AQA GCSE Biology | 8461

SPECIFICATION POINT 4.1.1.2

Animal and plant cells

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**25**
Available paper years	**2007–2022**

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.

4.1.1.2 Animal and plant cells

Answer 01 · Mark scheme

March 2007 | BLY1B | Original Q2 | Legacy

Two	**A**	limb is adapted for burrowing	**3**
	B	limb is adapted for flying	**4**
	C	limb is adapted for gripping branches	**1**
	D	limb is adapted for running	**2**

4.1.1.2 Animal and plant cells

Answer 02 · Mark scheme

Question 6

question	answers	extra information	mark
(a)	any **two** from: • transport up / against concentration gradient / low to high concentration • uses energy • use of protein / carrier		2
(b)	microvilli – large(r) surface area	accept have carriers	1
	mitochondria – release energy **or** make ATP	do **not** accept 'makes energy'	1
total			4

4.1.1.2 Animal and plant cells

Answer 02 · Mark scheme January 2008 | BLY3H | Original Q6 | Legacy

BLY3H

Answer 03 · Mark scheme June 2008 | BLY1AP | Original Q6 | Legacy

Six	**1**	**1**	**3**	**3**

4.1.1.2 Animal and plant cells

Answer 04 · Mark scheme

June 2010 | BLY2H | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	B large(r) surface / area **or** large(r) membrane	no mark for "B", alone accept reference to microvilli accept reasonable descriptions of the surface do **not** accept wall / cell wall ignore villi / hairs / cilia	 1
4(b)(i)	any **one** from: • insulin / hormone • enzyme / named enzyme	 if named hormone / enzyme must be correct for pancreas	1
4(b)(ii)	many ribosomes (ribosomes) produce protein **or** allow many mitochondria (1) provide energy to build protein **or** to make protein (1)	 accept insulin / hormone / enzyme named is (made of) protein accept ATP for energy	1 1
Total			**4**

4.1.1.2 Animal and plant cells

Answer 04 · Mark scheme

June 2010 | BLY2H | Original Q4 | Legacy

BLY 2H

4.1.1.2 Animal and plant cells

Answer 05 · Mark scheme

Question 1

question	answers	extra information	mark
1(a)(i)	A = (cell) wall B = cytoplasm	ignore cellulose	1 1
1(a)(ii)	any **one** from • bacterial cell / it has no nucleus • DNA free in cytoplasm • has no vacuole / no vesicles	 accept has DNA instead of a nucleus but **not** just has DNA allow no mitochondria ignore size ignore strands of DNA	1
1(b)(i)	yeast grows best / better / well **or** optimum temperature for yeast / more yeast present CO_2 made(by yeast) **or** respires / respiration (by yeast)	allow yeast works best / better / well allow fermentation (ignore anaerobic/aerobic)	1 1
1(b)(ii)	bacterium grows best / better / well / more bacteria present **or** optimum temperature for bacterium (lactic) acid made (by bacterium)	ignore micro organism / microbes allow works / respires best / better / well (ignore anaerobic/aerobic) do **not** allow wrong acid	1 1
1(b)(iii)	bread still rises (in acid conditions) **or** no need to control / monitor pH		1
Total			**8**

4.1.1.2 Animal and plant cells

Answer 05 · Mark scheme

June 2010 | BLY3H | Original Q1 | Legacy

BLY 3H

Answer 06 · Mark scheme

November 2010 | BLY1BP | Original Q7 | Legacy

Seven	**3**	**2**	**4**	**3**

4.1.1.2 Animal and plant cells

Answer 07 · Mark scheme

January 2011 | BLY2H | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)	any **two** from: • smaller vacuole • smaller / less cytoplasm • cell membrane / cytoplasm not (fully) against cell wall **or** cell membrane / cytoplasm (partly) pulled away from cell wall **or** space / liquid / sugar solution between cell membrane / cytoplasm and cell wall	correct names of cell components are required it = cell in sugar solution accept reverse only if clearly stated answer refers to cell in distilled water allow protoplasm for cytoplasm accept plasmolysed / flaccid / less turgid ignore reference to nucleus / water ignore explanations	2
7(b)	water passed / moved out (of cell) by osmosis / diffusion more concentrated (solution) outside **or** less concentrated (solution) inside **or** lower <u>water</u> concentration outside **or** higher <u>water</u> concentration inside	accept reverse answer if clearly refers to cell in distilled water assume reference to concentration refers to solute concentration unless answer refers to water concentration accept references to hypertonic / hypotonic solutions **or** water potential	1 1
Total			**4**

4.1.1.2 Animal and plant cells

Answer 07 · Mark scheme January 2011 | BLY2H | Original Q7 | Legacy

BLY2H

4.1.1.2 Animal and plant cells

Answer 08 · Mark scheme

Question 5

question	answers	extra information	mark
5	active transport needs energy **or** diffusion is <u>not</u> energy-dependent		1
	any **three** from: • (energy from) <u>aerobic respiration</u> • <u>more</u> respiration with $\underline{O_2}$ **or** <u>more</u> energy release with $\underline{O_2}$ • (aerobic) respiration / energy release occurs in mitochondria • xylose / other sugars absorbed by diffusion / not by active transport	do **not** allow anaerobic allow active transport is selective / specific **or** active transport can distinguish glucose and xylose	3
Total			**4**

4.1.1.2 Animal and plant cells

Answer 08 · Mark scheme January 2011 | BLY3H | Original Q5 | Legacy

BLY3H

4.1.1.2 Animal and plant cells

Answer 09 · Mark scheme

June 2011 | BLY2H | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a) E	because water enters (the cell / it / named cell)	do **not** accept salt / sugar / solution entering	1
	by osmosis / diffusion	if osmosis / diffusion not given accept concentration inside cell greater than outside cell assume concentration refers to solute concentration unless answer indicates otherwise allow water goes <u>up</u> the concentration gradient allow water goes <u>down its</u> concentration gradient do **not** accept if diffusion of salt / sugar	1
	through a partially permeable membrane	allow semi / selectively permeable membrane **or** description	1
1(b) E	(plant cells) have (cell) <u>wall</u>	accept animal cells have no (cell) <u>wall</u> ignore reference to cell membrane do **not** accept reference to other organelles **or** any implication that animal cells have a cell wall eg plant cells have a thicker cell wall	1
Total			**4**

