AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.4.1

Trophic levels

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**18**
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.

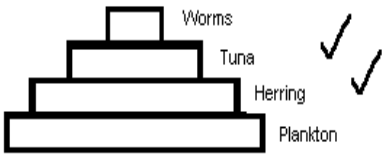
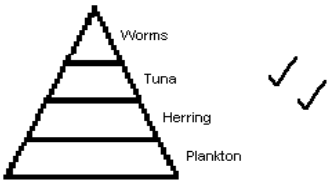
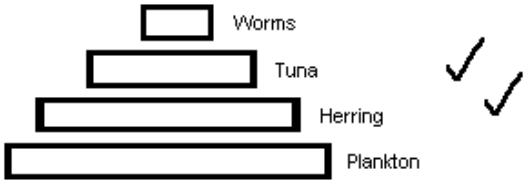
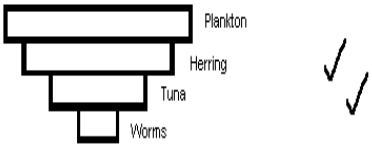
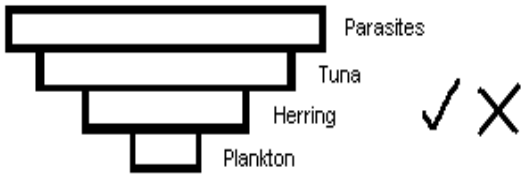
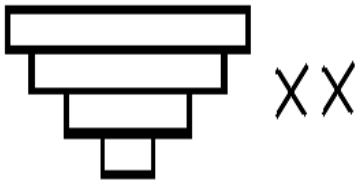
Name: _____ **Date:** _____

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

4.7.4.1 Trophic levels

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…

4.7.4.1 Trophic levels

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

4.7.4.1 Trophic levels

Answer 01 · Mark scheme

January 2008 | BLY2F | Original Q6 | Legacy

BLY2F

4.7.4.1 Trophic levels

Answer 02 · Mark scheme

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**

4.7.4.1 Trophic levels

Answer 02 · Mark scheme

January 2010 | BLY2F | Original Q6 | Legacy

BLY2F

4.7.4.1 Trophic levels

Answer 03 · Mark scheme

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**

4.7.4.1 Trophic levels

Answer 04 · 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**

4.7.4.1 Trophic levels

Answer 04 · Mark scheme

June 2011 | BLY2F | Original Q7 | Legacy

BLY2F

4.7.4.1 Trophic levels

Answer 05 · Mark scheme

June 2012 | BL1FP | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3 (a)(i)	sun	ignore light apply list principle	1
3 (a)(ii)	photosynthesis	apply list principle allow approximate spelling do **not** accept phototropism	1
3 (b)(i)	chemical		1
3 (b)(ii)	carbon dioxide		1
3 (b)(iii)	carbohydrates		1
3 (c)	As carbon dioxide from the caterpillar As faeces (droppings) from the blue-tit	if more than 2 boxes ticked deduct one mark for each additional incorrect box	1 1
Total			**7**

4.7.4.1 Trophic levels

Answer 05 · Mark scheme

June 2012 | BL1FP | Original Q3 | Legacy

BL1FP

4.7.4.1 Trophic levels

Answer 06 · 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**

4.7.4.1 Trophic levels

Answer 06 · Mark scheme

January 2013 | BL1FP | Original Q6 | Legacy

BL1FP

4.7.4.1 Trophic levels

Answer 07 · 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

4.7.4.1 Trophic levels

Answer 08 · Mark scheme

Question 8

question	Answers	extra information	mark
8(a)(i)	wheat → humans chain transfers 10 times more energy than wheat → pigs → humans chain or wheat → pigs → humans chain transfers 810 000 (kJ per hectare) less	allow 10% if given as a comparison e.g. one is 10% of the other ignore less unqualified	1
8(a)(ii)	any **one** reason for energy loss from pigs e.g.: • movement • (maintaining) body temperature • waste materials • not all parts of pig eaten by human • because there is an extra stage (pigs) in the food chain and energy is lost at each stage	ignore respiration, growth ignore heat unqualified allow named examples allow longer food chain so more energy lost	1

Question 8 continues on the next page . . .

