AQA GCSE Biology | 8461

SPECIFICATION POINT 4.2.2.7

Cancer

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**22**
Available paper years	**2007–2024**

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.

4.2.2.7 Cancer

Answer 01 · Mark scheme March 2007 | BLY1A | Original Q4 | Legacy

Four	**A**	total water loss from the body	**1**
	B	water loss from the kidneys	**2**
	C	water loss from the lungs	**4**
	D	water loss from the skin	**3**

Answer 02 · Mark scheme November 2007 | BLY1A | Original Q1 | Legacy

One	**A**	a hypothesis	**1**
	B	a survey	**4**
	C	an independent variable	**3**
	D	an observation	**2**

Answer 03 · Mark scheme November 2007 | BLY1A | Original Q6 | Legacy

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

Answer 04 · Mark scheme June 2008 | BLY1AP | Original Q3 | Legacy

Three	**2**	**2**	**2**	**2**

Answer 05 · Mark scheme June 2009 | BLY1AP | Original Q7 | Legacy

Seven	**4**	**1**	**1**	**4**

Answer 06 · Mark scheme June 2009 | BLY1AP | Original Q8 | Legacy

Eight	**3**	**4**	**1**	**1**

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Answer 07 · Mark scheme

June 2009 | BLY1H | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)	any **three** from • FSH <u>used / given / injected</u> • LH <u>used / given / injected</u> • FSH causes eggs to mature • LH stimulates egg release	if oestrogen **or** progesterone <u>used</u> = max 2 if both oestrogen **and** progesterone <u>used</u> = max 1 ignore <u>effects</u> of oestrogen and progesterone	3

Question 7 continues on next page…

BLY1H

Question 7 Continued

question	answers	extra information	mark
7(b)	max **two** pros for IVM / it from: • cheaper • less hormones used • ovarian hyperstimulation **or** the syndrome less likely • IVM treatment shorter	allow max **two** cons for IVF allow 'it's safer for the mother' ignore 'more risks' unqualified	2
	con for IVM • small risk of abnormal sex chromosomes / birth defects / baby cancer	allow max **one** pro for IVF allow 'more risk to baby' ignore 'more risks' unqualified	1
	evaluation eg IVM better because less risk to mother outweighs small risk to baby **or** IVF better because no risk to baby and a small risk to mother	must include an appreciation that there are two sides to the argument	1
Total			**7**

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Answer 08 · Mark scheme November 2009 | BLY1AP | Original Q1 | Legacy

No matching mark scheme was available in the supplied archive for this question.

Answer 09 · Mark scheme November 2009 | BLY1BP | Original Q6 | Legacy

Six	**3**	**1**	**2**	**2**

Answer 10 · Mark scheme March 2010 | BLY1AP | Original Q5 | Legacy

Five	**4**	**4**	**3**	**2**

Answer 11 · Mark scheme June 2010 | BLY1AP | Original Q7 | Legacy

Seven	**1**	**2**	**1**	**1**

Answer 12 · Mark scheme November 2010 | BLY1AP | Original Q2 | Legacy

Two	**A**	carbon monoxide	**3**		
	B	carcinogen	**2**		
	C	nicotine	**1**		
	D	oxygen	**4**		
	A		**B**	**C**	**D**

Answer 13 · Mark scheme November 2010 | BLY1AP | Original Q9 | Legacy

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

4.2.2.7 Cancer

Answer 14 · Mark scheme

Question 5

question	answers	extra information	mark
5(a)	any **two** from: • arthritis • diabetes • high blood pressure • heart / blood vessel disease	ignore descriptions ignore cholesterol	2
5(b)	(No) any **two** from: • patterns for cancer and obesity not identical • data only shows a link • some other factor(s) involved	allow descriptions of differences from graph	2
5(c)	any **two** from: • increases metabolic rate • exercise needs energy **or** exercise increases energy used by body • fat (stores) used / broken down **or** less food / energy converted into body mass / fat	accept increase BMR ignore increased respiration allow fat burned ignore burns energy / calories	2
Total			**6**

