AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.4.2

Pyramids of biomass

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**14**
Available paper years	**2008–2025**

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.

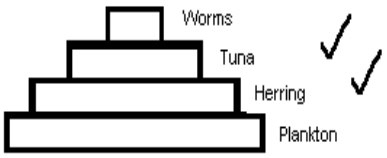
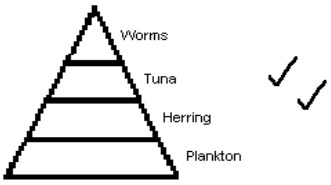
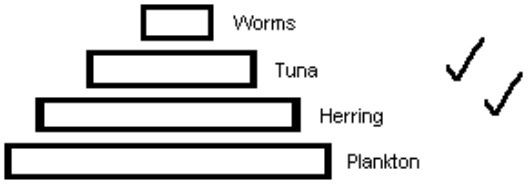
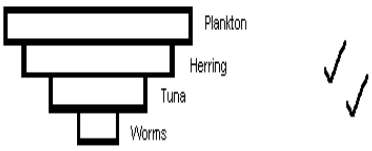
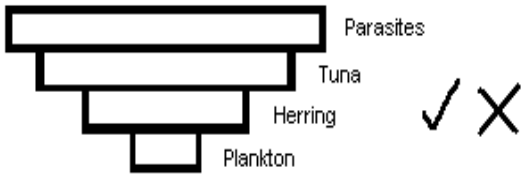
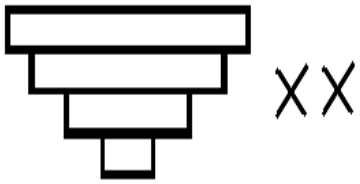
Name: _____ **Date:** _____

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

4.7.4.2 Pyramids of biomass

Answer 01 · Mark scheme January 2008 | BLY2F | Original Q6 | Legacy

Question 6

	answers	extra information	mark
(a)(i)	a triangular-shaped pyramid, with 4 layers – widest at the bottom	either in blocks or as a triangle	1
	labels in food chain order (from widest part) ie plankton—herring— tuna — parasitic / worms	upside down labelled pyramid with producer at top gains **2** marks upside down labelled pyramid with producer at bottom gains **1** mark for labels unlabelled upside down pyramid = **0** marks accept separate boxes correct food chain with correct arrows if given gains **1** mark	1
	eg 	eg 	
	eg 	eg 	
	eg 	eg 	

continued…

4.7.4.2 Pyramids of biomass

Answer 01 · Mark scheme

BLY2F

Question 6 continued…

	answers	extra information	mark
(a)(ii)	any **two** from: • waste / excreted / urine / faeces / CO_2 (from tuna) • respiration (of tuna) • movement (of tuna) / hunting • used for heat (production) (of tuna) • not digested / absorbed	from / of tuna not required but do not accept if of / from other organisms ignore used in reproduction if a mark is not awarded for respiration / movement / heat allow **1** mark for energy (unqualified)	2
(b)(i)	40	award **both** marks for correct answer, irrespective of working allow (290 – 50)/6 **or** 240/6 for **1** mark allow 48.3 / 48 ⅓ / 48 for **1** mark	2
(b)(ii)	cost of food / protein		1
(c)	any **one** from: • concern about animal welfare **or** examples **or** cruel to tuna **or** unethical **or** lack of space • poorer flavour / quality	allow immoral ignore not natural	1
total			8

4.7.4.2 Pyramids of biomass

Answer 01 · Mark scheme January 2008 | BLY2F | Original Q6 | Legacy

BLY2F

Answer 02 · Mark scheme January 2009 | BLY2F | Original Q6 | Legacy

question	answers	extra information	mark
6(a)	the sun / light / sunshine / solar	allow radiation from the sun ignore photosynthesis / respiration apply list principle do **not** allow water / minerals / heat	1
6(b)	2.5 (:1)	correct answer with or without working ignore rounding with correct working do **not** allow other equivalent ratios for both marks evidence of selection of 10(insects) **and** 4(frogs) **or** 50 **and** 20 **or** 1 **and** 0.4 for **1** mark if no other working allow **1** mark for 0.4:(1) on answer line	2
6(c)	any **two** from: • some parts indigestible / faeces • waste / examples of waste eg urea / nitrogenous compounds / urine / excretion • movement / eg of movement • heat • not all eaten / eg of not all eaten • respiration	allow for insects **or** frogs allow energy for biomass allow keeping warm do not accept energy for respiration	2

