AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.2.3

Decomposition (biology only)

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**23**
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.

4.7.2.3 Decomposition (biology only)

Answer 01 · Mark scheme January 2008 | BLY3H | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
(a)(i)	methane	apply list principle allow symbols	1
(a)(ii)	anaerobic respiration / (anaerobic) fermentation	ignore decay / decomposition etc	1
(b)(i)	any **two** from: • manure disposed of • gains fertiliser (for crops) • gets (free) fuel **or** cheap supply of energy **or** (free) cooking / heating / lighting • can sell crops at higher price	 allow converse allow not using wood / trees	2
(b)(ii)	in the UK lower temperature **or** not enough heat process is slower **or** enzymes action slower	allow converse arguments for Sri Lanka ignore other factor(s) ignore references to efficiency / 'bacteria working'	1 1
total			6

4.7.2.3 Decomposition (biology only)

Answer 01 · Mark scheme January 2008 | BLY3H | Original Q3 | Legacy

BLY3H

Answer 02 · Mark scheme January 2009 | BLY3H | Original Q6 | Legacy

question	answers	extra information	mark
6(a)	carbon dioxide **and** water vapour	either order	1
6(b)	less methane		1
	because less anaerobic respiration		1
	more CO_2	ignore water	1
	because (more) aerobic respiration		1
Total			**5**

4.7.2.3 Decomposition (biology only)

Answer 02 · Mark scheme January 2009 | BLY3H | Original Q6 | Legacy

COMPONENT NUMBER: BLY3H

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

4.7.2.3 Decomposition (biology only)

Answer 03 · Mark scheme June 2009 | BLY2H | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)(i)	increase / higher / faster / quicker numerical comparison eg from 30 to 60 / by 30 **or** it is 30 at 15°C and 60 at 25°C	 award **2** marks for doubles / goes twice as fast or 30 units more	1 1
2(a)(ii)	any **two** from: • oxygen / air (in) • for microorganisms / bacteria / microbes / fungi / decomposers • (for aerobic) respiration • let heat out • heat kills microorganisms	 do **not** accept lets oxygen / air out ignore reference to other substances / light passing in or out ignore microorganisms passing in ignore worms / germs / bugs ignore heat in	2
2(b)	compost contains minerals / nutrients / elements / ions / named	allow improve moisture / drainage allow nitrogen ignore CO_2 / food / goodness / fertilisers do **not** accept vitamins / glucose etc	1
Total			**5**

4.7.2.3 Decomposition (biology only)

Answer 03 · Mark scheme

June 2009 | BLY2H | Original Q2 | Legacy

BLY2H

4.7.2.3 Decomposition (biology only)

Answer 04 · Mark scheme

June 2009 | BLY3H | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)	methane	accept CH_4 / CH4 / CH^4 extras cancel	1
3(b)	**anaerobic** respiration **or** fermentation	ignore decay / decomposition / digestion do **not** allow aerobic	1
3(c)(i)	in range 32 – 33		1
3(c)(ii)	keep cool(er) **or** keep below 40 (°C) **or** insulate from heat high(er) / optimum rate of biogas production **or** rate decreases at higher temperatures **or** works more efficiently	allow keep at optimum temperature if (c)(i) < 40 allow correct reference to rate of enzyme action eg high temperature would denature enzyme owtte	1 1
3(d)	increases rate / high rate insulates / keeps warm	allow 'works better' allow maintains optimum temperature	1 1
Total			**7**

4.7.2.3 Decomposition (biology only)

Answer 04 · Mark scheme

June 2009 | BLY3H | Original Q3 | Legacy

BLY3H

4.7.2.3 Decomposition (biology only)

Answer 05 · Mark scheme

Question 4

question	answers	extra information	mark
4(a)	methane / CH_4	allow CH^4 / CH4 / H4C	1
4(b)(i)	any **two** from: • less visual impact • less heat loss **or** (better) insulated **or** temperature will be less variable / keeps warm / keeps cool **or** easier to maintain optimum temperature • withstand pressure build-up • ease of adding material / slurry	ignore reference to smell	2
4(b)(ii)	any **one** from: • to keep anaerobic • to prevent oxygen / air entering • to prevent biogas escaping • to maintain pressure / to allow removal of biogas		1
4(c)	any **two** from: • to maintain optimum temperature • to speed up production of biogas **or** reference to faster microbial action / named microbial process • UK temperature is low/below 25 ºC • self sufficient / sustainable	ignore to keep warm if reference to specific temperature accept any value in range 26 – 40 ºC as optimum UK temperature is below optimum = **2** marks	2
Total			**6**

4.7.2.3 Decomposition (biology only)

Answer 05 · Mark scheme

January 2010 | BLY3H | Original Q4 | Legacy

BLY3H

4.7.2.3 Decomposition (biology only)

Answer 06 · Mark scheme

June 2010 | BLY2H | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)	B and D	both required in any order	1
3(b)	any **two** from: • carbohydrate / named example • protein / enzyme • amino acid • hormone / named plant hormone • lipid / fat / oil / wax • chlorophyll • DNA • vitamin(s)	do **not** accept compounds restricted to animals allow **2** marks for 2 named examples do **not** allow a general name and a named example for **2** marks (eg award **1** mark only for carbohydrate and starch) allow **2** marks for 2 named examples	2
3(c)	contains minerals / salts / ions / nutrients / named (needed by plants) for health / better growth	ignore 'food' do **not** allow vitamins / glucose / energy etc for / help plant growth is insufficient ignore moisture retention / soil structure ignore more plants allow examples linked to mineral eg contains magnesium to make chlorophyll for **2** marks	1 1
Total			**5**

