** number of transects		1
(c)(i)	since squirrels mobile **or** squirrels could be counted twice **or** squirrels hide		1
(ii)	any **two** from: • numbers of larders observed likely to be lower than actual • since unlikely that all could be spotted if 5 m away • old larder • squirrels moved on / died • young squirrels • haven't made a larder	do **not** accept squirrels share larders or squirrels have more than one larder	2

Continued on next page

4.7.2.1 Levels of organisation

Answer 01 · Mark scheme

	answers	extra information	mark
(d)(i)	0 to 6.8 / 6.8 to 0		1
(ii)	any **one** from: • squirrels prefer blue spruce cones / seeds / nuts as food • <u>more</u> cones / food • <u>more</u> nesting sites • <u>fewer</u> predators / competitors	do **not** accept squirrels prefer blue spruce	1
total			8

4.7.2.1 Levels of organisation

Answer 02 · Mark scheme June 2007 | BLY1B | Original Q9 | Legacy

Nine	**3**	**1**	**4**	**1**

* This question is removed

Answer 03 · Mark scheme November 2009 | BLY1BP | Original Q4 | Legacy

Four	**2**	**2**	**2**	**1**

4.7.2.1 Levels of organisation

Answer 04 · Mark scheme

Question 3

question	answers	extra information	mark
3(a)	any **one** from eg: • shorter distance between samples • sample to greater height • specify the size of each site	ignore repeat investigation / measurements ignore longer transect	1
3(b)(i)	Parmelia		1
3(b)(ii)	Evernia		1
3(c)	any **two** from: • Lecanora does not extend over whole range of transect / does not grow everywhere /does not grow in town centre / does not grow in countryside • Lecanora grows in a range of sulfur dioxide concentrations ***or*** Lecanora only grows in limited range of sulfur dioxide concentrations **or** Lecanora lives over large range of sulfur dioxide concentrations • other factors eg different pollutant might also influence growth of Lecanora • sulfur dioxide / pollutant concentration was not measured • amount of Lecanora not measured	ignore Lecanora does not give accurate measure of sulfur dioxide concentration	2
Total			**5**

4.7.2.1 Levels of organisation

Answer 04 · Mark scheme January 2010 | BLY1H | Original Q3 | Legacy

BLY1H

4.7.2.1 Levels of organisation

Answer 05 · Mark scheme

January 2011 | BLY2H | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)(i)	6000	award **2** marks for correct answer irrespective of working allow **1** mark for 20 x 300 with incorrect or no answer allow answer in table if answer line blank	2
2(a)(ii)	bar width 6000 **or** to match answer to (a)(i) drawn below slugs	anywhere on scale ignore depth / height of bar label **not** required	1 1
2(b)	any **three** from: • respiration (by hedgehog) • (results in) loss of CO_2 • faeces (of hedgehog) **or** not digested • excreted / urine / urea (by hedgehog) • not all slug(s) are eaten (by hedgehogs) **or** some slugs eaten by other things	ignore reference to size / mass / number of organisms assume reference is to / of hedgehog unless stated otherwise do **not** accept idea that respiration uses / produces energy accept waste for **1** mark if neither faeces nor excretion point made ignore sweat alone ignore some slugs die ignore reference to movement / heat / growth allow references to energy losses by these methods, rather than biomass losses	3
Total			**7**

4.7.2.1 Levels of organisation

Answer 05 · Mark scheme January 2011 | BLY2H | Original Q2 | Legacy

BLY2H

4.7.2.1 Levels of organisation

Answer 06 · Mark scheme

June 2011 | BLY1H | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)	alters chemical reaction in the body **or** changes brain / body functioning **or** brain / body does not function correctly without drug	ignore references to dependence	1
	withdrawal symptoms	allow crave / craving	1
5(b)(i)	(rises to a) maximum at 25–29 / 30–34 / 25–34		1
	(falls to) minimum at 55–59		1
		if neither mark gained allow **1** mark for indicating high usage anywhere in the 20–44 range	
5(b)(ii)	any **two** from reference to eg: • (peer) pressure / fashionable • experiment / try new things • ease of obtaining drugs	ignore references to maturity / disposable income / stress	2
5(b)(iii)	some people will be dishonest / afraid to admit use	ignore sample not accurate	1
	(because) class A drugs illegal **or** because they will get into trouble		1
Total			**8**

4.7.2.1 Levels of organisation

Answer 06 · Mark scheme

June 2011 | BLY1H | Original Q5 | Legacy

BLY1H

4.7.2.1 Levels of organisation

Answer 07 · Mark scheme

January 2012 | BL1HP | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	triangular pyramid with 3 layers	may be as blocks or as triangle ignore food chains and arrows	1
	layers appropriately labelled: bean / plant aphid, ladybird	labelled in food chain order must **not** contradict correct pyramid allow correctly labelled inverted pyramid for **2** marks	1
3(a)(ii)	any **two** from: (for aphid / ladybird) • not all digested / faeces • loss in urine • loss of CO_2 • not all eaten	ignore energy ignore loss of CO_2 from bean plant if none of first 3 points given then allow waste (materials) / excretion for **1** mark	2
3(b)	microorganisms / microbes / bacteria / fungi / decomposers / detritivores / named	do **not** accept germs allow mould ignore aphids	1
	decay / breakdown / digest / decompose / rot (bean plant)	ignore eat	1
	respiration (of microorganisms etc / aphids)	allow burning / combustion	1
	carbon dioxide released (from respiration of microorganisms etc / aphids)	allow carbon dioxide released / produced (from burning / combustion) ignore other parts of the carbon cycle ignore formation of fossil fuels	1
Total			**8**