4.1.1.2 Animal and plant cells

Answer 09 · Mark scheme June 2011 | BLY2H | Original Q1 | Legacy

BLY2H

Answer 10 · Mark scheme June 2011 | BLY2H | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	release energy	allow provide / supply / give energy do **not** accept produce / create / generate / make energy do **not** allow release energy for respiration	1
4(a)(ii)	contain half the (number of) chromosomes **or** contains one set of chromosomes **or** contains 23 chromosomes	allow genetic information / DNA / genes / alleles instead of chromosomes accept haploid	1
4(b)	any **two** from: • (stem cells) are unspecialised / undifferentiated • are able to become differentiated **or** can form other types of cell / tissue / organ • stem cells can / able to divide / multiply	allow description eg ‘no particular job’	2
Total			**4**

Answer 10 · Mark scheme June 2011 | BLY2H | Original Q4 | Legacy

BLY2H

4.1.1.2 Animal and plant cells

Answer 11 · Mark scheme

June 2011 | BLY3H | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5	D – many microvilli (1) Ex – provide large surface area (1) D – many capillaries / good blood supply (1) Ex – maintain concentration / diffusion gradient **or** quickly removes food (1) D – thin wall / one cell thick surface / capillaries near surface (1) Ex – short distance for food to travel (1) D – many mitochondria (1) Ex – provide energy / ATP for active uptake / transport (1)	**five** points made max **3** descriptions max **3** explanations allow villi are thin ignore villi are one cell thick	max 5
Total			**5**

4.1.1.2 Animal and plant cells

Answer 11 · Mark scheme

June 2011 | BLY3H | Original Q5 | Legacy

BLY3H

4.1.1.2 Animal and plant cells

Answer 12 · Mark scheme

January 2012 | BL1HP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	any **one** from: • cells • tissues • (live) animals / named	 allow mammals	1
6(a)(ii)	any **three** from: (to test for) • toxicity / check not poisonous / not harmful • interaction with other drugs • efficacy **or** to see if they work **or** check if they treat the disease • dosage **or** how much is needed	 allow side-effect allow converse allow converse	3

Question 6 continues on the next page . . .

Question 6 continued

question	answers	extra information	mark
6(b)	**argued evaluation** any **six** from: • statin can damage / muscles / kidneys / organs but cholesterol blockers don't • statins can cause death but cholesterol blockers don't • cholesterol blockers can interfere with action of other drugs but statins don't • statins are for a life time but cholesterol blockers are not • statins (might) reduce cholesterol to zero but cholesterol blockers only reduce it **or** statins reduce cholesterol more • statins better for people with inherited high cholesterol • cholesterol blockers better for people with dietary cholesterol problems • taking/using statins/cholesterol blockers is better than dying from heart attack or build up of fat in blood vessels or reduced blood flow	comparison can be written anywhere in evaluation allow use of 'only' for implied comparison for each point eg **only** statins damage muscles / kidneys / organs ignore liver if neither of the first 2 points are given accept for **1** mark statins are more dangerous than cholesterol blockers **or** statins have more side effects allow statins (might) stop membrane / hormone production but cholesterol blockers don't	6
Total			**10**

4.1.1.2 Animal and plant cells

Answer 12 · Mark scheme

January 2012 | BL1HP | Original Q6 | Legacy

COMPONENT NUMBER: BL1HP

4.1.1.2 Animal and plant cells

Answer 13 · Mark scheme

June 2012 | BL2HP | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)(i)	makes / produces / synthesises protein / enzyme		1
2(a)(ii)	plant cell has nucleus / vacuole / chloroplasts / chlorophyll **or** plant cell is much larger	'It' = plant cell allow correct reference to DNA or chromosomes allow plant cell has fewer ribosomes allow cellulose (cell wall)	1
2(b)(i)	200	correct answer with or without working gains **2** marks if answer incorrect, allow **1** mark for $\frac{2 \times 50{,}000}{500}$ **or** $\frac{100{,}000}{500}$ **or** 100	2
2(b)(ii)	bacterial cell is too small / bacterial cell about same size as a mitochondrion / 'no room'	ignore references to respiration	1
Total			**5**

4.1.1.2 Animal and plant cells

Answer 13 · Mark scheme

June 2012 | BL2HP | Original Q2 | Legacy

BL2HP

4.1.1.2 Animal and plant cells

Answer 14 · Mark scheme

January 2013 | BL2HP | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	mitochondrion / mitochondria	must be phonetically correct	1
3(a)(ii)	carbon dioxide / CO_2 water / H_2O	in either order accept CO2 but **not** CO^2 accept H2O **or** HOH but not H^2O	1 1
3(a)(iii)	diffusion high to low concentration through (cell) membrane **or** through cytoplasm	 allow down a concentration gradient do **not** accept cell wall	1 1 1
3(b)	ribosomes make proteins / enzymes using amino acids part A / mitochondria provide the energy for the process	 allow ATP do **not** accept produce or make energy	1 1 1
Total			**9**