4.7.2.3 Decomposition (biology only)

Answer 06 · Mark scheme

June 2010 | BLY2H | Original Q3 | Legacy

BLY 2H

4.7.2.3 Decomposition (biology only)

Answer 07 · Mark scheme

June 2010 | BLY2H | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	stomach is acidic / has low pH	allow any pH below 7 ignore stomach is not alkaline	1
	lactase works best / well in alkali / high pH / neutral / non-acidic conditions	allow any pH of 7 and above accept works slowly in acid conditions allow figures from table with a **comparison** ignore reference to temperature	1
6(b)	any **three** from • (below 45(°C)) increase in temperature increases rate / *speed* of reaction • reference to molecules moving faster / colliding faster / harder / more collisions • optimum / best at 45(°C) • high temps / above 45(°C) (rate slows due to) denaturation of enzyme / lactase	 allow value(s) in range 41 – 49 allow synonyms of denaturation but **not** killed denaturation at high **and** low temperature does **not** gain this mark ignore body temperature ignore references to time / pH	3

Question 6 continues on the next page

4.7.2.3 Decomposition (biology only)

BLY 2H

Question 6 continued

question	answers	extra information	mark
6(c)	any **two** from • acid neutralised **or** conditions made neutral / alkali • *(*allow*)* emulsification / greater surface area of fat / lipid • enzymes (in small intestine) work (more effectively / better)	 accept bile is alkaline allow description of emulsification eg fat is broken down / broken up into droplets allow better for enzymes	2
Total			**7**

4.7.2.3 Decomposition (biology only)

Answer 07 · Mark scheme June 2010 | BLY2H | Original Q6 | Legacy

BLY 2H

4.7.2.3 Decomposition (biology only)

Answer 08 · Mark scheme

Question 3

question	answers	extra information	mark
3(a)(i)	without <u>oxygen</u>	ignore reference to air	1
3(a)(ii)	otherwise difficult to stir / to pump / to transfer	allow prevent 'clogging' owtte	1
3(a)(iii)	need to stir / pump / heat		1
3(b)(i)	rises then falls then levels / slight rise quantitative descriptor eg to 80% / max. on day 4 / min. on day 16	 accept other valid quantitative descriptor allow accuracy ± $\frac{1}{2}$ small square	1 1 1
3(b)(ii)	16 (15.5 to 16.4)		1
3(c)	oxygen present (CO_2 produced) by <u>aerobic</u> respiration **or** not much <u>anaerobic</u> respiration **or** not much methane / CH_4 produced		1 1
Total			**9**

4.7.2.3 Decomposition (biology only)

Answer 08 · Mark scheme

June 2010 | BLY3H | Original Q3 | Legacy

BLY 3H

4.7.2.3 Decomposition (biology only)

Answer 09 · Mark scheme

January 2013 | BL1HP | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)	any correct named physical environmental condition, e.g. light / water / rain / temperature / minerals / nutrients / space (between plants)	ignore carbon dioxide / climate / weather / sun / pollution	1
	genes / inheritance OR any correct named biotic factor e.g. predation / disease	ignore 'variety'	1
1(b)	mass of crop also depends on number of pods (per plant) / size / mass of each pea	ignore number of plants	1
1(c)	microorganisms / bacteria / fungi / decomposers / detritus feeders / named		1
	decompose / rot / break down / decay / digest	ignore feed / eat	1
	(these organisms) respire	do **not** allow respiration by pea (plants)	1
	(decay / respiration / microorganisms etc) releases carbon dioxide	do **not** allow combustion / fossilisation	1
Total			**7**

4.7.2.3 Decomposition (biology only)

Answer 09 · Mark scheme January 2013 | BL1HP | Original Q1 | Legacy

BL1HP

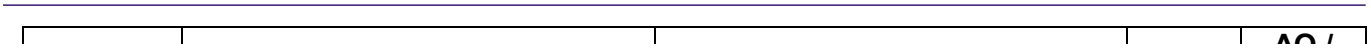
Answer 10 · Mark scheme June 2014 | BL1HP | Original Q3 | Legacy

3(a)	microorganisms (microorganisms) respire (respiration / decay / microorganisms) releases (thermal) energy / 'heat'	allow microbes / bacteria / fungi / decomposers do **not** allow dead plants respire ignore produce 'heat' do **not** allow produce energy do **not** allow dead plants release 'heat'	1 1 1	AO1 / AO2 1.6.1b
3(b)(i)	any **three** from: • (opening) allows oxygen in • microorganisms / eggs need oxygen • oxygen needed for respiration • (opening) allows release of carbon dioxide (from microorganisms / respiration / eggs) • (opening) allows energy / 'heat' to escape • (closing) retains energy / 'heat' if too cool / at night • (closing) retains moisture	allow air for oxygen allow gaseous exchange (1 mark) of / for microorganisms / eggs (1 mark) if none of first four points given if no mark awarded for either of these points allow 1 mark for vents open in the day to prevent overheating **and** close at night to prevent it getting too cold allow (opening) releases moisture	3	AO1 / AO2 / AO3 1.6.1b, c, 1.6.2
3(b)(ii)	any **one** from: • maintains sex balance • (survival of species depends on there being) males and females in population	e.g. equal / best / correct numbers of male and female allow so the offspring are not all the same sex	1	AO3 1.6.1
Total			**7**	

4.7.2.3 Decomposition (biology only)

Answer 10 · Mark scheme

June 2014 | BL1HP | Original Q3 | Legacy



4.7.2.3 Decomposition (biology only)

Answer 11 · Mark scheme June 2014 | BL3HP | Original Q7 | Legacy

7(a)(i)	(initially there is) oxygen (so) aerobic respiration (by microorganisms) producing CO_2 (which does not burn)	accept: oxygen hasn't been used up yet (so not anaerobic conditions yet) (because) methane is produced in anaerobic (fermentation) there is no methane ignore inflammable	1 1 1	AO1 / AO2 3.4.3c
7(a)(ii)	(peelings had) the most carbohydrate / organic material	answer must be comparative accept contained more microorganisms / decomposers / bacteria ignore water do **not** allow fat or protein	1	AO3 3.4.3c
7(b)(i)	0.22 / 0.221	correct answer with or without working gains 2 marks allow 0.2 for 1 mark allow 22.1 for 1 mark allow 0.34 × 65 / 0.65 for 1 mark	2	AO2 3.4.3c
7(b)(ii)	(sheep manure) produces a higher volume of biogas / almost double **or** produces 0.27 (m^3 per kg) more (sheep manure) produces biogas with a higher percentage methane **or** produces 2% more methane	accept 0.408(7) / 0.41 / 0.409 (m^3) from sheep for 2 marks accept 0.1877 / 0.188 / 0.19 (m^3) more than cow's manure for 2 marks allow correct difference in volume calculated using 0.408(7) / 0.41 / 0.409 minus answer given in 7(b)(i) for 2 marks	1 1	AO2 3.4.3c
Total			8	