4.7.2.1 Levels of organisation

Answer 07 · Mark scheme January 2012 | BL1HP | Original Q3 | Legacy

COMPONENT NUMBER: BL1HP

4.7.2.1 Levels of organisation

Answer 08 · Mark scheme

June 2012 | BL2HP | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	(white) clover		1
3(a)(ii)	reed sweet-grass	allow reed allow grass	1
3(a)(iii)	(only) found in swamp and aquatic zones **or** only found in water **or** doesn't grow in marsh	ignore wet conditions	1

3(b) — 6

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 2, and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant content.	There is a basic description which describes how a quadrat **or** a metre tape could be used to collect data	There is a clear description of how a quadrat **and** a metre tape could be used to collect data along a line	There is a clear, logical and detailed description of a method that will produce valid, repeatable results across / at intervals along the stream.

examples of procedural points made in the response:

- use of tape measure to produce transect
- placing of quadrats
- transect placed across stream
- score presence of each plant species
- use quadrat at regular intervals along tape
- repeat transect several times (≥ 3)
- along stream
- at random **or** regular intervals

Total			9

4.7.2.1 Levels of organisation

Answer 08 · Mark scheme

June 2012 | BL2HP | Original Q3 | Legacy

BL2HP

4.7.2.1 Levels of organisation

Answer 09 · Mark scheme

January 2013 | BL2HP | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)	use of quadrat / point frame randomly placed / random sampling	allow description ignore reference to transects	1 1
5(b)(i)	6		1
5(b)(ii)	more light in A / in field / where sunny more / better / faster photosynthesis in A / with more light	ignore sun allow converse	1 1
5(b)(iii)	use light meter / measure light intensity in both habitats take many measurements at same time of the day **or** laboratory / field investigation with 2 batches high light and low light (1) count or number of flowers in each (1)	 counting point is dependent on investigation point	1 1
5(c)	more glucose / energy available for growth	allow other named product eg protein allow if more energy produced dependent on 1st mark	1 1
Total			**9**

4.7.2.1 Levels of organisation

Answer 09 · Mark scheme

January 2013 | BL2HP | Original Q5 | Legacy

BL2HP

4.7.2.1 Levels of organisation

Answer 10 · Mark scheme

June 2013 | BL2HP | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	chose places randomly method of obtaining randomness, e.g. (grid and) random numbers	 allow thrown qualified e.g. over shoulder, eyes shut allow max 1 for mention of a transect with sampling at regular or random intervals	1 1
2(b)(i)	7 **or** 8	allow fractions / decimals between 7 and 8	1
2(b)(ii)	count number of whole squares and add estimate of area covered by part squares	allow reference to counting squares with ½ cover or more allow clear working on diagram and / or (b)(i)	1
2(b)(iii)	28 – 32 (in range)	allow ecf if answer incorrect allow **1** mark for reasonable reference to divided by 25 or multiplied by 4	2
2(c)	nutrients / minerals / ions / fertiliser / water	allow light / pH / trampling / soil texture / grazing / mowing / weed killer / where seeds originally fell ignore pollution / soil / competition if unqualified ignore temperature / wind	1
Total			**7**

4.7.2.1 Levels of organisation

Answer 11 · Mark scheme

Question	Answers	Extra information	Mark	AO / spec ref.
1(a)	3-layered triangular pyramid	as blocks or layered triangle, ignore (small) gaps between layers	1	AO2 1.5.1b
	(pyramid) labelled in food chain order	all three labels are required for **2** marks the pyramid must be fully correct	1	
1(b)(i)	C		1	AO3 1.5.1c
1(b)(ii)	shortest **or** fewest stages / transfers / (trophic) levels	allow only if (b)(i) is C or blank	1	AO1 / AO2 1.5.1c
	less losses in waste / faeces / urine / CO_2 / excretion	allow smaller amount uneaten	1	
	less loss in respiration / heat / movement	allow less lost keeping warm do **not** allow energy for respiration do **not** allow respiration makes energy	1	
		allow less loss (of biomass / energy) **or** less transfer (of biomass / energy) to surroundings if neither 2nd nor 3rd point given, for **1** mark		
Total			**6**	

4.7.2.1 Levels of organisation

Answer 11 · Mark scheme

June 2014 | BL1HP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.
2	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.		6	AO1 1.4.1d,f

0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant content.	At least **one** way in which animals **and / or** plants are adapted to survive.	A description of ways in which animals **and / or** plants are adapted **and** an attempt to link at least **one** adaptation to how it increases the chance of survival.	A description of ways in which animals **and** plants are adapted **and** a description of how at least **one** adaptation increases the chance of survival.

examples of biology points made in the response:

(animals)
- (A) change / decrease in surface area / example
  - (decrease in surface area which) reduces area from which sweat / water may be lost
- (A) hump with fat / fat stores
  - (fat in hump) to convert to water (via respiration)
- (A) long eyelashes
  - (long eyelashes) to keep (wind-blown) dust out of eyes
- (A) nocturnal / 'keep out of the sun'
  - reduce sweat loss (in heat of the day)

(plants)
- (A) decrease in surface area
- (A) leaves are spikes
  - (reduced area / leaves are spikes) reduces water loss / transpiration / evaporation
- (A) long / wide spread / extensive roots
  - (long / wide spread /extensive roots) to absorb (more) water
- (A) fleshy / thick stem
  - (fleshy / thick stem) to store water

extra information

allow adaptations of specific animals to living in specified dry conditions, eg a desert
- (A) change / increase in surface area / example
  - (increase in surface area which) increases area heat may be lost from (by radiation)
- (A) changes to thickness of insulating coat
  - (thicker coat on upper surface) increases insulation from sun's heat
- (A) thin (layer) / reduced amount of body fat
  - (reduced amount of body fat which) reduces insulating layer
- (A) wide feet
  - (wide feet) to reduce pressure / spread weight / prevent sinking

allow adaptations of specific plants to living in specified dry conditions, eg a desert
- (A) thick wax
  - (thick wax) to reduce evaporation / water loss / transpiration
- (A) few(er) stomata
  - (few stomata) to reduce evaporation / water loss / transpiration

Total			6	

4.7.2.1 Levels of organisation

Answer 11 · Mark scheme

June 2014 | BL1HP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.

4.7.2.1 Levels of organisation

Answer 12 · Mark scheme

June 2014 | BL2HP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.
5(a)(i)	to get data re position of seaweed / of organism in relation to distance from sea / distance down shore / how long each seaweed was exposed		1 1	AO2 2.4.1b
5(a)(ii)	repeat several times elsewhere along the shore	minimum = 2 repeats	1 1	AO3 2.4
5(a)(iii)	bladder wrack is further up the shore (than the sea lettuce) / exposed for longer sea lettuce (only) in rock pools / in the sea / (only) in water	ignore found in dry areas / on bare rock	1 1	AO3 2.4.1a,b
5(b)	gets more light / closer to light (so) more photosynthesis	allow better access to CO_2 allow 1 mark for light for photosynthesis allow 1 mark for CO_2 for photosynthesis ignore reference to oxygen for respiration 'more' only needed once for 2 marks	1 1	AO1 / AO2 2.4.1a, 2.3.1c
Total			8	

4.7.2.1 Levels of organisation

Answer 12 · Mark scheme

June 2014 | BL2HP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.

4.7.2.1 Levels of organisation

Answer 13 · Mark scheme June 2016 | BL1HP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)(i)	any **two** from: • not all eaten • used for respiration • lost as CO_2 / water / urea • lost as faeces **or** not all digested	allow eaten by other animals ignore used / lost in heat / movement if neither mark awarded allow 1 mark for lost as waste ignore references to energy losses do **not** allow for growth / repair / reproduction	2	AO1 1.5.1b/c
7(a)(ii)	any **one** from: • thrushes eat other things • thrush numbers likely to vary (considerably) • thrushes were not present all the time • thrushes feed on a much bigger area	allow it is only an estimate (of population size) **or** only counted thrushes for 5 hours	1	AO3 1.5.1
7(b)(i)	any **one** from: • there are two dependent variables • there is no independent variable • to show the association / correlation / pattern (between the two variables)		1	AO2 1.5.1

4.7.2.1 Levels of organisation

Answer 13 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(b)(ii)	(snails in woodlands) more have dark(er) colour (ed shells) **or** fewer have light-coloured shells (shells have) no / fewer stripes or have no stripes	allow converse for grassland, if clear allow converse for grassland, if clear	1 1	AO2 1.4.1d/f/g
7(b)(iii)	less likely to be seen (by predators / birds / thrushes)	allow camouflaged (from predators / birds / thrushes) allow light coloured shells with stripes would be more visible (to predators / birds / thrushes in woodland (than grassland)).	1	AO3 1.4.1d/f/g
7(c)(i)	*Indicator species* invertebrate (animals) **or** correctly named invertebrate *Environmental factor* (concentration of dissolved) oxygen	both required for **1** mark allow water pollution allow other correct examples	1	AO1 1.4.2c
7(c)(ii)	oxygen meter	must match factor given in **(c)(i)** allow oxygen probe / sensor (and data logger) ignore pollution meter	1	AO1 1.4.2d
Total			**9**	

4.7.2.1 Levels of organisation

Answer 14 · Mark scheme

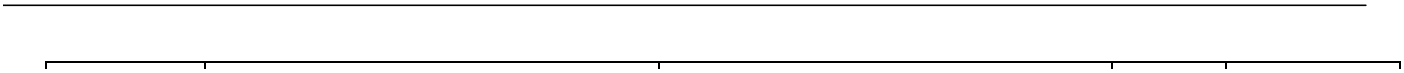
June 2016 | BL2HP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)	160 000	if incorrect answer / no answer: allow max. 2 for method: 1 mark for mean = total number ÷ area of ten quadrats eg $\frac{20}{0.625}$ or $\frac{20 \times 8}{5}$ or $\frac{160}{5}$ or 32 1 mark for final answer = mean x field area eg mean x 5000	3	AO2 2.4.1b
7(b)	Improvement: place quadrats randomly **and** Reason: avoid bias / (more) representative / (more) reliable Improvement: more quadrats **and** Reason: overcome random variation / (more) typical / (more) representative / (more) reliable / repeatable Improvement: larger quadrats **or** repeat when plants are bigger **and** Reason: less likely to miss plants	allow 1 mark if 2 correct improvements but no reasons / only incorrect reasons ignore accurate ,valid, precise and fair ignore anomalies	1 1 1	AO3 2.4, 2.4.1b
Total			**6**	