4.1.1.2 Animal and plant cells

Answer 14 · Mark scheme

January 2013 | BL2HP | Original Q3 | Legacy

BL2HP

4.1.1.2 Animal and plant cells

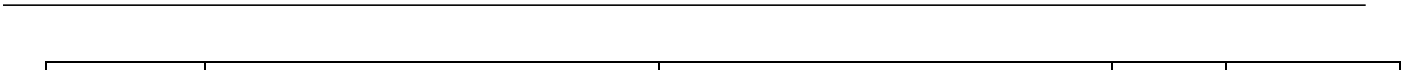
Answer 15 · Mark scheme June 2015 | BL2HP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	contract / shorten to churn / move / mix food	ignore relax do **not** allow expand accept peristalsis / mechanical digestion ignore movement unqualified	1 1	AO1 2.1, 2.2.1b,c, 2.1.1e
4(b)	400	acceptable range 390-410 allow 1 mark for answer in range of 39 to 41 allow 1 mark for answer in range of 3900 to 4100	2	AO2 2.2.1b,c
4(c)	to transfer energy for use by (aerobic) respiration **or** from glucose	allow to release / give / supply / provide energy do **not** allow to 'make' / 'produce' / 'create' energy allow to make ATP ignore to store energy do **not** allow anaerobic energy released **for** respiration = max 1 mark	1 1	AO1 2.1.1a, 2.6.1d
4(d)(i)	to make protein / enzyme	ignore 'antibody' or other named protein	1	AO1 2.1.1a
4(d)(ii)	too small / very small	allow light microscope does not have sufficient magnification / resolution allow ribosomes are smaller than mitochondria ignore not sensitive enough ignore ribosomes are transparent	1	AO2 2.1.1a
Total			**8**	

4.1.1.2 Animal and plant cells

Answer 15 · Mark scheme

June 2015 | BL2HP | Original Q4 | Legacy



4.1.1.2 Animal and plant cells

Answer 16 · Mark scheme June 2017 | BL1HP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)	idea that sexual reproduction results in genetic variation	allow converse if clearly referring to asexual reproduction allow reference to natural selection / evolution (if conditions change)	1	AO1 1.7.2a
7(b)(i)	any **four** from: • nucleus taken from egg (cell) (of female) **A or** cytoplasm (and membrane) discarded • nucleus removed / discarded from egg (cell) (from female) **B or** only cytoplasm (and membrane) kept • nucleus from **A** inserted into (enucleated / empty cell / cytoplasm from) egg (cell) (of female) **B** • fertilised / fertilisation (of 'hybrid' cell) • electric shock (after fertilisation) **or** grown into embryo	accept throughout: female **A** = person with faulty mitochondria female **B** = person without faulty mitochondria allow egg and sperm fuse allow cell division / mitosis	4	AO1/3 1.7.2a/c
7(b)(ii)	idea of cytoplasm / mitochondria of 'hybrid' / fertilised cell / embryo comes from cell / female / B with 'normal' mitochondria **OR** only the nucleus is used from A (1) the nucleus does not contain mitochondria **or** these faulty genes (1)		1 1	AO2 1.7.2c

4.1.1.2 Animal and plant cells

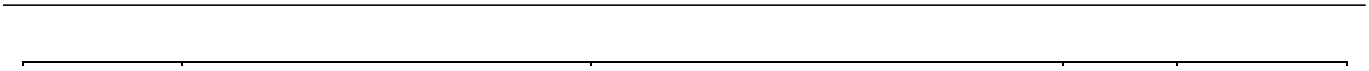
Answer 16 · Mark scheme

7(b)(iii)	any **one** from: • idea that child has unknown parentage **or** 3 parents • against religious beliefs / teachings • could cause (more) prejudice (against people with perceived imperfection)	ignore ref to unethical / immoral ignore ref to being against religion / God's will unqualified	1	AO3 1.7
Total			**8**	

4.1.1.2 Animal and plant cells

Answer 16 · Mark scheme

June 2017 | BL1HP | Original Q7 | Legacy



4.1.1.2 Animal and plant cells

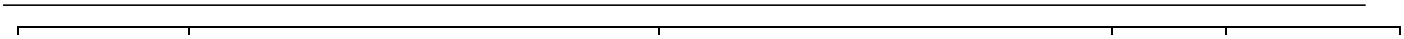
Answer 17 · Mark scheme June 2017 | BL2HP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)(i)	surface of organ(s)	allow covering / lining organ allow named example of an organ, e.g. surface of stomach allow the skin	1	AO1 2.2.1b/c
1(a)(ii)	**A** (cell) membrane **B** cytoplasm	allow phonetic spelling allow cell surface membrane do **not** allow (cell) wall	1 1	AO1 2.1.1a
1(b)	Protein synthesis		1	AO1 2.1.1a
1(c)	movement of <u>particles</u> / <u>molecules</u> from high to low concentration / down a concentration gradient	allow movement of ions / atoms ignore carbon dioxide or other named substance ignore along / across gradient ignore through membrane	1 1	AO1 2.1 2.1.2a/b
Total			**6**	

4.1.1.2 Animal and plant cells

Answer 17 · Mark scheme

June 2017 | BL2HP | Original Q1 | Legacy



4.1.1.2 Animal and plant cells

Answer 18 · Mark scheme June 2018 | 8461/1H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	(yes, because) the mass change (of egg 4) is much lower than the others	allow because it / egg 4 has gained (over) 50% less mass than the others allow it / egg 4 has gained 1.5 g and the others have all gained more than 3 g (unit required)	1	AO3 4.1.3.2
04.2		an answer of 4.6 / 4.56 / 4.558 scores **2** marks		AO2 4.1.3.2
	$\frac{75.7 - 72.4}{72.4} \times 100$	or equivalent	1	
	4.6 (%)	allow 4.558 / 4.56 (%) allow any correct rounding of 4.558011049723757	1	
04.3	(mass increased because) water entered by osmosis		1	AO2 4.1.3.2
	from a dilute solution in the beaker to a more concentrated solution in the egg (cell)	allow from an area of high water concentration in the beaker to an area of low water concentration in the egg (cell) allow ref to water potential allow ref to 'strong' and 'weak' solutions ignore along / across concentration gradient do **not** accept 'amount' in place of concentration	1	AO2 4.1.3.2
	through a partially permeable membrane	allow semi-permeable / selectively permeable membrane	1	AO1 4.1.3.2