4.7.2.3 Decomposition (biology only)

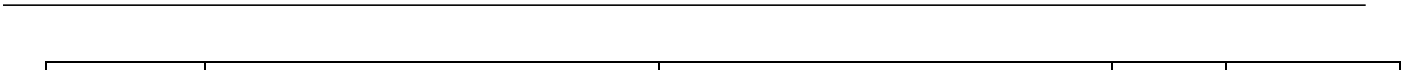
Answer 12 · Mark scheme June 2015 | BL3HP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	any **two** from: • (volume of) peat compost has been steady and then declined **or** volume of peat compost has declined since 2005 • (volume of) peat-free compost has increased (since 1999) • (volume of) peat is higher than peat-free until 2005, then peat-free compost is higher (than peat) • total volume of peat and peat-free compost has increased	allow 2007 instead of 2005 allow 2007	2	AO2 342d
3(b)	increases carbon dioxide (in the atmosphere)	ignore methane	1	AO1 342
3(c)	any **one** from: • reduces biodiversity • destruction of habitats • disruption of food chains		1	AO1 342b
Total			**4**	

4.7.2.3 Decomposition (biology only)

Answer 12 · Mark scheme

June 2015 | BL3HP | Original Q3 | Legacy



4.7.2.3 Decomposition (biology only)

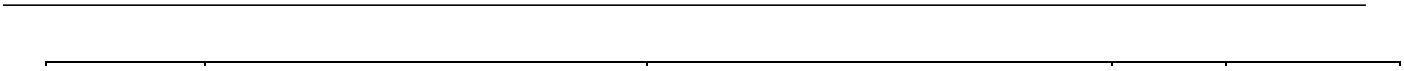
Answer 13 · Mark scheme June 2016 | BL1HP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	any **one** from: • continuous readings • do not need to be there • (more likely to be) accurate • reduces human error	 allow automatic readings allow greater resolution do **not** allow valid allow easier to read	1	AO3 1.6.2
3(b)(i)	microorganisms (microorganisms) respire (respiration / decay / microorganisms) releases carbon dioxide	allow microbes / bacteria / fungi / decomposers for microorganisms, throughout ignore carbon released	1 1 1	AO1 1.6.1a/b / 1.6.2a /1.5.1c
3(b)(ii)	all grass decomposed / decayed / rotted	allow idea that all microorganisms dead (due to accumulation of waste **or** lack of oxygen) allow lack of / no oxygen (for respiration of microorganisms)	1	AO3 1.6.1b
Total			**5**	

4.7.2.3 Decomposition (biology only)

Answer 13 · Mark scheme

June 2016 | BL1HP | Original Q3 | Legacy



4.7.2.3 Decomposition (biology only)

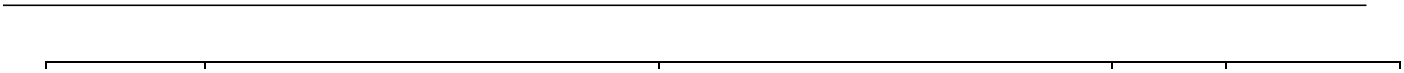
Answer 14 · Mark scheme June 2016 | BL2HP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	a catalyst / speeds up a reaction it is a protein **or** it is specific / described **or** it has an active site	ignore it is not used up allow it only acts on one molecule	1 1	AO1 2.5.1a/b
3(b)	cytoplasm		1	AO1 2.1.1a 2.6.1a
3(c)	**Advantage:** any **one** from: • heat would denature proteins (in milk) • heat alters texture or flavour (of milk) • catalase / enzyme is specific **or** only affects hydrogen peroxide • less energy / fuel / lower temperature used so less expensive **or** less pollution **Disadvantage:** any **one** from: • (some pathogens may survive) causing illness • catalase / enzyme left in milk **or** may cause allergies **or** may alter taste		1 1	AO3 2.5, 2.5.2j
Total			**5**	

4.7.2.3 Decomposition (biology only)

Answer 14 · Mark scheme

June 2016 | BL2HP | Original Q3 | Legacy



4.7.2.3 Decomposition (biology only)

Answer 15 · Mark scheme

June 2017 | BL3HP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)	less CO_2 absorbed / taken in (by trees from the atmosphere)	allow release / increase of CO_2 from burning / use of (heavy) machinery ignore less photosynthesis unqualified	1	AO1 3.4.2a
1(b)(i)	0.8		1	AO2 3.4.2
1(b)(ii)	anywhere in range: 3(.0) – 3.4		1	AO2 3.4.2
1(c)	microorganisms respire **and** release CO_2	allow bacteria / fungi / decomposers allow anaerobic decay / respiration releases methane	1 1	AO1 3.4.2a
Total			**5**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.

4.7.2.3 Decomposition (biology only)

Answer 15 · Mark scheme

2(a)(i)	left ventricle		1	AO1 3.2.1c
2(a)(ii)	aorta	ignore artery allow aortic (artery)	1	AO1 3.2.1d
2(a)(iii)	(to keep) blood flowing in the right / one direction **or** prevent backflow (of blood)	ignore ref to veins	1	AO1 3.2.1e

2(b)	Reasons for: • less likely to die (44% cf. 59%) • lower risk of death from having a second operation • lower risk of heart infections • less chance of the valve stopping working • longer lasting • doesn't cause rejection • avoids religious issues of using organs from a pig **or** no ethical issue from using part of a living organism Reasons against: • chance of death by bleeding is increased • offers no advantage against clots **or** equal risk of blood clots • have to take anti-clotting drugs for life • can be noisy	max 3 marks if only reasons for or reasons against given allow converse for each point if clearly referring to the pig tissue valve ignore cost allow doesn't stop working allow been used for a longer period of time ignore religion **or** ethical unqualified	4	AO3 3.2