Question 8 continued

8(b)	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
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 of at least one factory farming method **or** identification of an advantage or disadvantage of factory farming.	There is a description of at least one factory farming method **and** an advantage or disadvantage is explained.	There is a description of factory farming methods **and** advantage(s) and disadvantage(s) are explained.

examples of biology points made in the response:

factory farming methods e.g.:

- Kept in cramped conditions / battery hens / calf crates / pig barns / fish tanks
- Controlled temperature / heating
- Controlled feeding / modified food given / growth hormones
- Controlled lighting
- Treated with prophylactic antibiotics

Advantages e.g.:

- Increased efficiency / profit / greater food production / cheaper food / faster growth
- Farmer can have more livestock
- Less energy is lost through movement
- Less energy is used keeping warm
- (Food is high in calories / protein) so animals will grow faster / lay more eggs
- Easier to vaccinate all the animals
- Easier to protect animals from predators
- Antibiotic treatment stops infections in animals

Disadvantages e.g.:

- Stress / cruelty / inhumane / unethical
- Restricted movement / overcrowding
- Faster spread of diseases
- Antibiotics in the food chain / residual chemicals in the food chain
- Wasting fossil fuels / increasing global warming
- Increased pollution from animal waste and from additional transport

Total			**8**

UMS Conversion Calculator: www.aqa.org.uk/umsconversion

4.7.4.1 Trophic levels

Answer 09 · Mark scheme

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**	

Answer 09 · Mark scheme

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	

4.7.4.1 Trophic levels

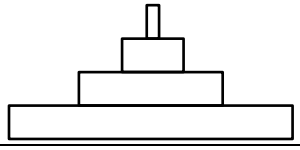
Answer 09 · Mark scheme

June 2014 | BL1FP | Original Q8 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.

4.7.4.1 Trophic levels

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**	

4.7.4.1 Trophic levels

Answer 10 · Mark scheme

June 2016 | BL1FP | Original Q3 | Legacy

4.7.4.1 Trophic levels

Answer 11 · Mark scheme

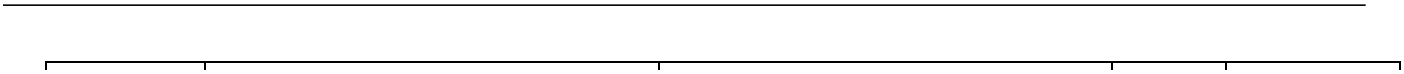
June 2017 | BL1FP | Original Q7 | Legacy

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**	

4.7.4.1 Trophic levels

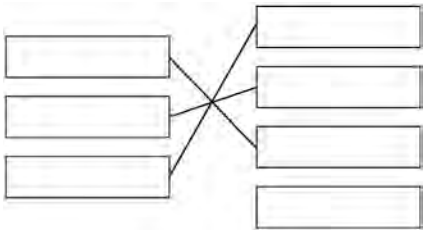
Answer 11 · Mark scheme

June 2017 | BL1FP | Original Q7 | Legacy



4.7.4.1 Trophic levels

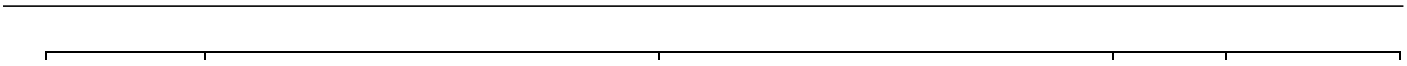
Answer 12 · Mark scheme June 2018 | 8461/2F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1		extra line from a scientific term cancels the mark	1 1 1	AO2 4.7.4.1
01.2	$\frac{10}{200} \times 100$ 5 / 5.0	an answer of 5 / 5.0 scores **2** marks	1 1	AO2 4.7.4.3
01.3	digestion respiration excretion	in this order only	1 1 1	AO2 4.5.3.3 4.7.4.3
01.4	fewer are eaten (by small fish)	allow there are fewer (small) fish eating them do **not** accept none are eaten	1	AO2 4.7.4.1
Total			**9**	

4.7.4.1 Trophic levels

Answer 12 · Mark scheme

June 2018 | 8461/2F | Original Q1



4.7.4.1 Trophic levels

Answer 13 · 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

4.7.4.1 Trophic levels

Answer 13 · Mark scheme

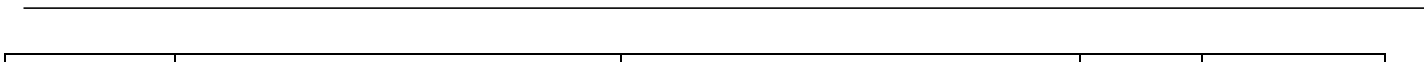
June 2019 | 8461/2F | Original Q7

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	allow fertiliser toxic to Hydra (1) (so) fewer Daphnia eaten (1)	1	4.7.4.1
07.7	(Hydra have) less food		1	AO3 4.7.2.1
	because (graph shows) fewer Daphnia (with more fertiliser)	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)	1	4.7.3.2
Total			**14**	