4.1.1.2 Animal and plant cells

Answer 18 · Mark scheme

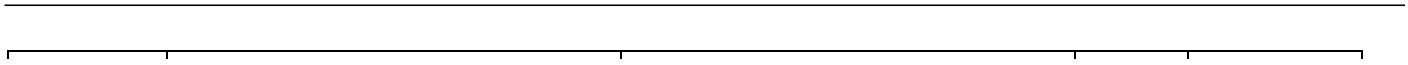
June 2018 | 8461/1H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	use five (or more) different concentrations of salt / sugar solution (in beakers)	allow any number of concentrations provided it is more than four	1	AO3 4.1.3.2
	(by) plotting percentage change (in mass / volume) on / using a graph		1	
	determine the concentration where the curve / line crosses the zero percentage change (in mass / volume)		1	
04.5	(ions are moved) from an area of low concentration to high concentration	allow against the concentration gradient allow in terms of solution do **not** accept molecules	1	AO2 4.1.3.3
	(by) active transport		1	AO1 4.1.3.3
	(which) requires using energy	do **not** accept idea of energy being created	1	AO1 4.1.3.3
Total			**12**	

4.1.1.2 Animal and plant cells

Answer 18 · Mark scheme

June 2018 | 8461/1H | Original Q4



4.1.1.2 Animal and plant cells

Answer 19 · Mark scheme

June 2018 | 8461/1H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	DNA / deoxyribo(se)nucleic acid		1	AO1 4.1.2.1
06.2	controls the movement of substances in / out of cell	ignore allows substances in / out of cell	1	AO1 4.1.1.2
06.3	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.		5–6	AO2 4.2.2.1 4.2.2.2 4.4.2.1
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.		3–4	
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.		1–2	
	No relevant content		0	
	Indicative content fewer (digestive) enzymes enter small intestine • (so) enzymes break down / digest less food • (therefore) less absorption of nutrients • (so) less glucose can enter the blood(stream) • (so) less (glucose) available for respiration • (less absorption of nutrients so) fewer amino acids can enter the blood(stream) • (so) less protein is made (for growth) ignore ref to bile less oxygen enters blood(stream) / reaches cells / organs / tissues (ignore body / lungs) • (so) less (oxygen) available for (aerobic) respiration • (so) less energy released / available (for growth) do **not** accept energy produced for **level 3**, reference to both enzymes and oxygen is required			

4.1.1.2 Animal and plant cells

Answer 19 · Mark scheme

June 2018 | 8461/1H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	put ages in (ascending / descending / chronological) order		1	AO2 4.2.2.5
	find middle value	allow a way of achieving this ie $\frac{(n+1)}{2}$ where n is the number of people	1	AO1 4.2.2.5
06.5	most common in young people **or** (more) don't live to an old age	allow causes of this	1	AO3 4.2.2.5
06.6		an answer of 10 584 scores **2** marks		AO2 4.2.2.5
	$0.98 \times 10\,800$	allow $\frac{98}{100} \times 10\,800$	1	
	10 584	allow 10 800 – (0.02 ×10 800) or equivalent	1	
06.7	take stem cells from patient (bone marrow / skin)		1	AO2 4.1.2.3
	remove / change / fix the faulty / CF gene		1	
	create embryo using these stem cells	allow idea of transferring nucleus from stem cells into enucleated egg / ovum	1	
	remove stem cells (from embryo) and stimulate / allow them to divide / differentiate into lung (cells)	if no other marks awarded allow **1** mark for therapeutic cloning	1	

4.1.1.2 Animal and plant cells

Answer 19 · Mark scheme

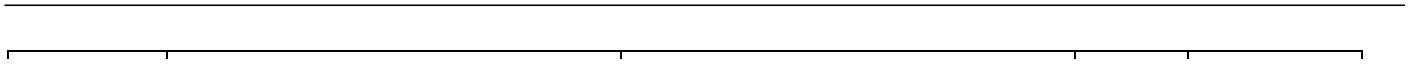
June 2018 | 8461/1H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.8	idea of ethical / religious concerns about use of embryos such as loss of (potential) human life	allow idea that embryo cannot give consent ignore idea of against human rights of embryo unqualified ignore religious / ethical reasons unqualified	1	AO3 4.1.2.3
Total			18	

4.1.1.2 Animal and plant cells

Answer 19 · Mark scheme

June 2018 | 8461/1H | Original Q6



4.1.1.2 Animal and plant cells

Answer 20 · Mark scheme June 2019 | 8461/1H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	controls the (activities of the) cell	allow contains genetic information / genes / DNA / chromosomes do **not** accept brain do **not** accept controls substances entering / leaving the cell	1	4.1.1.2 AO1
01.2	red blood cell / RBC **or** bacteria / prokaryote **or** xylem (cell)	allow erythrocyte ignore blood cell unqualified ignore platelets allow named examples of bacteria do **not** accept virus	1	4.2.2.3 4.1.1.1 AO1
01.3	cell shape is similar to cell in **Figure 1 and** nucleus present any **two** features correctly identified and labelled: • nucleus • (cell) membrane • cytoplasm • mitochondria / mitochondrion • ribosome(s)	ignore shading do **not** accept a cell wall drawn allow cell wall if drawn and correctly labelled do **not** accept other plant sub-cellular structures	1 1	4.1.1.2 AO2 8.2.1 AO1
01.4	any **one** from: • (cellulose cell) wall • chloroplast • (permanent) vacuole	ignore chlorophyll allow starch grain	1	4.1.1.2 AO1