4.7.2.1 Levels of organisation

Answer 14 · Mark scheme

June 2016 | BL2HP | Original Q7 | Legacy



4.7.2.1 Levels of organisation

Answer 15 · Mark scheme

June 2017 | BL2HP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2			6	AO1/2/3 2.4 2.4.1a/b Prac

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content.	A simple correct statement is made about the investigation, e.g. counting plants in a quadrat **or** measuring pH **or** random placement of a quadrat.	There is a description of how a quadrat could be used to collect data at different locations. **or** how a pH meter could be used to collect data at different locations. **For four marks** an additional point is made e.g. reference to randomness **or** compare to other's results.	There is a description of how a quadrat **and** pH meter could be used to collect data at different locations. **For full marks** an additional point to ensure validity is made e.g. repeat in a different marshland **or** randomness **or** measure pH at the same depth each time **or** large number of repeats **or** graph or correlate results.

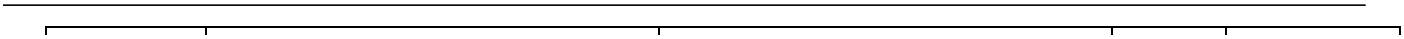
examples of points made in the response:	extra information
• placing of quadrat and measuring plants	
• randomly in area where plant is growing • randomly in area where plant is not growing	allow • regular intervals along a transect • from an area where plants are growing to an area where plants are not growing
• many times • score number **or** % cover **or** dry mass or heights of plants per quadrat • measure soil pH in each quadrat • control variables such as measurements at same depth • repetition of pH measurements in a quadrat • calculate mean pH for each quadrat • relate quantity of plants to soil pH – e.g. graph	allow presence / absence

Total		6

4.7.2.1 Levels of organisation

Answer 15 · Mark scheme

June 2017 | BL2HP | Original Q2 | Legacy



4.7.2.1 Levels of organisation

Answer 16 · Mark scheme

June 2018 | 8461/2H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	there is an uneven distribution of dandelions **or** (more) representative / valid **or** avoid bias **or** more accurate / precise mean	 ignore accurate / precise unqualified ignore repeatability / reproducibility / reliability / fair test	1	AO1 4.7.2.1
04.2		an answer of 3.3×10^5 scores **5** marks an answer of 330 000 scores **4** marks		AO2 4.7.2.1
	(correct mean per m^2 =) 6 or 6.0		1	
	(correct field area =) 55 000 (m^2)		1	
	mean x area – eg 6(.0) × 55 000	allow incorrect calculated values for mean and / or field area	1	
	330 000	allow correct calculation from previous calculation	1	
	3.3×10^5	allow calculated value in standard form	1	

4.7.2.1 Levels of organisation

Answer 16 · Mark scheme

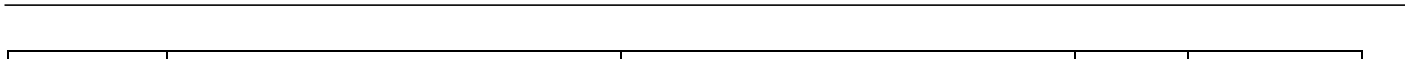
June 2018 | 8461/2H | Original Q4

Question	Answers		Mark	AO / Spec. Ref.
04.3	**Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.		5–6	AO3
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.		3–4	AO2
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.		1–2	AO1
	No relevant content		0	
	Indicative content • placing of quadrat • large number of quadrats used • how randomness achieved – eg table of random numbers **or** random number button on calculator **or** along transect • quadrats placed at coordinates **or** regular intervals along transect • in each of two areas of different light intensities **or** transect running through areas of different light intensity • for each quadrat count number of dandelions • for each quadrat measure light intensity • compare data from different light intensity to access **level 3** the key ideas of using a large number of quadrats randomly, or along a transect, and counting the number of dandelions in areas of differing light intensity need to be given to produce a valid outcome			4.7.2.1
04.4	any **two** from: • temperature • water • (soil) pH • minerals / ions • wind • herbivores	allow heat allow moisture / rain allow acidity allow eg magnesium ions **or** nitrate allow salts / nutrients allow trampling ignore carbon dioxide ignore space ignore competition unqualified do **not** accept oxygen	2	AO1 4.4.1.2 4.7.1.2
Total			**14**	