4.7.4.1 Trophic levels

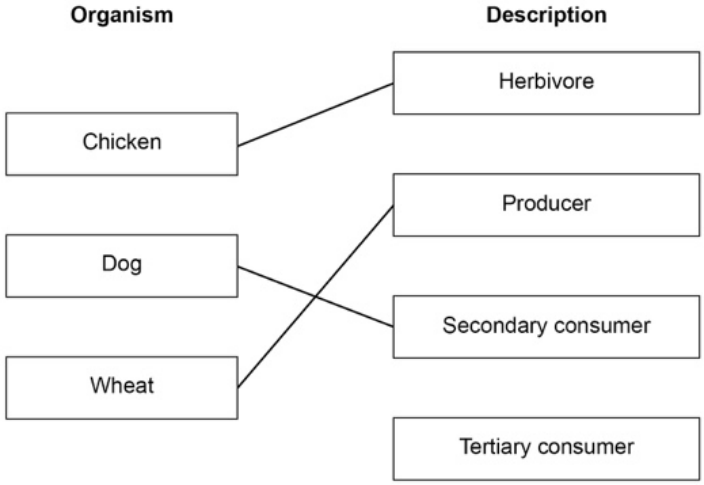
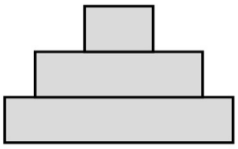
Answer 13 · Mark scheme

June 2019 | 8461/2F | Original Q7



4.7.4.1 Trophic levels

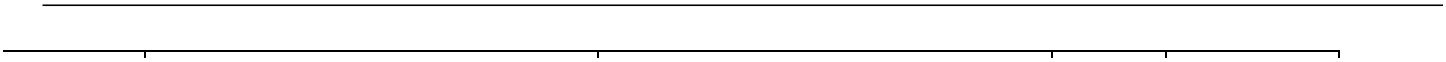
Answer 14 · Mark scheme November 2020 | 8461/2F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	3		1	AO2 4.7.4.1 4.7.4.2
01.2	 additional line from a box on the left negates the mark for that box		3	AO2 4.7.4.1
01.3	photosynthesis		1	AO1 4.7.2.1
01.4	the dog produces waste in faeces		1	AO2 4.7.4.3
01.5			1	AO2 4.7.4.2
01.6	farming cows needs more land than farming insects fewer cows being farmed will slow down global warming		1 1	AO3 4.7.3.4 AO3 4.7.3.5
Total			**9**	

4.7.4.1 Trophic levels

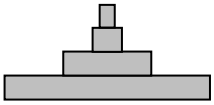
Answer 14 · Mark scheme

November 2020 | 8461/2F | Original Q1



4.7.4.1 Trophic levels

Answer 15 · 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

4.7.4.1 Trophic levels

Answer 15 · Mark scheme

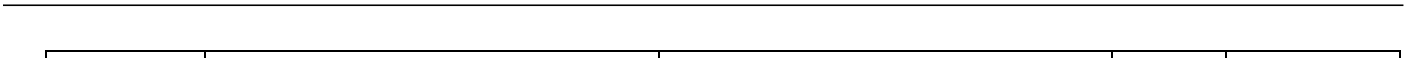
November 2021 | 8461/2F | Original Q3

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	

4.7.4.1 Trophic levels

Answer 15 · Mark scheme

November 2021 | 8461/2F | Original Q3



Answer 16 · Mark scheme

June 2023 | 8461/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.1	any **one** from: • sun • light	ignore photosynthesis	1	AO1 4.7.2.1 4.7.4.3

Question	Answers	Mark	AO / Spec Ref.
03.2	<table><tr><th>Feeding relationship</th><th>Organism</th></tr><tr><td>Secondary consumer</td><td>lynx</td></tr><tr><td>Primary consumer</td><td>(snowshoe) hare</td></tr><tr><td>Producer</td><td>grass</td></tr><tr><td>Herbivore</td><td>(snowshoe) hare</td></tr><tr><td>Carnivore</td><td>lynx</td></tr><tr><td>Prey</td><td>(snowshoe) hare</td></tr><tr><td>Predator</td><td>lynx</td></tr></table> if no other mark awarded allow **1** mark for 3 correct answers	1 1 1	AO3 4.7.2.1 4.7.4.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.3	camouflaged / hidden **or** not (easily) seen	allow description eg blends in with surroundings	1	AO3
	from lynx / predator / carnivore		1	AO2
	not killed / eaten	allow less likely to be killed / eaten	1	AO2
				4.7.1.2 4.7.1.3 4.7.1.4 4.7.2.1