Question 6 continued on next page…

4.7.4.2 Pyramids of biomass

COMPONENT NUMBER: BLY2F

COMPONENT NAME: Additional Science / Biology

STATUS: Final

DATE: January 2009

Question 6 continued…

question	answers	extra information	mark
6(d)	any **four** from: • (bodies) consumed by animals / named / scavengers / detritus feeders • microorganisms / bacteria / fungi / decomposers • reference to enzymes • decay / <u>breakdown</u> / decompose / rot • respiration • carbon dioxide produced • photosynthesis • sugar / glucose produced • fossilisation / fossil fuels / named • combustion / burning • (burning) produces carbon dioxide	ignore digest(ion) accept other organic molecules must be linked with fossilisation / fossil fuels allow carbon dioxide produced once only	4
Total			**9**

4.7.4.2 Pyramids of biomass

Answer 02 · Mark scheme

January 2009 | BLY2F | Original Q6 | Legacy

COMPONENT NUMBER: BLY2F

COMPONENT NAME: Additional Science / Biology

STATUS: Final

DATE: January 2009

4.7.4.2 Pyramids of biomass

Answer 03 · Mark scheme June 2009 | BLY2F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	tick in box of FIRST pyramid		1
4(a)(ii)	any **one** from: • less energy / biomass lost / wasted • greatest biomass / energy for humans • shortest food chain **or** less stages **or** least number of different organisms **or** only one predator **or** only 2 boxes tall **or** least boxes	 ignore human box is bigger ignore 'food' for humans allow only one stage	1
4(b)(i)	any **two** from: • quicker / more growth **or** grow fatter • less urine **or** less faeces • less heat (lost) • less movement	assume for pigs indoors allow converse if clear for pigs outdoors do **not** allow no for less ignore less space	2
4(b)(ii)	any **one** from: • less cruelty **or** more ethical **or** better animal welfare • better flavour / quality (of meat) • less pollution / etc / less fossil fuel used for heating	assume for pigs outdoors allow converse if clear for pigs indoors ignore more natural ignore ideas referring to against God's will ignore pig health **or** free range / organic ignore quality of life	1
Total			**5**

4.7.4.2 Pyramids of biomass

Answer 03 · Mark scheme

June 2009 | BLY2F | Original Q4 | Legacy

BLY2F

4.7.4.2 Pyramids of biomass

Answer 04 · Mark scheme

January 2019 | BLY2F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	three layer triangular pyramid soya / beans / food – trout / fish – people / human (in sequence)	either way up (as blocks or triangle) ignore reference to producers / herbivores / consumers award **1** mark only for a correct food chain with 2 correct arrows showing energy flow	1 1
6(b)	the trout release energy when they respire some energy will be lost in waste from the trout		1 1
6(c)	any **one** from eg • easy / easier to catch / more caught • easy / easier to feed • no / less predation • less energy loss • less movement	 allow easy / easier to monitor allow control food allow less fishing / poaching allow grow faster ignore less space to move do **not** allow easier to farm	1
6(d)	any **two** from: • microorganisms / bacteria / decomposers / microbes / fungi / detritus feeders • decay / rot / decompose / digest / break down • (microorganisms) respire • turned into fossil fuels / named fossil fuels • carbon dioxide / CO_2 released	 ignore biodegrade do **not** award this mark if response implies the trout respire	2
Total			**7**

4.7.4.2 Pyramids of biomass

Answer 04 · Mark scheme

January 2010 | BLY2F | Original Q6 | Legacy

BLY2F

4.7.4.2 Pyramids of biomass

Answer 05 · Mark scheme

January 2011 | BLY2F | Original Q8 | Legacy

Question 8

question	answers	extra information	mark
8(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
8(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
8(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**

4.7.4.2 Pyramids of biomass

Answer 06 · Mark scheme

June 2011 | BLY2F | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)	bottom / third pyramid ticked	extra box ticked cancels the mark	1
7(b)	the sun	extra ring drawn cancels the mark	1
7(c)	any **two** from: • heat • movement / named example internal or external • respiration • faeces / not all digested • excretion/ urine • not all of animal / all parts eaten	 ignore keeping warm ignore digestion do **not** allow <u>for</u> respiration allow waste for **1** mark if neither faeces nor excretion given (ie waste + movement = **2** marks waste + faeces = **1** mark do **not** accept growth / reproduction	2
Total			**4**

4.7.4.2 Pyramids of biomass

Answer 06 · Mark scheme

June 2011 | BLY2F | Original Q7 | Legacy

BLY2F

4.7.4.2 Pyramids of biomass

Answer 07 · Mark scheme

January 2013 | BL1FP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	1800(g)		1
6(a)(ii)	triangular pyramid with four layers correctly labelled in order of food chain	accept ecf from (a)(i) allow inverted pyramid	1 1
6(b)	any **two** from: • (lost as) crab faeces / not all digested • (lost as) crab urine / urea • loss of carbon dioxide by crab • not all the limpet is eaten eg don't eat the shell • not **all** limpets are eaten (by crabs)	 allow waste / excretion for **one** mark if neither faeces nor urine are given accept (lost via) respiration allow not enough crabs to eat **all** the limpets / the limpet population ignore energy losses, such as movement	2
Total			**5**