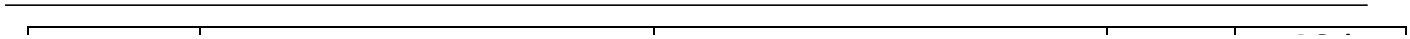
2(c)	(inserted to) keep the (coronary) artery / arteries open allows more blood to flow (to the heart muscle) **or** return blood flow to normal	do **not** allow veins allow (more) glucose / oxygen to reach the heart (muscle)	1 1	AO1 3.2.1f

Total		**9**

4.7.2.3 Decomposition (biology only)

Answer 15 · Mark scheme

June 2017 | BL3HP | Original Q1 | Legacy



4.7.2.3 Decomposition (biology only)

Answer 16 · Mark scheme

June 2018 | 8461/1H | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1		an answer of 560 / 559.8 / 559.78 / 559 (cm^3) scores **3** marks an incorrect answer for one step does not prevent allocation of marks for subsequent steps		AO2 4.2.2.1
	(for calcium) $\frac{500}{605} \times 1000 = 826.446281$ (cm^3)	allow any correct rounding to minimum 3 significant figures allow alternative route with correct rounding	1	
	(for vitamin B-12) $\frac{500}{4.5} \times 2.4 = 266.67$ (cm^3)	allow alternative route with correct rounding	1	
	560 / 559.8 / 559.78 / 559 (cm^3)	allow only correct answer based on values given for vitamin B-12 and calcium	1	
07.2	**Level 2**: Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.		4–6	AO1 4.2.2.1
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.		1–3	
	No relevant content		0	
	Indicative content • Biuret reagent (allow $CuSO_4$ and NaOH) tests for protein • add Biuret reagent to milk • solution will turn (from blue) to lilac if positive • iodine solution tests for starch (ignore iodine unqualified) • add iodine solution to milk • solution will turn (from orange / brown) to blue / black if positive • Benedict's reagent tests for sugars • add Benedict's reagent to milk and boil / heat (allow any temperature above 60 °C) • solution will turn (from blue) to (brick) red / brown / orange / yellow / green if positive for **level 2**, reference to all three food tests is required			

4.7.2.3 Decomposition (biology only)

Answer 16 · Mark scheme

June 2018 | 8461/1H | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	lipase breaks down fat into fatty acids (and glycerol) (and) fatty acids lower the pH (and when) fatty acids cause the pH to be below 10 (the indicator becomes colourless)	do **not** accept if 'glycerol' is contradicted	1 1 1	AO2 4.2.2.1
07.4	observation of colour change is subjective / based on opinion	ignore human error unqualified ignore experimental error or examples of this	1	AO3 4.2.2.1
07.5	bile emulsifies fats	allow a correct description of emulsification (ie breaks fat from large droplets into smaller droplets) do **not** accept a description of chemical breakdown	1	AO1 4.2.2.1
	creates a larger surface area (of fat)		1	AO2 4.2.2.1
	(so) lipase can break down fat (to produce fatty acids) more quickly / effectively	allow fatty acids produced by action of lipase more quickly	1	AO3 4.2.2.1
Total			**16**	

4.7.2.3 Decomposition (biology only)

Answer 17 · Mark scheme November 2020 | 8461/2H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	bacteria fungi	allow singular allow mould ignore microbes / germs / decomposers do **not** accept viruses	1 1	AO1 4.7.2.2 4.7.2.3
01.2	fatty acid(s)		1	AO2 4.7.2.3 4.2.2.1 RPA10
01.3	any **one** from: • universal indicator (paper / solution) • pH meter	allow UI (paper / solution) ignore pH paper unqualified allow pH probe ignore datalogger unqualified ignore Cresol red ignore phenolphthalein / litmus	1	AO1 4.7.2.3 RPA10
01.4	any **two** from: • volume of milk • exposure to air / oxygen • sterilise test tubes • treatment of milk before investigation • freshness / age of milk (at start) • time of day pH was measured	allow amount of milk allow bungs on test tubes allow example such as pasteurised or not allow starting pH of milk	2	AO1 4.7.2.3 RPA10
01.5	almond (milk)		1	AO3 4.7.2.3 RPA10

4.7.2.3 Decomposition (biology only)

Answer 17 · Mark scheme

November 2020 | 8461/2H | Original Q1

01.6	as temperature increases up to 15 °C the time taken (to reach pH 5) decreases above 15 °C the time taken (to reach pH 5) stays the same	allow converse if no other mark awarded allow **1** mark for as temperature increases the time taken (to reach 5 °C) decreases and then stays the same	1 1	AO2 4.7.2.3 RPA10
01.7	any **one** from: • bacteria / microbes / microorganisms / fungi dividing faster (when warmer) • reactions (in the bacteria) are happening faster (to decay milk) • (because there is) more (kinetic) energy • enzyme activity is higher (at 10 °C than at 5 °C)	allow converse if clearly describing 5 °C allow number of bacteria / microbes / microorganisms / fungi increasing (when warmer) allow more bacteria microbes / microorganisms / fungi allow particles move faster allow more collisions between particles allow enzymes work faster ignore enzymes work better	1	AO2 4.7.2.3 4.1.1.6 RPA10
01.8	any **two** from: • different concentration / type of fat / lipid • different concentration / type of proteins / carbohydrate / sugar • different (amount / type of) bacteria present • may have been pasteurised by a different process • different starting pH	allow different amounts of fat / lipid allow different amounts of proteins / carbohydrate / sugar allow may have been treated in different ways (before the investigation) ignore different oxygen concentration	2	AO3 4.7.2.3 RPA10

4.7.2.3 Decomposition (biology only)

Answer 17 · Mark scheme

01.9	determine the types of bacteria present in the milk		1	AO3 4.7.2.3 RPA10
Total			**13**	