4.7.4.1 Trophic levels

Answer 16 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.4	any **two** from: • fewer lynx (to eat them) • more food / grass (available) • hares reproduce / breed / multiply	allow not many predators / lynx do **not** accept no lynx / predators allow a lot of food / grass	2	AO2 4.7.1.3 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.5	(number of lynx) increases		1	AO3 4.7.1.3 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.6	less food **or** fewer (snowshoe) hares (to eat) **or** fewer prey	ignore the lynx were hunted do **not** accept no food	1	AO2 4.7.1.3 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.7	any **two** from: • (lost in) respiration (of snowshoe hare) • egestion / faeces • excretion / urea / urine • not all eaten	allow as carbon dioxide allow not all digested allow not all (named) parts eaten if no other mark awarded, allow **1** mark for waste	2	AO1 4.7.2.1 4.7.4.3

Total Question 3	13

Answer 17 · Mark scheme

June 2024 | 8461/2F | Original Q10

Question 10

Question	Answers	Extra information	Mark	AO / Spec Ref.
10.1	lack of oxygen for (aerobic) respiration	do **not** accept ref to respiration in dead plants	1	AO3
	(so) less / no energy (released)	do **not** accept energy produced / made / created	1	AO2
	(for) microorganisms / bacteria / fungi / microbes / decomposers **OR** low pH denatures enzymes (1)	allow low pH / acidity reduces enzyme activity	1	AO2 4.2.2.1 4.4.2.1 4.7.1.2 4.7.2.3
	(so) less / no (chemical) reactions / metabolism / respiration **or** less **/** no energy released (1) in microorganisms / bacteria / fungi / microbes / decomposers (1)	do **not** accept energy produced / made / created		

Question	Answers	Extra information	Mark	AO / Spec Ref.
10.2	34 g/m^2/year		1	AO2 4.7.4.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
10.3	DNA		1	AO1 4.6.1.5 4.7.1.2 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec Ref.
10.4	protein		1	AO1 4.4.1.1 4.4.2.1 4.4.2.3 4.7.1.2 4.7.1.4

4.7.4.1 Trophic levels

Answer 17 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
10.5	increase in temperature	allow global warming allow heat (energy) is trapped ignore reference to greenhouse gases	1	AO3
	(because) carbon dioxide is released (from the peat bog)		1	AO2
	(because) carbon dioxide is produced by burning / decay of peat	ignore methane is released from burning / decay of peat allow fewer plants to take in carbon dioxide (for photosynthesis)	1	AO2
	(because) methane is released (from the peat bog)		1	AO2
				4.4.2.1 4.7.2.3 4.7.3.3 4.7.3.5

Total Question 10	10

4.7.4.1 Trophic levels

Answer 18 · 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

4.7.4.1 Trophic levels

Answer 18 · 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**

4.7.4.1 Trophic levels

Answer 14 · Examiner comments November 2020 | 8461/2F | Original Q1

Question 1 (low & standard demand)

This question was about the transfer of biomass through a food chain. In **01.2**, although many students correctly identified wheat as the producer, it was then very common for students to suggest the chicken as a secondary consumer and the dog as a tertiary consumer. A high proportion of students recognised in **01.6** that farming cows requires more land than farming insects, though relatively fewer realised that a reduction in cattle farming would slow down global warming. Of incorrect responses, the fifth alternative proved most popular.

Answer 16 · Examiner comments June 2023 | 8461/2F | Original Q3

Question 3

This question was about a simple food chain and predator-prey relationships.

03.1 This was generally well done, with sun and light being very common correct answers as the source of energy for the grass. Some students included extra suggestions, such as water which was incorrect and thus disqualified the mark.

4.7.4.1 Trophic levels

Answer 16 · Examiner comments June 2023 | 8461/2F | Original Q3

03.2 Completion of Table 2 to name one organism from the food chain in Figure 3 that matched each of the given descriptions (secondary consumer, producer, herbivore, etc) was done successfully by two-thirds of students. However, those who did not read the question carefully used the names of other organisms, such as 'lions' and 'cows' which could not be credited.