4.7.4.2 Pyramids of biomass

Answer 07 · Mark scheme

January 2013 | BL1FP | Original Q6 | Legacy

BL1FP

4.7.4.2 Pyramids of biomass

Answer 08 · Mark scheme

June 2013 | BL1FP | Original Q4 | Legacy

Question 4

question	answers	extra information	Mark
4(a)	sulfur dioxide		1
4(b)(i)	mutation		1
4(b)(ii)	pale form now (more) easily seen (by predators) **or** dark form now less easily seen (by predators) so pale form (more) likely to be eaten **or** dark form less likely to be eaten so dark form (more likely to) breed / pass on genes **or** pale form less likely to breed / pass on genes	accept ref to camouflage	1 1 1
4(c)(i)	pyramid of three layers of diminishing size three labels in food chain order	either way up award 2 marks only if the pyramid is correctly labelled accept trees / birch accept (peppered) moth(s) / larvae	1 1
4(c)(ii)	some material is lost in waste from the birds peppered moth larvae do not eat all the leaves from the trees		1 1
Total			9

4.7.4.2 Pyramids of biomass

Answer 09 · Mark scheme June 2014 | BL1FP | Original Q8 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.
8(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	
8(b)(i)	C		1	AO3 1.5.1c
8(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**	

4.7.4.2 Pyramids of biomass

Answer 09 · Mark scheme

June 2014 | BL1FP | Original Q8 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.
9	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**	

4.7.4.2 Pyramids of biomass

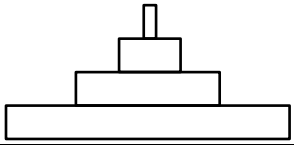
Answer 09 · Mark scheme

June 2014 | BL1FP | Original Q8 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.

4.7.4.2 Pyramids of biomass

Answer 10 · Mark scheme June 2016 | BL1FP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	any **two** from: • *idea of* absorption of light / energy • transfer to chemical energy • provides food / energy for animals / caterpillar • releases oxygen	allow produce sugars / glucose / starch / carbohydrate / food / biomass	2	AO1 1.5.1a
3(b)			1	AO2 1.5.1b/c
3(c)	15(%)	allow **1** mark for $\frac{3 \times 100}{20}$ with no answer or incorrect answer **or** allow **1** mark for 0.15	2	AO2 1.5.1c
3(d)(i)	any **two** from: • markings look like eyes / face / mouth of much larger animal • looks fierce / scary / dangerous • to frighten blue tit / bird	allow it looks like a snake max 1 if reference to camouflage	2	AO2/AO3 1.4.1d/g
3(d)(ii)	any **two** from: • sharp / long / big claws • sharp / hooked beak • large wings **or** flies quickly • good eyesight	ignore strong ignore strong / big allow streamlined / aerodynamic ignore powerful wings	2	AO2 1.4.1d/f
Total			**9**	

4.7.4.2 Pyramids of biomass

Answer 10 · Mark scheme

June 2016 | BL1FP | Original Q3 | Legacy

4.7.4.2 Pyramids of biomass

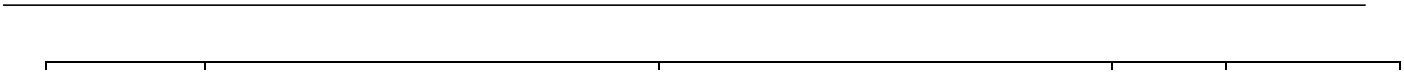
Answer 11 · Mark scheme June 2017 | BL1FP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)(i)	5000	allow **1** mark for 2500 **or** allow **1** mark for (3500 – 1000) x 2 **or** equivalent	2	AO2 1.5.1b/c
7(a)(ii)	Hawks produce faeces		1	AO2 1.5.1c
7(b)	photosynthesis sugar / glucose	 allow starch allow $C_6H_{12}O_6$	1 1	AO1 1.5.1a
Total			**5**	

4.7.4.2 Pyramids of biomass

Answer 11 · Mark scheme

June 2017 | BL1FP | Original Q7 | Legacy



4.7.4.2 Pyramids of biomass

Answer 12 · Mark scheme June 2019 | 8461/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	primary consumer		1	AO2 4.7.2.1 4.7.4.1
07.2	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
07.3	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
07.4	 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