4.7.2.1 Levels of organisation

Answer 16 · Mark scheme

June 2018 | 8461/2H | Original Q4



4.7.2.1 Levels of organisation

Answer 17 · Mark scheme June 2019 | 8461/2H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	primary consumer		1	AO2 4.7.2.1 4.7.4.1
01.2	correct shape: 4 tiers with largest at bottom and smallest at top correctly labelled: dragonfly / nymph + hydra + daphnia + algae	 in this order **or** allow: 3rd-order **or** tertiary consumer **or** apex / top predator **or** (trophic level) 4 2nd-order **or** secondary consumer **or** (trophic level) 3 1st-order **or** primary consumer **or** herbivore **or** (trophic level) 2 producer **or** (trophic level) 1 allow for **2** marks inverted pyramid if correctly labelled	1 1	AO2 4.7.4.2
01.3	any **one** from: (Daphnia biomass smaller because) • non-digestible parts (of algae) or lost in faeces • not all absorbed • lost in urine / urea • used in respiration **or** lost as carbon dioxide / CO_2 • algae not all eaten **or** eaten by other organisms • some algae decompose	 ignore waste allow excretion allow (to supply energy) for movement / warmth allow used to supply energy	1	AO1 4.7.4.3
01.4	 14 14 000	an answer of 14 000 scores **2** marks allow evidence of an incorrectly calculated mean × 1000 allow 1.4×10^4	 1 1	AO2 4.7.2.1

4.7.2.1 Levels of organisation

Answer 17 · Mark scheme

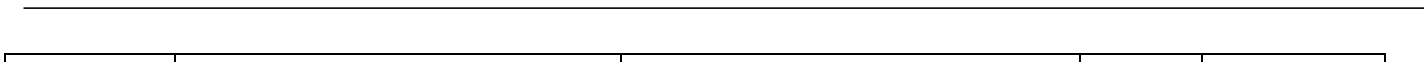
June 2019 | 8461/2H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5		an answer of 2.625×10^4 **or** 2.63×10^4 **or** 2.6×10^4 scores **4** marks an answer of 26250 scores **3** marks allow ecf from Question **01.4**		AO2 4.7.2.1
	(volume of pond =) 1.875 **or** $2.5 \times 1.5 \times 0.5$	an incorrect answer for one step does **not** prevent allocation of marks for subsequent steps	1	
	$14\,000 \times 1.875$	allow ecf from Question **01.4**	1	
	26250		1	
	2.625×10^4	allow 2.63×10^4 **or** 2.6×10^4	1	
01.6	increased (growth / reproduction of) algae		1	AO2 4.7.2.1 4.7.3.2
	(more algae so) more food for Daphnia		1	4.7.4.1
		allow fertiliser toxic to Hydra (1) (so) fewer Daphnia eaten (1)		
01.7	(Hydra have) less food		1	AO3 4.7.2.1
	because (graph shows) fewer Daphnia (with more fertiliser)		1	4.7.3.2
		allow other valid suggestions, eg fertiliser toxic to Hydra (1) **or** fertiliser causes growth of algae (on surface) which block light and so die and decay **or** eutrophication (1) (decay / eutrophication) uses up oxygen (so lack of oxygen for Hydra) (1)		
Total			14	

4.7.2.1 Levels of organisation

Answer 17 · Mark scheme

June 2019 | 8461/2H | Original Q1



4.7.2.1 Levels of organisation

Answer 18 · Mark scheme November 2021 | 8461/2H | Original Q5

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>05.1</td><td>
<table>
<tr><th>Factor</th><th>Biotic</th><th>Abiotic</th></tr>
<tr><td>Nitrates in the soil</td><td></td><td>✓</td></tr>
<tr><td>Rabbits eating the plants</td><td>✓</td><td></td></tr>
<tr><td>Shading by a building</td><td></td><td>✓</td></tr>
<tr><td>Soil pH</td><td></td><td>✓</td></tr>
<tr><td>Temperature</td><td></td><td>✓</td></tr>
<tr><td>Trampling by people</td><td>✓</td><td></td></tr>
</table>
all 6 correct = 3 marks
4 or 5 correct = 2 marks
2 or 3 correct = 1 mark
0 or 1 correct = 0 marks
</td><td></td><td>3</td><td>AO1
4.7.1.2
4.7.1.3
4.4.1.2</td></tr>
<tr><td>05.2</td><td>(grid and) coordinates

to achieve randomness</td><td>

ignore throwing quadrat

allow random coordinates for 2 marks

if no other mark awarded allow random walk or description of random walk for 1 mark</td><td>1

1</td><td>AO1
4.7.2.1
RPA9</td></tr>
</table>

4.7.2.1 Levels of organisation

Answer 18 · Mark scheme

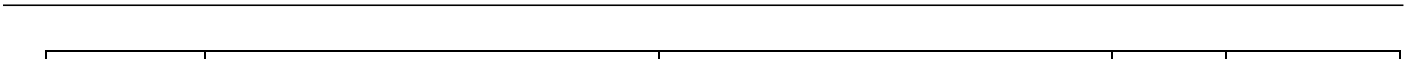
November 2021 | 8461/2H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	*(mean per m^2 =)* 24 **or** 6×4		1	AO2 4.7.2.1 RPA9
	(calculation of area of lawn =) $(\frac{1}{2} \times 16 \times 10) - (6 \times 3)$ **or** $80 - 18$		1	
	(area of lawn =) 62 m^2	allow correct calculation using total area (of triangle) – area of rectangle	1	
	(total number of daisies =) 24×62	allow correct calculation using an incorrectly calculated area of the lawn and / or mean	1	
	1488	allow answer based on incorrect area	1	
	(answer to 3 sig figs =) 1490	allow student's calculated answer rounded to 3 sig figs	1	
05.4	too few quadrats **or** quadrat too small	allow sample size too small	1	AO3 4.7.2.1 RPA9
	sample may not be representative of the lawn	allow quadrats may not have been placed randomly	1	
Total			13	