4.7.2.3 Decomposition (biology only)

Answer 17 · Mark scheme

November 2020 | 8461/2H | Original Q1



4.7.2.3 Decomposition (biology only)

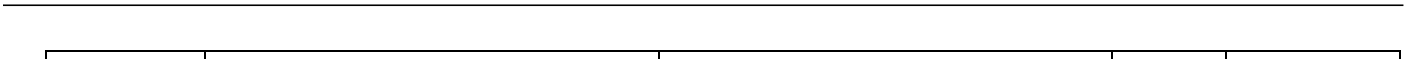
Answer 18 · Mark scheme November 2021 | 8461/2H | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	(put beaker in a) water bath	allow (put beaker in an) incubator	1	AO1 4.7.2.3 RPA10
02.2	volume of the milk **or** type of milk	allow amount of milk allow named type of milk, eg cows' or semi-skimmed	1	AO1 4.7.2.3 RPA10
02.3	correct scale and axis labelled all points plotted correctly suitable curved line of best fit	scale must be at least 1 cm for 1 day allow a tolerance of ± ½ small square allow 4 or 5 correct plots for **1** mark ignore line joined point to point with straight lines	1 2 1	AO2 4.7.2.3 RPA10
02.4	similar shaped line drawn to left of 20 °C line on **Figure 4** same start pH	 allow a tolerance of ± ½ small square allow from student's line of best fit or student's plot for 0 days	1 1	AO2 4.7.2.3 RPA10
Total			**8**	

4.7.2.3 Decomposition (biology only)

Answer 18 · Mark scheme

November 2021 | 8461/2H | Original Q2



4.7.2.3 Decomposition (biology only)

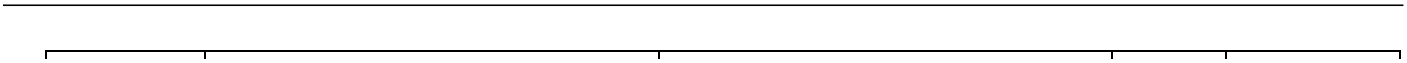
Answer 19 · Mark scheme November 2021 | 8461/2H | Original Q4

Question	Answers	Mark	AO / Spec. Ref.
4	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6	AO1 4.7.2.1 4.7.2.2 4.7.2.3 4.2.2.1 4.2.3.1 4.2.3.2 4.4.1.1 4.4.1.3 4.4.2.1
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–3	
	No relevant content	0	
	Indicative content *in microorganisms* • digestion **or** large molecules to small molecules • enzymes **or** named example • respiration • production of carbon dioxide • release of mineral ions **or** named example such as nitrate / phosphate / magnesium *in plants* • carbon dioxide (from air) taken in by leaves • by diffusion • via stomata • carbon dioxide used in photosynthesis • making glucose / sugar / starch / cellulose **or** making other correctly named example • (named) ions taken in by roots • by active transport • nitrate ions for making amino acids / proteins / DNA / chlorophyll • phosphate for making DNA For **Level 2** processes in microorganisms and in plants should be considered		
Total		**6**	

4.7.2.3 Decomposition (biology only)

Answer 19 · Mark scheme

November 2021 | 8461/2H | Original Q4



4.7.2.3 Decomposition (biology only)

Answer 20 · Mark scheme

June 2022 | 8461/2H | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	**abiotic** any **two** from: • water • oxygen / air (in soil) • pH (of soil) • minerals / ions • temperature • size of soil particles **or** texture / type of soil	 allow moisture / humidity / rain(fall) allow dryness ignore carbon dioxide allow acidity / alkalinity (of soil) allow salts allow named example of an ion ignore nutrients allow named example of soil type ignore space / toxins / weather	2	AO1 4.7.1.1 4.7.1.2 4.7.1.3
	biotic any **two** from: • food • predators / consumers / carnivores • disease / pathogens / bacteria / fungi	 allow amount of dead / decaying matter (in soil) ignore nutrients allow example – such as birds allow microorganisms / microbes / parasites if **no** other marks awarded allow **2** marks for **four** factors in reverse categories	2	

Question	Answers	Mark	AO / Spec. Ref.
02.2	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5–6	AO2
	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 • same concentration of chemical / **X** applied to the soil • same volume / amount of chemical / **X** applied to the soil • same size of area sampled – eg 1 m^2 or 0.25 m^2 • use of a quadrat • same time between application and collecting worms • same time allowed for collecting worms after application • each sample area selected randomly • method of achieving randomness – eg random coordinates • (collect and) count worms in each of areas **A** and **B** • at least 5 repeats in each of areas **A** and **B** • calculate mean (per unit area) **or** total for each of areas **A** and **B** • compare means / totals for areas **A** and **B**		4.7.2.1 RPA9

Total Question 2		**10**

4.7.2.3 Decomposition (biology only)

Answer 21 · Mark scheme

June 2023 | 8461/2H | Original Q4

Question 4

Question	Answers	Mark	AO / Spec. Ref.
04.1	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6	AO1 4.7.2.1 4.7.2.2 4.2.3.2 4.4.1.1 4.4.1.3 4.4.2.1
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–3	
	No relevant content	0	
	Indicative content • microorganisms / bacteria / fungi (cause decay) • (named) enzyme used in decay / digestion • digestion **or** large molecules to small molecules • respiration by microorganisms • production / release of carbon dioxide • carbon dioxide is released into the air • carbon dioxide taken in by stomata / leaves • carbon dioxide used in photosynthesis • making glucose / sugar / starch / cellulose / other named example • release of nitrate (ions) into the soil • nitrate (ions) taken in (by roots) • nitrate (ions) taken in by active transport • nitrate (ions) for making amino acids / proteins / DNA / other named example For **Level 2**, the response needs to refer to both breakdown and use of nitrogen and carbon compounds		

4.7.2.3 Decomposition (biology only)

Answer 21 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.2	any **one** from: • use more temperatures • measure pH at smaller time intervals • use a data logger (for continuous monitoring) • measure pH at same time of day • same type of milk • repeat (at each temperature) and calculate a mean **or** repeat (at each temperature) and eliminate anomalies • cover / uncover all beakers	allow example, such as same fat content of milk ignore same pH probe / meter ignore extend beyond 4 days ignore age of milk	1	AO3 4.7.2.3 RPA10