4.7.4.2 Pyramids of biomass

Answer 12 · Mark scheme

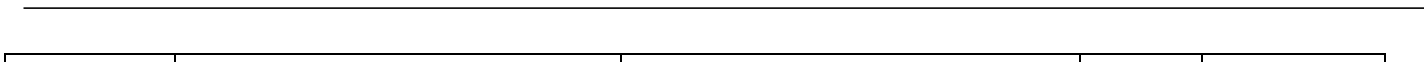
June 2019 | 8461/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5		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 **07.4**		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 **07.4**	1	
	26250		1	
	2.625×10^4	allow 2.63×10^4 **or** 2.6×10^4	1	
07.6	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)		
07.7	(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**	

4.7.4.2 Pyramids of biomass

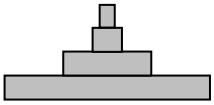
Answer 12 · Mark scheme

June 2019 | 8461/2F | Original Q7



4.7.4.2 Pyramids of biomass

Answer 13 · Mark scheme November 2021 | 8461/2F | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	carbon dioxide water		1 1	AO1 4.7.2.2 4.4.1.1
03.2	light		1	AO1 4.7.4.3 4.4.1.1
03.3			1	AO3 4.7.4.2
03.4	 2.3 **and** 0.5 $\frac{(2.3 - 0.5)}{2.3} \times 100$ **or** $\frac{1.8}{2.3} \times 100$ 78.2(6087....) 78	allow figures in millions allow in range 2.25 to 2.3 for 2.3 allow in range 0.5 to 0.55 for 0.5 allow correct substitution of student's incorrect graph readings allow correct answer from student's substitution of incorrect graph readings ignore incorrect rounding allow correct rounding of calculated value	 1 1 1 1	AO2 4.7.5.3
03.5	increase (in biomass of herring) from 0.1 to 1.8 (million tonnes) **or** change of 1.7 (million tonnes) **or** change of 1700%	 allow a tolerance of ± ½ small square for graph readings	1 1	AO3 AO2 4.7.5.3

4.7.4.2 Pyramids of biomass

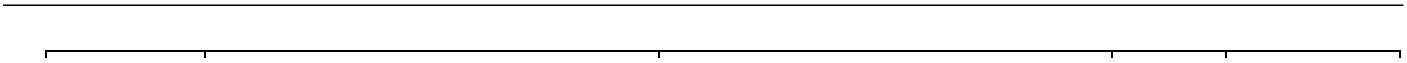
Answer 13 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	smaller / 4-yr-old fish not caught	allow younger fish not caught allow (only) older fish caught	1	AO3 4.7.5.3
	(so) escaping fish can reproduce	allow so younger fish can survive to reproduce	1	
Total			**12**	

4.7.4.2 Pyramids of biomass

Answer 13 · Mark scheme

November 2021 | 8461/2F | Original Q3



4.7.4.2 Pyramids of biomass

Answer 14 · Mark scheme

June 2025 | 8461/2F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	sunlight		1	AO1 4.7.4.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	worm **or** snail		1	AO3 4.7.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3			1	AO3 4.7.4.2 4.7.4.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	1%		1	AO2 4.7.4.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	faeces movement		1 1	AO1 4.7.4.3 4.7.5.2

4.7.4.2 Pyramids of biomass

Answer 14 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	(fish) 3 (snails) 12 (worms) 23	all correct = **2** marks 1 or 2 correct = **1** mark	2	AO2 4.7.2.1

Total Question 6	**8**

4.7.4.2 Pyramids of biomass

Answer 14 · Examiner comments

June 2025 | 8461/2F | Original Q6

Question 6 (Low demand)

06.1
Almost 60% of students knew that pondweed gets its energy from sunlight.

06.2
The question asks for the student to interpret the food web given on the paper. Only half of students were able to identify a primary consumer from the food web. There was a range of answers showing that some students were not sure of the terminology of a food chain and where a primary consumer would correctly be found. A few students did not refer to the given food web and made up their own primary consumer – some examples being an eagle, a tiger, or a shark.

06.3
Over three quarters of students identified the correct pyramid of biomass for the food web.

06.4
Around half of students knew that 1% of the biomass in the algae is transferred to the fish.

06.5
Only 20% of students gained no marks in this question – with 40% of them knowing that energy is lost from organisms via faeces and movement. A further 40% scored one mark for identify one method.

06.6
Students were presented with a tally chart and asked to convert the tallies into numbers for each organism. If all 3 totals were correct, then the student was awarded 2 marks – which was the case for 85% of students. If one or two were correct they were awarded only 1 mark. The few students that did not understand tally charts either copied the lines or did not attempt the question.