4.1.1.2 Animal and plant cells

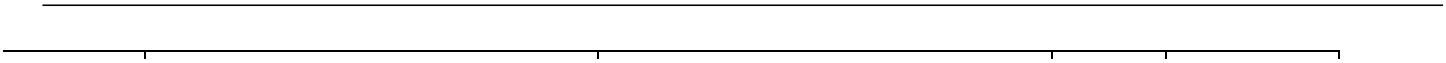
Answer 20 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5		an answer of (×) 400 scores **3** marks an answer of (×) 40 scores **2** marks		4.1.1.5 AO2
	24 (mm) **or** 2.4 (cm)	allow in range 23 to 25 (mm) **or** in range 2.3 to 2.5 (cm)	1	
	$\frac{24}{0.06}$ **or** $\frac{2.4}{0.06}$	allow correct calculation from their measurement of **X** to **Y** in the range 2.3 cm to 3.5 cm **or** 23 mm to 35 mm	1	
	(×) 400	allow correct magnification derived from their measurement in **mm** ignore rounding errors	1	
01.6	high(er) magnification high(er) resolution **or** high(er) resolving power	ignore bigger / zoom allow see more detail if neither mark awarded allow **1** mark for see smaller objects **or** see smaller sub-cellular structures allow 3D image	1 1	4.1.1.5 AO1
Total			**10**	

4.1.1.2 Animal and plant cells

Answer 20 · Mark scheme

June 2019 | 8461/1H | Original Q1



4.1.1.2 Animal and plant cells

Answer 21 · Mark scheme

June 2019 | 8461/2H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	same kingdom + phylum + class + order **or** same order **or** they have the top four groups the same	allow both Poales	1	AO3 4.6.4
05.2	**Rr / rR**	do **not** accept **RR** or **rr** ignore heterozygous do not accept homozygous	1	AO3 4.6.1.6 4.6.3.3
05.3	C^WC^W		1	AO3 4.6.1.6
05.4	parental genotypes / gametes correct for both parents: $C^R C^W$ $C^R C^W$ / C^R and C^W genotypes of offspring correctly derived in a Punnett square: C^RC^R C^RC^W C^WC^W correct identification of phenotypes from their cross: C^RC^R = red C^RC^W = pink C^WC^W = white	allow **R** and **W** throughout allow own symbols if defined allow correctly derived genotypes from incorrect gametes allow colours correctly identified from different offspring, only if pink and other colour(s) are given	1 1 1	AO2 4.6.1.6
05.5	answer correctly derived from Question **05.4** to match stated phenotypes	allow 50(%) if no offspring given in Question **05.4** allow to match genotypes if no phenotypes given	1	AO2 4.6.1.6

4.1.1.2 Animal and plant cells

Answer 21 · Mark scheme

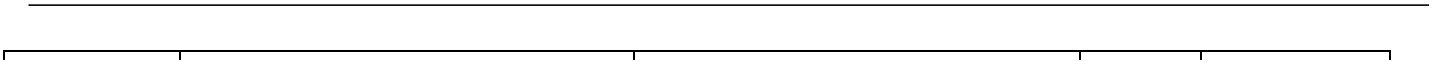
June 2019 | 8461/2H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	*(several groups)* so many / several plants can be produced	allow each (group) will give a new plant	1	AO1 4.1.2.3 4.6.1.3 4.6.2.5
	(nutrients) for making protein / amino acids **or** for making chlorophyll **or for providing** energy **or for respiration**	allow other examples do **not** accept making energy ignore for growth	1	
	(add hormones) so differentiation occurs **or** so roots / shoots develop	allow for the formation of different tissues / organs / named allow to stimulate cell division	1	
	(sterile conditions) to prevent growth / entry of microorganisms / named type **or** prevent decay / disease	ignore to kill microorganisms ignore contamination unqualified	1	
	(temperature = 20 ^{o}C) so optimum / good growth	allow reference to enzymes working well ignore enzymes not denatured ignore reference to pathogens / microorganisms	1	
05.7	(all new plants have been) produced by asexual reproduction / mitosis **or** produced without (fusion of) gametes	ignore produced from one parent	1	AO2 4.1 4.1.2.2 4.6.1.1 4.6.2.5
	(so) all are genetically identical / clones **or** all are C^RC^W **/** heterozygous	allow all are the same genotype / alleles / genes / DNA	1	
Total			**14**	

4.1.1.2 Animal and plant cells

Answer 21 · Mark scheme

June 2019 | 8461/2H | Original Q5



4.1.1.2 Animal and plant cells

Answer 22 · Mark scheme November 2021 | 8461/1H | Original Q1

01.1	any **two** from: • (microscope) slide • cover slip • dye / stain • (mounted) needle • pipette / dropper • scalpel • forceps / tweezers	allow named dye / stain ignore water ignore knife allow swab (to collect cells)	2	AO1 4.1.1.5 RPA1
01.2	eyepiece / lens	do **not** accept objective lens	1	AO1 4.1.1.5 RPA1
01.3	to focus (the image / cells)	allow to make the cells / image clear(er) allow to improve resolution (of the image) ignore to move the stage up / down do **not** accept reference to magnification	1	AO1 4.1.1.5 RPA1
01.4	any **one** from: • no cells in the field of view • slide not in the correct position • mirror not in correct position • (objective) lens not clicked into place **or** (objective) lens dirty • (student is) looking at a (large) air bubble • (the microscope is) not focussed	allow light / microscope not switched on / plugged in allow student did not stain the cells allow idea of magnification not being high enough	1	AO3 4.1.1.5 RPA1

4.1.1.2 Animal and plant cells

Answer 22 · Mark scheme

01.5	**Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar/different is made clear and (where appropriate) the magnitude of the similarity/difference is noted.	4–6	AO2
	Level 1: Relevant features are identified and differences noted.	1–3	AO1
	No relevant content	0	
	Indicative Content **Differences:** • red blood cell has no nucleus **or** plant cell has a nucleus • red blood cell has no cell wall **or** plant cell has a cell wall • red blood cell is a biconcave disc **or** there are many different shapes of plant cell • red blood cell contains haemoglobin **or** plant cells do not contain haemoglobin • red blood cells do not contain chlorophyll **or** plant cells (may) contain chlorophyll • red blood cell has no chloroplasts **or** plant cell has chloroplasts • red blood cell has no (permanent) vacuole **or** plant cell has (permanent) vacuole • red blood cells are (much) smaller than plant cells **Similarities:** both have: • cytoplasm • cell membrane • pigments (although they are different) ignore references to mitochondria and ribosomes for **Level 2**, consideration of both red blood cells and plant cells is required.		4.1.1.2 4.2.2.3

01.6	water enters (the cells) by osmosis / diffusion	allow water enters **and** the cell starts to swell ignore explanations of osmosis	1	AO2
	plant cell has a cell wall (which prevents it from bursting)	allow red blood cell has no cell wall (so it swells and bursts)	1	AO1 4.1.3.2 4.1.1.2
Total			**13**	

4.1.1.2 Animal and plant cells

Answer 22 · Mark scheme

November 2021 | 8461/1H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.