03.3 The two photographs in Figure 4 of the snowshoe hare, respectively in the summer and in the winter, showed its different fur colour in these different seasons. Students had to explain how this change in fur colour would increase the hare's chance of survival. Many students realised that the change of fur colour was important for camouflage and described this in a variety of ways. These students often went on to explain that this would help the hare to avoid being seen by predators. However, the most common omission was a description of why avoiding being seen was important for survival, with large numbers of students only restating the question '…so they survive', which was not creditworthy. Only 1 in 10 students scored all 3 marks in this question, although around a half included the ideas of camouflage and not being seen by predators such as the lynx.

03.4 Figure 5 showed students how the populations of snowshoe hare and lynx oscillated over the course of 35 years. Appropriate suggestions about why the hare population increased at various times included the decline in population of the lynx, the abundance of food for the hares and the fact that the hares reproduced. One-third of students were able to suggest two of these reasons.

03.5 Students were required to look at the relationship shown in Figure 5 to see that an increase in the number of hares resulted in an increase in the number of lynx – just over one-half were able to describe this.

03.6 A reason why the lynx population fell over the given years should have been evident from Figure 5 which showed the fall in hare population immediately before it – around 60 percent of students realised this.

03.7 This question was very poorly answered. Few students (around 1 in 20) gained both marks and the majority struggled to gain even one. Suitable reasons for the loss of biomass in the food chain between the grass and the snowshoe hare would be respiration of the hare or egestion or excretion.

4.7.4.1 Trophic levels

Answer 17 · Examiner comments

June 2024 | 8461/2F | Original Q10

Question 10 (standard demand)

10.1 Some students appeared to be confused as to how decay happens, believing that the dead plant matter would decay itself. However, around 10% of students did indicate that some sort of microorganism is involved in the decay process, gaining the third mark in the mark scheme. Some students spent time unnecessarily describing the factors needed for decay and often needed to extend their answers onto the additional pages.

There were two routes students could use to gain marks. Many students' answers included elements of both routes, so examiners awarded marks for the described route which gave the higher mark. In most cases this was the first route given in the mark scheme.

The information in the question told students that layer B contains 'very little oxygen' and 'has a low pH'; thus, simply repeating either of these was insufficient to gain credit. To gain the first mark, students needed to link one of these pieces of information to their own knowledge: either in terms of respiration or in terms of enzymes being denatured or reducing in activity. Many students also gained this first marking point, although some who took the second route demonstrated confusion about what a 'low pH' constitutes, describing it as 'low acidity' or 'being 'alkaline'.

Achieving marking point 2 proved to be more problematic for many students. Most simply by omitting any reference to energy or metabolism. Students should be advised that when referring to respiration in their answers (as many did), they should then go on to describe the role of respiration: 'releasing energy'. For those who did refer to energy, it was noted that very few described energy being 'produced', which is never acceptable as this would contradict the principle of conservation of energy.

10.2 40% of students identified the correct answer regarding the approximate biomass of moss that becomes biomass in primary consumers.

10.3 Fewer than a tenth of students identified DNA as a substance that can be made using phosphates.

10.4 Around 20% of students could identify protein as the substance that can be made using nitrogen.

10.5 Almost 65% of students gained at least one mark in this question, and a quarter of those gained three of the four available marks. A number of students described a rise in temperature of the Earth's atmosphere, gaining marking point 1.

It should be noted that the 'greenhouse effect' and 'climate change' are not equivalent to 'global warming'. A significant number of students attempted to describe the mechanism of global warming. This was often confused, including references to the 'ozone layer' and incorrect descriptions of long and short-wave radiation. However, such descriptions are beyond the requirements of the specification, so were ignored.

Students who merely repeated the information that the peat bog 'contains' carbon dioxide and methane could not be awarded marking points 2 or 4. Instead further added value was required, in that these gases would be 'released' from the peat when the bog was destroyed. A significant number of students omitted any reference to methane, so were unable to gain marking point 4.

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4.7.4.1 Trophic levels

Answer 17 · Examiner comments June 2024 | 8461/2F | Original Q10

Again, students should be advised that repeating the information in the question will not gain credit, thus those that described 'the use of peat as a fuel' releasing carbon dioxide. To gain credit here, students needed to indicate that the peat would have to be 'burned' to produce carbon dioxide. In this case, examiners ignored the idea that burning would also release (trapped) methane, as this would inevitably also be burned, releasing more carbon dioxide.

Answer 18 · 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.