4.7.2.1 Levels of organisation

Answer 18 · Mark scheme

November 2021 | 8461/2H | Original Q5



4.7.2.1 Levels of organisation

Answer 19 · Mark scheme

November 2021 | 8461/2H | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	from light / sunlight absorbed by chlorophyll / chloroplasts	ignore sun unqualified if no other mark awarded allow by photosynthesis for **1** mark	1 1	AO1 4.7.2.1 4.7.4.3 4.4.1.1
07.2	krill / herring / copepod		1	AO2 4.7.2.1 4.7.4.1
07.3	algae		1	AO2 4.7.2.1 4.7.4.1
07.4	1 algae 2 krill **or** copepod 3 squid 4 mackerel (5 Human)	all correct for **1** mark	1	AO2 4.7.2.1
07.5	any **two** from: (losses due to) • non-eaten parts (of squid / krill) • <u>respiration</u> **or** <u>respiring</u> (in mackerel) • excretion (by mackerel)	 allow bones / shells allow eaten by other animals do **not** accept respiration produces / makes / creates energy allow loss of a named waste product such as CO_2 / urea ignore loss of waste unqualified ignore faeces	2	AO1 4.7.4.3

4.7.2.1 Levels of organisation

Answer 19 · Mark scheme

November 2021 | 8461/2H | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	2.3 **and** 0.1 (million)	allow in the range 2.25 to 2.3 for 2.3 (million)	1	AO2 4.7.5.3
	$\frac{2.3 - 0.1}{2.3} \times 100$ **or** $\frac{220}{2.3}$		1	
	95.65217.....	allow answer from correct substitution of incorrect values from **Figure 11**	1	
	96	allow student's calculated answer correctly rounded to the nearest whole number	1	

4.7.2.1 Levels of organisation

Answer 19 · Mark scheme

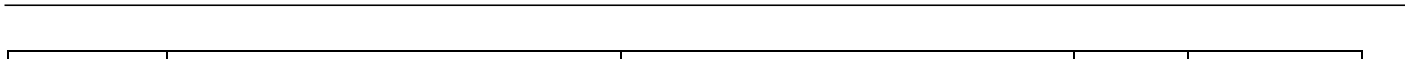
November 2021 | 8461/2H | Original Q7

Question	Answers	Mark	AO / Spec Ref.
07.7	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3 4.7.5.3
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content	0	
	Indicative content figures may be given without units (million tonnes) throughout **points for:** • small fish are not caught so can live long enough to reproduce • biomass / stocks have generally increased after these laws introduced • '77-'81 law (total ban) resulted in increase in biomass, eg 0.1 to 0.48 **or** to 0.9 by '84 • '84 law (mesh size) resulted in increase in biomass, eg 0.9 to 1.8 (by '90) • '97 law (quotas) resulted in increase, eg 1.15 to 1.25 • '98 law (ban in breeding season) resulted in increase, eg 1.25 to 2.5 **points against:** • could be a cause other than the law **or** correlation does not necessarily indicate causal relationship **or** other factors • laws superimposed so can't necessarily tell the effect of each • each law results in an increase followed by a decrease • quotas lead to dead fish being thrown back into sea For **Level 3** points both for and against must be considered together with appropriate use of data		
Total		**17**	

4.7.2.1 Levels of organisation

Answer 19 · Mark scheme

November 2021 | 8461/2H | Original Q7



4.7.2.1 Levels of organisation

Answer 20 · Mark scheme

June 2024 | 8461/2H | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **one** from: • collect more samples each time • collect samples more frequently • use a bigger bucket / sample • do not return tadpoles until after the fourth sample • sample at the same time of day • randomise collecting positions • collect at range of depths • standardised sweeps with a net instead of a bucket	 allow suggested time interval allow a method to avoid double counting tadpoles	1	AO3 4.7.2.1 RPA9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	6	if no answer on line, allow answer in **Table 1**	1	AO2 4.7.2.1 RPA9

4.7.2.1 Levels of organisation

Answer 20 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	correct linear scale and axis labelled weeks	scale must use at least half available space	1	AO2 4.7.2.1 RPA9
	all points plotted correctly	allow a tolerance of ±½ small square allow 4 or 5 correct plots for **1** mark	2	
	curved line of best fit	ignore line drawn point to point	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	correct value at 0 and 4 weeks from line on student's graph, eg 60 and 22	allow a tolerance of ± ½ small square	1	AO2 4.7.2.1
	correct calculation eg $\frac{22}{60} \times 100$		1	
	36.7	allow 37 or 36.6... allow correct calculation using values from the student's graph if no line drawn on Figure allow a calculation based on values of 60 and 24 for up to full marks if line drawn on Figure but data from table used (60 and 24) only mp2 and mp3 can be awarded	1	