4.1.1.2 Animal and plant cells

Answer 23 · Mark scheme November 2021 | 8461/1H | Original Q4

04.1	$6O_2 + C_6H_{12}O_6 \rightarrow 6H_2O + 6CO_2$		1	AO1 4.4.2.1
04.2	mitochondria / mitochondrion		1	AO1 4.1.1.2
04.3	any **two** from: • movement / muscle contraction • keeping warm • active transport • building larger molecules	ignore reference to metabolism unqualified allow examples of movement allow examples of building larger molecules e.g. making (named) proteins / cellulose allow cell division ignore growth	2	AO1 4.4.2.1 4.4.2.3
04.4	any **two** from: • anaerobic produces lactic acid **and** aerobic does not • aerobic produces carbon dioxide **and** anaerobic does not • aerobic produces water **and** anaerobic does not • aerobic occurs (mainly) in the mitochondria **and** anaerobic does not • anaerobic releases less energy than aerobic	allow anaerobic creates an oxygen debt **and** aerobic does not allow anaerobic **only** occurs in the cytoplasm allow anaerobic releases less ATP (than anaerobic) do **not** accept anaerobic produces / makes / creates less energy	2	AO1 4.4.2.1
04.5	carbon dioxide ethanol		1 1	AO1 4.4.2.1

4.1.1.2 Animal and plant cells

04.6	pondweed takes in CO_2 for photosynthesis snail **and** pondweed are respiring producing CO_2	 if no other mark awarded allow rate of respiration = rate of photosynthesis for **1** mark	1 1	AO2 4.4.2.1 4.4.1.1
04.7	(no light so) no photosynthesis **or** plant is not taking in CO_2 **and** snail **and** plant are respiring and so are releasing CO_2		1	AO2 4.4.2.1 4.4.1.1
04.8	snail is being decayed / decomposed / broken down (by) decomposers / bacteria (in pond water / snail) (therefore) respiration (of decomposers / bacteria) releases CO_2	ignore being fed on allow fungi / microbes / microorganisms do **not** accept anaerobic respiration	1 1 1	AO3 AO2 AO3 4.7.2.2 4.4.2.1
Total			**14**	

4.1.1.2 Animal and plant cells

Answer 23 · Mark scheme

November 2021 | 8461/1H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.

4.1.1.2 Animal and plant cells

Answer 24 · Mark scheme

June 2022 | 8461/1H | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1		must be in this order		AO1 4.1.1.1 4.1.1.2
	nucleus	allow chromosomes allow plasmid	1	
	(site of aerobic) respiration	allow makes ATP **or** releases energy do **not** accept produces / makes / creates energy do **not** accept anaerobic respiration	1	
	(cell) membrane		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	photosynthesis	allow produce glucose / sugar allow to absorb (sun) light ignore contains chlorophyll	1	AO1 4.1.1.2 4.4.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	root (hair)	allow xylem / phloem / epidermis / meristem	1	AO1 4.1.1.3 4.2.3.1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	concentration of salt solution		1	AO1 4.1.3.2 RPA3

4.1.1.2 Animal and plant cells

Answer 24 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	to make sure **only** the potato mass was measured **or** if water / solution / liquid was left on (the potato), the mass would be higher / affected	allow (to) remove **excess** water / solution / liquid do **not** accept if water / solution / liquid was left on (potato) the mass would be lower ignore to remove water / solution / liquid on the outside / surface (of potato)	1	AO2 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	$\frac{0.2}{2.5} \times 100$ 8(%)	allow $\frac{2.7 - 2.5}{2.5} \times 100$ if no other mark awarded allow **1** mark for $\frac{2.5 - 2.7}{2.5} \times 100 = -8\ (\%)$	1 1	AO2 4.1.3.2 RPA3

4.1.1.2 Animal and plant cells

Answer 24 · Mark scheme

June 2022 | 8461/1H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7 Mark with 01.8		max **3** marks for bar chart		AO2 4.1.3.2 RPA3
	correct scale **and** axis labelled (concentration (of salt solution) in mol/dm^3)	scale must take up at least 50% of grid	1	
	all points plotted correctly	allow a tolerance of ± ½ small square allow 3 or 4 correct plots for **1** mark	2	
	curved line of best fit	ignore line extended beyond 0.4 mol/dm^3 ignore line joined point to point with straight lines	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.8 Mark with 01.7	correct answer from their line drawn on **Figure 1**	allow a tolerance of ± ½ small square ignore line joined point to point with straight lines if a line of best fit is drawn if no line of best fit is drawn, allow an answer in the range 0.31 – 0.33 (mol/dm^3)	1	AO2 4.1.3.2 RPA3

4.1.1.2 Animal and plant cells

Answer 24 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.9		allow 'pieces' for potato throughout		AO2 4.1.3.2 RPA3
	water moves out of cells / potato		1	
	by osmosis	allow by diffusion through a partially / selectively / semi permeable membrane	1	
	(because) the solution in the cells / potato is less concentrated than outside **or** (because) the solution in the cells / potato is more dilute than outside	allow (because) the solution outside the cells / potato is more concentrated than inside allow (because) the solution outside the cells / potato is less dilute than inside allow correct references to water concentration / potential ignore reference to amount of water or salt do **not** accept water moves from an area of high (solute) concentration to an area of low (solute) concentration	1	