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.3	points for days 1, 2 and 3 correctly plotted	allow a tolerance of ± ½ small square allow 2 correct plots from days 1, 2 and 3 for **1** mark do **not** accept an incorrect plot for day 0 / 4	2	AO2 4.7.2.3 RPA10
	correct curved line of best fit	ignore line joined point to point with straight lines ignore extrapolation do **not** accept a single straight line	1	

4.7.2.3 Decomposition (biology only)

Answer 21 · Mark scheme

June 2023 | 8461/2H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.4	tangent drawn to the 15 °C curve at 2 days	do **not** accept if there is an incorrect tangent at 2 days	1	AO2 4.7.2.3 RPA10
	$\frac{6.5 - 4.5}{4}$	allow a tolerance of ± ½ small square	1	
	0.5		1	
	$\frac{0.5}{0.3} = 1.67$	allow any number of decimal places allow answer to student's incorrectly calculated rate divided by 0.3 do **not** accept if a unit is given	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.5	enzymes more active **or** more bacteria produced	allow enzymes work more quickly ignore enzymes work better	1	AO2
	lipids broken down more quickly	allow fats broken down more quickly	1	AO2
	<u>fatty acids</u> produced more quickly (which changes pH)	ignore glycerol do **not** accept incorrect products of lipid breakdown, eg amino acids or glycogen **alternative route** allow more (kinetic) energy (at higher temperature) (1) molecules move faster **or** more (successful) collisions **or** lipids broken down more quickly (1) <u>fatty acids</u> produced more quickly (which changes pH) (1)	1	AO1 4.2.2.1 4.7.2.3 RPA10

Total Question 4	17

4.7.2.3 Decomposition (biology only)

Answer 22 · Mark scheme

June 2024 | 8461/2H | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.1	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.
02.2	34 g/m^2/year		1	AO2 4.7.4.3

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

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

4.7.2.3 Decomposition (biology only)

Answer 22 · Mark scheme

June 2024 | 8461/2H | Original Q2

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.5	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 2	10

4.7.2.3 Decomposition (biology only)

Answer 23 · Mark scheme

June 2025 | 8461/1H | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.1	type 2 diabetes	ignore diabetes unqualified do **not** accept type 1 diabetes allow high blood pressure allow (coronary) heart disease **or** CHD allow cardiovascular disease **or** CVD allow stroke allow heart attack allow (osteo)arthritis allow cancer allow sleep apnoea allow liver disease allow other correct diseases ignore high cholesterol ignore heart failure	1	AO1 4.2.2.6 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.2	correct scale **and** *y*-axis labelled 'mean obesity rate in arbitrary units'		1	AO2 4.2.2.6
	all points plotted correctly	allow a tolerance of ± ½ small square allow 3 or 4 correct plots for **1** mark ignore letters	2	
	line of best fit drawn	ignore line extended beyond plotted points ignore line joined point to point with straight lines	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.3	scatter (diagram / graph)	allow scattergram	1	AO2 4.2.2.6

4.7.2.3 Decomposition (biology only)

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.4	positive correlation		1	AO2 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.5	(30 °C) (iodine solution remains yellow-brown because) starch is not present	allow (iodine solution remains yellow-brown because) all / the starch had been broken down	1	AO3
	(because) amylase / enzyme broke starch down	allow (because) the amylase / enzyme is active / working allow (because this is close to) the optimum / best temperature for amylase / enzyme	1	AO2
	(90 °C) (iodine solution blue-black because) starch was (still) present	allow (iodine solution blue-black because) starch was not broken down allow (because) the amylase / enzyme had no effect on starch	1	AO3
	(because) the amylase / enzyme has denatured	allow description of denaturation allow amylase / enzyme is destroyed / damaged do **not** accept amylase / enzyme has been killed	1	AO2 4.2.2.1 RPA5

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.6	test more temperatures between 10 °C and 60 °C		1	AO3 4.2.2.1 RPA5

4.7.2.3 Decomposition (biology only)

<table>
<tr><th>Question</th><th>Answers</th><th>Mark</th><th>AO / Spec Ref.</th></tr>
<tr><td>02.7</td><td>
<table>
<tr><th>Protease enzyme</th><th>Optimum pH</th><th>Organ where enzyme is active</th></tr>
<tr><td></td><td></td><td>stomach</td></tr>
<tr><td></td><td></td><td><u>small</u> intestine
allow ileum / duodenum</td></tr>
</table>
</td><td>1

1</td><td>AO2
4.2.2.1</td></tr>
</table>

Total Question 2	14

4.7.2.3 Decomposition (biology only)

Answer 16 · Examiner comments

June 2018 | 8461/1H | Original Q7

Question 7 (standard / high & high demand)

07.1 The most common reason why students who took the right route but did not achieve full marks for this question was incorrect rounding part way through the calculation, eg, a value of 266.6 being used rather than 266.7. It was common for students to write down a long string of decimal places in their calculations.

07.2 Generally this question was well answered with 48% achieving three or more marks. Most students made good attempts to gain full marks and often wrote at length. The test for protein was well known by the majority of students. However, the need to describe both the starch test and the test for glucose was not recognised by a significant number of students, who often gave only the former.

In the starch test, students needed to refer to iodine solution, rather than just iodine. When describing the test for sugars, the need for heat was often omitted, with some students only referring to a water bath, rather than a hot water bath. Some students confused the colour changes for positive results.

4.7.2.3 Decomposition (biology only)

Answer 16 · Examiner comments

07.3 Those students who started their answer with the idea that the lipase was breaking down fat into fatty acids (and glycerol) often went on to achieve full marks. However, many students attempted to describe their answers in terms of the neutralising effect of bile and thus resulted in no marks.

07.4 Many students gave the correct reason, referring to the subjective nature of the values. However, a significant number suggested that the measurement of time might be inaccurate due to a human error or a stop clock that was not accurate.

07.5 There were a number of students who confused the answers with that for question **07.3**. It was not uncommon for students to suggest that bile is an enzyme or described their answers in terms of the pH of bile or its effects on pH of the mixture.

Those students who recognised that the difference was due to emulsification of the fat in milk often went on to describe the consequence on surface area. However, the final mark was often poorly explained or lacked detail, with students often suggesting that the bile, rather than the lipase, broke down the fat more quickly.