4.7.2.1 Levels of organisation

Answer 20 · Mark scheme

June 2024 | 8461/2H | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	any **two** from: • disease / (named) pathogens • being eaten **or** predators • lack of food • low oxygen (concentration in water) • change in temperature • change in pH • (some of the) pond dried out • toxic chemical	allow competition for food ignore competition unqualified allow eutrophication allow lack of space allow named example such as sewage / fertiliser ignore pollution ignore waste	2	AO2 4.7.1.2 4.7.1.3

Total Question 3	11

4.7.2.1 Levels of organisation

Answer 21 · Mark scheme

June 2025 | 8461/2H | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	to remove all / the water	allow to make sure there is no water left allow to make sure the soil is (completely) dry ignore to remove water unqualified	1	AO3 4.7.1.2 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	$\frac{71}{252} \times 100$ 28.1(746…) 28 (%)	 allow student's incorrectly calculated percentage using mass data for 20 metres, rounded to nearest whole number	1 1 1	AO2 4.7.1.2 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	as distance increases the percentage of water increases	allow positive correlation allow as one increases the other increases allow as one decreases the other decreases ignore directly proportional	1	AO3 4.7.1.2 4.7.2.1 RPA9

4.7.2.1 Levels of organisation

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	any **two** from: • repeat (at each distance) **and** calculate a mean • test at intermediate / further distances • test around more / different trees • test at different angles around the (same) tree	allow repeat (at each distance) **and** remove / identify anomalies allow test more areas	2	AO3 4.7.1.2 4.7.2.1 RPA9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	any **three** from: • light (intensity) • temperature • type of soil • pH (of soil) • minerals / ions (in soil) • wind (intensity / direction) • oxygen in soil	} if neither awarded allow shade for **1** mark ignore sun allow acidity / alkalinity (of soil) allow salts **or** named examples of ions, such as nitrate allow fertiliser ignore nitrogen / nutrients ignore (availability of) space ignore carbon dioxide	3	AO2 4.7.1.1 4.7.1.2 4.7.2.1 RPA9

Total Question 2	10

4.7.2.1 Levels of organisation

Answer 18 · Examiner comments

November 2021 | 8461/2H | Original Q5

Question 5 (standard, standard/high & high demand)

This question related to Required Practical Activity 9 and was about determination of the size of a daisy population on a lawn. There was much confusion about biotic and abiotic factors that might affect the growth of daisy plants on the lawn and, although three-quarters assigned at least two of the given factors correctly, fewer than half got all six correct.

In **05.2**, around half the students knew that sampling of the daisies should be at random but very few were able to describe adequately how this might be achieved, ie the use of random coordinates. References to 'throwing' the quadrat were not rewarded.

05.3 was a 6-mark extended calculation of the daisy population on a triangular shaped lawn with a rectangular paved area cut into it. This examined mathematics skill 5c and students were therefore expected to know how to calculate the area of a triangle and a rectangle. However, some thought that the Pythagoras theorem was appropriate for calculating the area of a triangle. Some calculations were very difficult to follow and students should be encouraged to make their reasoning clear; others gave highly improbable answers, eg a total population on the lawn being less than the mean for one quadrat. There was the anticipated error in calculating the area of a 50 cm × 50 cm quadrat, with incorrect answers including 25 m^2. Many students attempted to convert all measurements to centimetres rather than metres and the excessive number of zeros often caused transfer errors from one line of working to the next; or they thought there were 100 cm^2 in 1 m^2 rather than 10 000. Some calculations did not include the given mean of 6 plants per quadrat. Thus, around an eighth of students were completely successful, scoring all 6 marks, and almost two-thirds scored less than half-marks.

Answer 18 · Examiner comments

November 2021 | 8461/2H | Original Q5

Most students scored one of the two marks available in **05.4**, for pointing out that the use of just 10 quadrats may not have been sufficient. Hardly any students could go on to elaborate on this to state, for example, that this may not have been a representative sample or that it would not have allowed for an uneven distribution of the daisies, or that the 10 quadrat positions may not have been sufficiently random.

4.7.2.1 Levels of organisation

Answer 19 · Examiner comments

November 2021 | 8461/2H | Original Q7

Question 7 (standard, standard/high & high demand)

This question was about a marine food web and legislation to ensure sustainable fishing of herring in the North Sea. In **07.1**, almost two-thirds of students scored 1 mark for stating either that light was the source of energy for the algae or that the algae used photosynthesis. Many stated that the energy came 'from the Sun' which did not distinguish between light and other forms of solar energy. Incorrect answers included carbon dioxide, water, mineral ions and even from eating other organisms. 1% of answers mentioned that chlorophyll or chloroplasts absorbed the light energy.

Most students were able to identify a primary consumer and the producer in the food web in **07.2** and **07.3**, respectively. A common incorrect answer for the primary consumer was the 'human', presumably confusing primary with top. Similarly, around three-quarters of students were able to assign 5 organisms from the food web to a food chain ending in the human.

In **07.5**, although one reason for the lower biomass of the mackerel than that of the combined biomass of the krill and squid was given as non-digestibility of parts of these animals, many students suggested 'lost in faeces' as an additional reason. Around one-third of students gained some credit for their answers by suggesting losses due to respiration or excretion or, alternatively, that some parts of the krill and squid were not even eaten or they were eaten by other animals.