Total Question 1		17

4.1.1.2 Animal and plant cells

Answer 25 · Mark scheme

June 2022 | 8461/1H | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	(cell) wall **or** (large / permanent) vacuole	ignore cellulose	1	AO3 4.1.1.1 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	rose black spot		1	AO1 4.3.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	$\frac{24 \times 60}{90}$ **or** $\frac{24}{1.5}$ 16	allow $\frac{1440}{90}$ do **not** accept if a unit is given	1 1	AO2 4.1.1.6 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	stomach		1	AO1 4.2.2.1

4.1.1.2 Animal and plant cells

Answer 25 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	biuret reagent		1	AO1 4.2.2.1 RPA4

4.1.1.2 Animal and plant cells

Answer 25 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
02.6	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5-6	AO3
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3-4	AO2
	Level 1: Relevant points are made. They are not logically linked.	1-2	AO1
	No relevant content.	0	4.2.2.1 4.2.2.4 4.2.2.5 4.2.2.6

	Indicative content
	• meat-free burgers contain more fibre
	  • aids digestion **or** prevents constipation
	• meat burgers contain more protein
	  • for growth
	• meat burgers contain more fat
	  • can cause CHD **or** heart attack **or** narrowing of arteries
	  • may lead to needing a stent
	  • may lead to obesity
	  • obesity is a risk factor for (type 2) diabetes
	• meat burgers contain more cholesterol
	  • can cause narrowing of arteries **or** CHD **or** heart attack
	  • may lead to needing a stent
	  • may need to take statins
	• both burgers have similar amounts of carbohydrate
	  • good for providing energy
	• no information on vitamins / minerals provided for either burger
	• meat burgers require animals to be farmed
	  • increase in methane in atmosphere
	  • (methane) contributes to global warming
	• meat burgers require animals to be slaughtered
	  • ethical issues
	• some people won't eat meat-free burgers
	  • (because) some people don't like the idea of eating fungus
	  • (because) some people prefer the taste of meat
	For **Level 2**, comparisons and linked reasons using own knowledge are required.		

Total Question 2		**12**

Answer 18 · Examiner comments

Question 4 (standard, standard / high & high demand)

04.1 Some students stated 'no, because they all increased'. This indicates that they only paid cursory attention to the numbers on the table and did not scrutinise them in sufficient detail.

Those who recognised that the result was anomalous did not go far enough in describing their reason, recognising that it was lower than the other values, rather than being much lower. A few students quoted values derived from the table but omitted the unit.

04.2 54% of students achieved both marks here. However common errors included using 75.7 as the denominator and incorrectly rounding their final answers. Whilst a specific number of significant figures were not required, when students round their values, they're expected to do so correctly.

04.3 The great majority of students recognised that this question involved osmosis and that water was passing into the egg. Students' description of the difference in concentration often had responses that referred to both solute concentration and water concentration, although most students realised that the (solute) concentration was greater inside the eggs than outside.

Answers that referred only to amount of water in the beaker / egg did not gain credit. A number of students omitted reference to the nature of the membrane and so failed to gain this final mark.

04.4 Many students found this question very demanding with 6% achieving at least one mark. Those who appeared to understand the basic ideas required still did not achieve marks as the question asked for details of the modifications required. Thus simply putting eggs into different concentrations of solution was insufficient; as was looking for an egg which gave no change in mass.

Due to the positive and negative changes, determining where any line crossed the *x*-axis was also insufficient as the axis could be drawn at different points on a graph, instead, students needed to refer to the zero-percentage change in mass.

04.5 This question was generally well answered with 40% achieving full marks. The majority of students recognised that the calcium ion concentration was higher in the cytoplasm and thus deduced that active transport was involved, requiring energy.

Once more, students who referred to energy being made, created or produced could not gain credit for the final marking point.

4.1.1.2 Animal and plant cells

Answer 19 · Examiner comments

June 2018 | 8461/1H | Original Q6

Question 6 (standard, standard / high & high demand)

Following updated research information and communications with parents of children with cystic fibrosis, we have decided to withdraw the question on this topic from this paper.

It has been decided not to provide a replacement question as it would not be possible to determine accurately how a replacement question would have performed if it had been part of the original paper taken in 2018.

The following statistics may help you to make effective use of the remainder of the paper:
Mean mark (maximum mark)

06.1	0.47 (1)
06.2	0.65 (1)
06.3	2.27 (6)
06.4	1.27 (2)
06.5	0.69 (1)
06.6	1.33 (2)
06.7	0.56 (4)
06.8	0.42 (1)
Question 6	7.66 (18)

Answer 22 · Examiner comments

November 2021 | 8461/1H | Original Q1

Question 1 (standard demand)

A lack of correct terminology was seen throughout Question 1. Many students were confused over the apparatus used in the Required Practical Activity (RPA) assessed in **01.1** and the RPA on microbial growth. Unrelated equipment given as an answer included a spatula, microwave and petri dish and a number of students gave answers such as microscope, stage and objective lens, indicating that they had not read the question correctly.

Commonly, weak descriptions of the idea of focussing were given in **01.3**, with many students referring incorrectly to magnification, or more commonly, ‘zoom’.

In **01.5**, most students were able to state some of the structures of a red blood cell and a plant cell, and some students were able to make comparisons between the two. Few students included similarities in their comparisons and several were confused about the different blood components, stating that red blood cells contain platelets, plasma and nuclei.

Confusion about the function of the cell wall was seen in **01.6**. Many students thought that the cell wall stops the movement of water into the cell and hence, this is the reason why the cell placed in water did not burst. Several students also thought that the plant cell already had lots of water inside of it and so would not take any additional water in, and therefore, would not burst.