4.7.2.3 Decomposition (biology only)

Answer 16 · Examiner comments

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

4.7.2.3 Decomposition (biology only)

Answer 17 · Examiner comments

November 2020 | 8461/2H | Original Q1

Question 1 (standard demand)

The topic was the decay of milk. **01.2** was not answered well, with just over one-third of the entire entry able to give 'fatty acids' as the product of lipid breakdown. Common errors were 'lipase' and 'amino acids'. 'Glycerol' was sometime stated in addition to fatty acids but inclusion of this forfeited the mark as it was not clear the student knew which one caused the pH to decrease.

In **01.4**, the need to control the volume of milk was frequently recognised, although some students forgot the aim of the investigation and qualified their answer unsuitably as cows' milk. Very few other correct answers were offered, the most common being the time of day when the pH should have been measured. A significant number of students repeated information already provided, including the duration of the investigation, or incorrectly suggested 'temperature' (which was the independent variable).

A large majority of students in **01.6** either misinterpreted the graph itself or the aim of the investigation. Thus, there were many descriptions of temperature and pH falling as time progressed. It was particularly common for students to interpret the y-axis as showing pH, despite it being clearly labelled as the time taken. Thus, fewer than one-third of students gained both marks here and many omitted any reference to data, as required by the question.

In **01.7** some students contradicted the information and described the reverse relationship, while others compared pH10 with pH5 rather than the time taken for reaction at 10 °C compared with that at 5 °C. Those who did gain the mark usually referred to enzyme activity, although some thought the enzyme would have denatured at 10 °C. Hardly any referred to a higher rate of division of microorganisms at the higher temperature.

Answer 17 · Examiner comments

November 2020 | 8461/2H | Original Q1

In **01.8** some students recognised that one possible cause was due to differences in composition between the different types of milk, often suggesting different amounts of lipid. Higher-attaining students also suggested different amounts of bacteria present or differences in the starting pH; however very few were able to offer two acceptable ideas.

4.7.2.3 Decomposition (biology only)

Answer 18 · Examiner comments November 2021 | 8461/2H | Original Q2

Question 2 (standard demand)

This question was about the effect of temperature on the decay of milk, as followed by monitoring changes in pH. It related to Required Practical Activity 10.

Success was very mixed in the different parts of this question. Fewer than half were able to suggest that a water bath (or an incubator) could be used for keeping the milk at a constant temperature of 20 °C and, despite pH being the dependent variable, many suggested that it might be a variable that should have been kept constant.

A quarter of the students scored full marks for plotting the graph of the results. The major error was to draw a straight line instead of a curve through the plotted points. Some students also forgot to label the *x*-axis. The sketched line showing expected results at the higher temperature of 25 °C proved difficult for most students: most did not draw a line starting at the same pH as that for 20 °C and many did not indicate a faster fall in pH with time. In addition, approximately one-fifth of students made no attempt at sketching the line on the graph.

Answer 19 · Examiner comments November 2021 | 8461/2H | Original Q4

Question 4 (standard demand)

This was a 6-mark extended response question about decay in a compost heap and the recycling of chemicals in the dead plant remains for re-use by living plants. Answers frequently lacked details of named substances and processes. The vast majority of students gave answers sufficient for Level 1, with 1 in 25 attaining Level 2 and none scoring full marks.

The most commonly given correct points related to the release of mineral ions from the dead plant matter, the production of carbon dioxide and the use of carbon dioxide in photosynthesis by the living plants, possibly to make a named organic substance such as glucose. Digestion by enzymes and respiration in microorganisms were referred to less often. Details of how living plants took in carbon dioxide (diffusion through stomata into leaves) or mineral ions (active transport via the root hairs) were rarely mentioned. Similarly, hardly any answers explained that living plants might use ions such as nitrate for making compounds like amino acids, proteins or DNA; or that phosphate could be used to make DNA.

Common errors included the microorganisms ‘eating’ the dead plant material, considering that worms and insects were microorganisms and that microorganisms released waste products as faeces. Often ‘carbon’ was release by the microorganisms rather than carbon dioxide, and ‘nutrients’ rather than mineral ions.

4.7.2.3 Decomposition (biology only)

Answer 20 · Examiner comments

June 2022 | 8461/2H | Original Q2

Question 2

This was the second of three questions common to both the Foundation and Higher Tier papers. The topic was biotic and abiotic factors that affected the populations of earthworms in two habitats.

02.1 It was evident that many students did not understand the difference between the two types of factors, with fewer than half scoring full marks for suggesting two abiotic and two biotic factors that could affect the size of an earthworm population. Appropriate answers for abiotic factors included water, oxygen, pH and temperature and, for biotic factors, food availability, predators and pathogens.

02.2 This was a 6-mark extended response question on planning an investigation to compare the number of earthworms per m^2 in two areas: a grass lawn and a farmer's field. Most students answered this very well, with almost a half scoring full marks. Answers typically included the use of the given chemical **X** to bring the worms to the surface, the use of a quadrat (sometimes of stated dimensions) placed randomly, with a suitable method for selection of random coordinates, counting the worms, repeating the procedure a large number of times, calculation of a mean and a comparison between the two areas. Points less frequently given included standardisation of the concentration and volume of the chemical, waiting a standard amount of time for the worms to come to the surface and collecting for a standard time period. Inappropriate points included the use of a transect or attempts at randomisation by throwing the quadrat.

4.7.2.3 Decomposition (biology only)

Answer 21 · Examiner comments

June 2023 | 8461/2H | Original Q4

Question 4

This question was about decay – both in the natural environment and in a laboratory investigation.

04.1 This was an extended response style of question about the recycling of the elements carbon and nitrogen in tree leaves that fall in the autumn.
High-level answers had to include the role of microorganisms, the release of carbon dioxide, the use of carbon dioxide by trees in photosynthesis and the release and use of nitrate ions for making a named organic nitrogen-containing compound in the trees.
Further details, such as the enzyme-catalysed digestion of compounds in the leaves by the microorganisms, the production of carbon dioxide by their respiration, the use of carbon dioxide by trees to make glucose / starch / cellulose (or other organic substance), the uptake of nitrate via the roots of trees using active transport, were also rewarded. Very few students (only 1 in 20) scored all of the 6 marks available and only a quarter gained half-marks. Many just wrote about 'carbon' (rather than carbon dioxide) and about 'nitrogen' (rather than nitrates) which impeded their ability to score marks.