Answer 19 · Examiner comments

November 2021 | 8461/2H | Original Q7

07.6 was a 4-mark calculation of percentage decrease using figures read from a graph. Fewer than half of students were completely successful. Errors included the use of an incorrect starting point – the first and highest value on the graph for the year 1950 was quite a common error, or reading the value for 1977 as '0.2' or '0.05' instead of 0.1. Many students did not get credit for not rounding their answer to the nearest whole number as instructed in the question. Some calculated a percentage reduction in excess of 100%, the highest such value being '2300%'. Around one-sixth of students scored no marks.

07.7 was a 6-mark extended response question requiring the evaluation of the data from the graph in relation to various acts of legislation introduced at different times. Many students found this very difficult with more than two-thirds attaining no higher than Level 1. The question instructed students to use data from the graph and information from the diagram showing the relationship between mesh size of fishing nets and the sizes of herring of different ages. Many students did not cite any data, or did not consider all four pieces of legislation and their subsequent effects on herring biomass. It was rare to read any negative points – the most common being the decrease in biomass at certain times despite the legislation that had been introduced – and hardly any students thinking that causes in addition to the given legislation might have been responsible for the changes in biomass or that, since the acts of legislation overlapped in their application, it was hard to ascertain the effect of each. Very few students attempted to make a judgement on the basis of the points they had made and no-one scored all 6 marks.

4.7.2.1 Levels of organisation

Answer 20 · Examiner comments

June 2024 | 8461/2H | Original Q3

Question 3 (standard demand)

03.1 Just under 70% of students successfully identified an improvement to the method. The most common creditworthy responses were 'repeats', 'collect more water' or a description of avoiding double counting of the tadpoles. As the experimental time frame given was 8 weeks, improvements that suggested extending this time period were not given credit.

03.2 Over 95% of students correctly carried out the simple calculation. Students using the row rather than the column was the main reason to not score marks.

03.3 Students were asked to complete a graph to show how the total number of tadpoles changed over the 8-week period. Over 90% of students scored 3 or more marks, with a mark commonly missed for not labelling the *x*-axis or failing to use a linear scale.

Plotting the points was mostly done well and students that did lose the marks was due to accuracy as each small square vertically was 2 units. The line of best fit should have been a smooth curve through the points, but some students used a ruler to draw a straight line of best fit or simply joined the plots dot-to-dot – neither of which gained credit.

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4.7.2.1 Levels of organisation

Answer 20 · Examiner comments June 2024 | 8461/2H | Original Q3

03.4 Students are asked to calculate the percentage of the tadpoles that would still be found in the pond at four weeks compared to zero weeks, using the data from their graph. Around 75% of students gained the full three marks for this calculation. Many students achieved marking point 1 only for using the values from their graph at 0 and 4 weeks. They then could not use the values correctly to determine the answer.

A common incorrect approach was to take the answer for 4 weeks away from 60 before multiplying by 100. A noticeable number of students chose not to use their graph but instead used data from the table, allowing some credit to be given as long as the values from the table were correct.

03.5 Over 65% of students gained full marks in this question for correctly suggesting two reasons why the tadpoles died. The most common correct answers were ‘not enough food’, and then reference to predators or disease. The most common uncreditworthy responses seen were vague references to changes in environment/conditions, lack of parental care and natural selection. Effects of the experimental method were ignored.

4.7.2.1 Levels of organisation

Answer 21 · Examiner comments

June 2025 | 8461/2H | Original Q2

Question 2 (Standard demand)

02.1
Students were given a method for an investigation into numbers of daisy plants growing in a field at different distances from the tree. Three quarters of students knew that the steps were repeated to remove all the water, or to ensure all the water had evaporated. Common incorrect answers seen included 'to improve accuracy', 'to identify anomalies' and 'to remove excess water'.

02.2
Students were given data from an investigation into the number of daisy plants growing at different distances from a tree. They were asked to calculate a percentage and give their answer to the nearest whole number. This calculation was attempted by over 95% of students, with a pleasing 80% being awarded the full 3 marks. Of the students that did not gain all 3 marks, those that showed their working out were able to gain one or two marks. Students should be encouraged to always show their working out for calculations.

02.3
A pleasing number of students were able to describe the effect of distance from the tree on the percentage of water in the soil – with almost 90% gaining credit. Students that simply stated 'it increased' did not gain credit as reference to both the distance and the percentage of water were required for the mark.

02.4
Students were asked to consider changes to the investigation that would increase the validity of the student's conclusion. Bullet point 1 was most commonly seen, although students stating simply to 'repeat it' without further qualification could not be given credit at this level of demand. Around 75% of students gained at least one mark for this question.

02.5
Around a quarter of students were able to suggest three abiotic factors that might have caused more daisy plants to grow further from the tree, with a further half of students gaining two of the available three marks. The full range of possible correct responses outlined on the mark scheme were seen, with light being the most common. A few students negated a correct abiotic factor by suggesting the tree (biotic) was the cause – for example 'shade from the tree'.
Vague answers such as 'soil' or 'weather' did not gain credit, and despite being told in the question not to refer to water, a small number of students referred to rainfall, humidity or drought which again could not be credited.