4.1.1.2 Animal and plant cells

Answer 23 · Examiner comments November 2021 | 8461/1H | Original Q4

Question 4 (standard, standard/high & high demand)

As in previous years, many students continue to incorrectly refer to energy production and that respiration requires energy. Very few students scored full marks in **04.6** due to a lack of understanding that both the plant and the animal were respiring. Many students appeared to not read the question or graph correctly, and referred to there being card over the tube and hence, no photosynthesis. Many students thought that the carbon dioxide concentration stayed the same because the light intensity was changing. A number of students described the 'lid' of the tube as not being held on securely and therefore, allowing the escape of carbon dioxide.

An unusually high number of students referred to the black paper in the investigation as black pepper, causing some confusion when it came to answering associated questions.

In **04.8**, a common misconception seen was that cells continue to respire once an organism has died and that as a body decomposes, the body itself releases carbon dioxide, rather than the carbon dioxide being released from respiration of microorganisms.

4.1.1.2 Animal and plant cells

Answer 24 · Examiner comments

June 2022 | 8461/1H | Original Q1

Question 1 (Standard demand)

01.1 Students' knowledge of sub-cellular structures was generally well evidenced in this question, with over 70% of students scoring full marks; however, the common error of referring to energy production / creation in the mitochondria was still seen. In addition, students often referred to energy being released 'for respiration', which is not creditworthy. There was also frequent confusion between cell membranes and cell walls.

01.2 Over 90% of students were able to correctly reference the function of chloroplasts. A few students simply stated that the role was to make the cell or plant green, which was insufficient.

01.3 65% of students were able to name a plant cell that was lacking in chloroplasts, however, several incorrect answers giving other types of cell (such as a bacterium), or other sub-cellular structures, were commonly seen.

01.4 Nearly 85% of students were able to correctly identify the independent variable in the investigation.

01.5 It was clear that many students had carried out the Required Practical Activity on osmosis assessed in this question. The three quarters of students who gained credit in this question were able to articulate the need to remove excess water, or that any extra water would add to the mass recorded, rather than just repeat the stem of the question.

01.6 The vast majority of students were able to use the equation provided to correctly calculate the percentage increase. Some students used an alternative method which would have led to a correct value if they had remembered to subtract 100 from their final answer. Students should therefore be reminded that, in questions where they are given an equation to use, they should use that equation to avoid missing out on vital marks.

01.7 Graph drawing skills still prove challenging for some students, and many make their lives more difficult by using unusual scales or, as often seen in this question, by shifting their *x*-axis scale. These ideas in themselves are acceptable, but only when the scales remain even and the zero is clearly identified, which often, they were not. While many students were able to plot accurately, a number incorrectly transcribed the reading of (0.3, 0.4) from the table, instead plotting the *x*-value at 4.0. Many students were unable to draw a correct curve of best fit, either drawing a straight line, or a curve that did not hit all of the points, or that was broken or 'feathered'. Curves of best fit should fall within ½ a small square of all of the points and should be a single, unbroken line. Students should also be reminded that their scale should take up at least 50% of the grid space provided.

01.8 Over a third of students understood the idea that where the curve crosses the x-axis is where there is no net loss or gain of water in osmosis, however, some students did not gain credit because of inaccurate readings. Again, readings must be within ½ a small square to be creditworthy.

4.1.1.2 Animal and plant cells

Answer 24 · Examiner comments June 2022 | 8461/1H | Original Q1

01.9 As in previous years, many students continue to make the same error when describing 'concentration' in osmosis explanations and less than 45% of students gained full marks in this question. If water concentration is not specified, it is assumed that solute concentration is being described and this often results in an incorrect answer (for example, 'water moves from an area of high concentration to an area of low concentration' is **not** correct). Some students correctly articulate themselves in terms of water concentration, but then go on to contradict themselves with incorrect references to concentration gradients (again, solute is assumed unless water is specifically quoted).

4.1.1.2 Animal and plant cells

Answer 25 · Examiner comments — June 2022 | 8461/1H | Original Q2

Question 2 (Standard demand)

02.1 95% of students correctly identified 'vacuole' or 'cell wall' as features found in plant and fungal cells but not in animal cells. The most common error was to give 'membrane' or 'nucleus', though such answers were fairly rare.

02.2 95% of students were able to identify the fungal disease rose black spot.

02.3 While many students were able to carry out a simple calculation to find the number of times a fungal cell would divide in 24 hours, some students made errors, including stating that one and half hours is 1.3 hours or reversing the numerator and denominator in their calculation. A small but significant proportion of students went further, perhaps deciding that the sum they had completed had not been sufficient to gain the 2 marks or had simply misread the question. These students attempted to determine the total number of cells there would be in 24 hours and frequently calculated 2^{16}.

02.4 Generally, the stomach was correctly identified as the site where protein was digested in the human digestive system**,** although a significant number of students selected large intestine.

02.5 Over 90% of students correctly identified Biuret regent as able to identify the presence of protein.

02.6 The extended response question was well attempted by most students, however, some failed to acknowledge the instruction to 'use your own knowledge', and gave lengthy comparisons about the nutrient content of both burgers, without referring to why this did, or did not, contribute to a balanced diet, thus limiting these students to level 1. Some students did not make effective comparisons, using statements such as 'high in fat' rather than 'higher in fat' or simply repeated figures from the table, therefore, gaining no credit. Some students who did go on to attempt to use their own knowledge gave only vague statements about the burger being 'better for the body' and many confused the significance of each food component, stating that fat is needed for muscle growth and that excess cholesterol causes obesity, for example. Many students understood that protein is needed for muscle development but failed to go on to use the term 'growth' to gain credit. A few students wasted time by giving fairly detailed, (but irrelevant in terms of the question) accounts of enzymic digestion of carbohydrates, fats and proteins in the digestive system. A small number of students offered a valued judgement as to which type of burger might be 'better overall'.

Answer 25 · Examiner comments — June 2022 | 8461/1H | Original Q2

However; as the evaluation was taken to be the comparison between the nutritional content of the two burgers, this was not required and so was ignored.