04.2 Given the results in Table 1 which showed daily recordings of the pH of milk samples at three different temperatures over 4 days, students were required to suggest an improvement to the method of the investigation. Appropriate answers included measuring the pH values at shorter time intervals, the use of more than the three given temperatures, doing repeats at each temperature and calculating means at each time interval. However, only half of the students gave such answers; a common inadequate answer was 'do repeats' with no mention of calculating mean values.

04.3 In this question, students had to plot the data for the pH values obtained at 25 °C on the graph in Figure 6. Just over half scored all 3 marks. There were many errors in plotting points, for example the plotting of values 4.9 and 4.8 as, respectively, 1 small square below 5 and 2 small squares below 5 (the actual scale was 2 small squares for 0.1 units). Some failed to gain marks for plotting as they may have used dots instead of crosses but the dots were then obscured by the line drawn on top of them. Some drew straight lines, point-to-point, instead of following the instruction 'draw a line of best fit', and some drew sketchy lines.

04.4 This was a 4-mark calculation to compare two rates of reaction. Students were instructed to draw a tangent to the 15 °C line at 2 days. Some did not draw a tangent; others drew one that spanned just 1 or 2 cm each way rather than extending to each axis which would, conveniently, have met the y-axis at 6.5 and the x-axis at 4.0, giving a gradient of

$$\frac{6.5-4.5}{4} = 0.5$$

This then had to be divided by the gradient for 5 °C, given as 0.3 in the question, producing a final answer of 1.67 times faster.
Some missed the value 0.3 given in the question and calculated it for themselves. Others subtracted 0.3 from their calculated gradient for 15 °C. There were also errors in reading values from the graph and in forgetting to subtract the lower y-axis value from the higher one. A little over one-third scored full marks.

04.5 An explanation was required for why the pH changed more quickly at 15 °C than at 5 °C. The graph (and data in Table 1) showed quite clearly that the pH decreased with time, but some students wrote about an increase in pH. Some thought that enzymes denatured at 15

4.7.2.3 Decomposition (biology only)

Answer 21 · Examiner comments June 2023 | 8461/2H | Original Q4

°C, although how that would make the reaction faster was unclear. Although some understood that a decrease in pH must have been caused by acid production, very few thought that fatty acids would have been produced by the breakdown of lipids in the milk (‘amino acids’ being a more common answer). Only 1 in 6 students scored all 3 marks with just under a half scoring at least 2.

4.7.2.3 Decomposition (biology only)

Answer 22 · Examiner comments

June 2024 | 8461/2H | Original Q2

Question 2 (standard demand)

02.1 Some students appeared to be confused as to how decay happens, believing that the dead plant matter would decay itself. However, the majority of students did indicate that some sort of microorganism is involved in the decay process, gaining the third mark in the mark scheme. 40% of students gained at least 2 or more marks overall.

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 a mark 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.

02.2 Just under 70% of students identified the correct answer regarding the approximate biomass of moss that becomes biomass in primary consumers.

02.3 Half of students identified DNA as a substance that can be made using phosphates.

02.4 Around 65% of students could identify protein as the substance that can be made using nitrogen.

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4.7.2.3 Decomposition (biology only)

Answer 22 · Examiner comments June 2024 | 8461/2H | Original Q2

02.5 This was a well answered question, with almost all students gaining at least one mark, and 65% of those gaining three or more 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.

Again, students should be advised that repeating the information in the question will not gain credit, such as 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.

4.7.2.3 Decomposition (biology only)

Answer 23 · Examiner comments

Question 2 (standard demand)

02.1 Nearly 80% of students gave a creditworthy answer to this question, very often by referring to heart disease or to Type 2 diabetes. Heart failure was considered too vague and did not gain credit. The most frequently seen error was one of omission when students simply suggested 'diabetes' without the qualification of 'Type 2'.

02.2 Nearly 60% of students achieved full marks in this question, with a further 32% achieving 2 marks. MP1 was occasionally missed due to labelling the axis with 'y' only, omitting to include 'arbitrary units' or the use of an incorrect scale. It was sometimes difficult to determine the plotted points in responses, because they were either far too small or far too large or were concealed by a very thick line of best fit. Students should ideally be advised to give clear crosses for plotted points and to draw graphs in pencil so that alterations can be made without any ambiguity. MP4 was usually awarded for a straight line which went through or between the majority of the plotted points, regardless of whether some of these had been incorrect. The most common error was to draw the line of best fit through the origin. It was rare to see students drawing straight lines between individual points but, where this alone was given, they did not match MP4.

02.3 77% of students answered this question correctly, with the most common incorrect responses including 'dot', 'line' or 'spot' graph, or references to conclusions in respect of correlations shown, such as 'directly proportional'.

02.4 99% of students gained credit in this question.

02.5 Over half of all students scored full marks in this question, correctly interpreting the results and using their knowledge of the starch test to explain the results shown in the table. A lack of acknowledgement of the command word (explain) and confusion over the colour changes at each temperature (thinking that at 30 °C, the enzyme was not working) were the most common errors seen. A small proportion of students incorrectly stated that iodine solution showed the presence (or absence) of both starch *and* sugar, or that the amylase itself was being broken down. Unspecific references to 'carbohydrates' in place of starch and / or glucose were not creditworthy.

02.6 53% of students gained credit in this question.

02.7 60% of students scored full marks in this question, with a further 28% scoring 1 mark, most commonly MP1. A substantial number of students gave their answers the wrong way around and the 'pancreas' was often chosen mistakenly in the context of being a site of production, rather than activity of, protease. Unqualified references to 'intestine' were frequently seen but were not credited and a number of students think that the liver is an organ that manufactures, and is a site of, digestive enzyme activity.