4.2.2.7 Cancer

Answer 14 · Mark scheme

January 2011 | BLY1H | Original Q5 | Legacy

BLY1H

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Answer 15 · Mark scheme

January 2011 | BLY2H | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	half / 50% sperm have X (chromosome) **or** half / 50% sperm have Y (chromosome) all eggs have X (chromosome)	penalise incorrect use of gene / allele once only annotated genetic diagram could gain **2 marks**	1 1
4(b)	screening	ignore selection	1
4(c)	any **three** from: advantages:**(max 2**) • (girl / children / women) don't / less likely to get / inherit (breast) cancer / this / the disease • future generations get less cancer **or** less likely to have the allele • less expensive (for NHS) than treating cancer disadvantages:**(max 2)** • (wrong / immoral to) reject / kill embryos • possible harm to embryo (that is implanted) / miscarriage • possible harm to mother (due to operational procedure) argued conclusion	max **2** if only advantages **or** only disadvantages discussed do **not** accept reference to allele alone for this point ignore wrong / immoral / religious argument unqualified ignore reference to termination allow reference to needing hormone treatment must refer to **both** advantages and disadvantages and must be at end of answer	3 1
Total			**7**

4.2.2.7 Cancer

Answer 15 · Mark scheme

January 2011 | BLY2H | Original Q4 | Legacy

BLY2H

Answer 16 · Mark scheme

June 2011 | BLY1AP | Original Q4 | Legacy

Four	**2**	**2**	**4**	**1**

4.2.2.7 Cancer

Answer 17 · Mark scheme

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			

Answer 17 · Mark scheme

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 $10\,800 - (0.02 \times 10\,800)$ 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	

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Answer 17 · Mark scheme

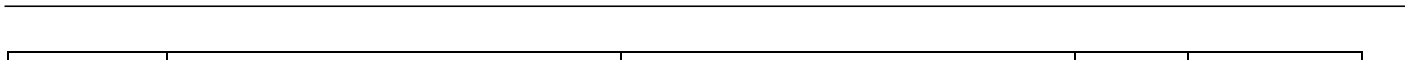
June 2018 | 8461/1H | Original Q6

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**	

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Answer 17 · Mark scheme

June 2018 | 8461/1H | Original Q6



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Answer 18 · Mark scheme

June 2019 | 8461/1H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	any **one** from: • (chemical which) catalyses / speeds up reactions in living organisms • (chemical which) catalyses / speeds up biological reactions	allow biological catalyst allow reduces activation energy (of reactions) in living organisms	1	4.2.2.1 AO1
	idea of specificity **or** (is a) protein	allow made of amino acids	1	
08.2	salivary gland	ignore mouth ignore liver	1	4.2.2.1 AO1
	small intestine	allow duodenum / ileum ignore intestine unqualified do **not** accept large intestine	1	

4.2.2.7 Cancer

Answer 18 · Mark scheme

June 2019 | 8461/1H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	reduced / no enzyme production / release (from pancreas)	allow named example of enzymes ignore reference to hormones	1	4.2.2.1 4.4.2.3 4.4.2.1 AO2
	food is not broken down fully **or** food is not digested fully	allow no food is broken down / digested allow example	1	
	plus any **one** of the following routes for max **2** marks:	mark as pairs		
	less glucose / sugar absorbed **or** less glucose / sugar passes into the blood(stream)		1	
	(so) less glucose available for respiration so more (body / stored) fat used up in metabolism / respiration **or** fewer amino acids absorbed **or** fewer amino acids pass into the blood(stream) (1) (so) fewer amino acids are available for making new protein for repair / replacement (1) **or** fewer fatty acids absorbed **or** fewer fatty acids pass into the blood(stream) (1) (so) fewer fatty acids available so less fat is stored in the body (1) **or** chemotherapy / radiotherapy causes nausea / loss of appetite (1) (so) less intake of food (1)	ignore glycerol ignore glycerol	1	

4.2.2.7 Cancer

Answer 18 · Mark scheme

June 2019 | 8461/1H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	(cancer) cells cannot divide **or** (cancer) cells are destroyed / killed	do **not** accept reference to the drug killing (cancer) cells	1	4.2.2.7 AO3
	(so) tumour doesn't grow / get bigger **or** tumour less likely to spread **or** tumour less likely to form secondary tumours	allow cancer cells less likely to spread / metastasise	1	
	(because) enzymes **A** and **B** are not working / active / effective / present **or** (because) enzymes **A** and **B** are inhibited	allow reference to both enzymes ignore enzymes unqualified	1	
08.5	(functional) enzyme **B** would still be made / present	allow enzyme **B** is not inhibited	1	4.2.2.7 AO3
	(therefore cancer) cells would still divide uncontrollably **or** (therefore cancer) cells would not be destroyed **or** (therefore) the tumour will (continue to) grow / get bigger / spread **or** the tumour will form secondary tumours		1	
08.6	any **two** from: • to avoid the patients thinking they feel better with the drug **or** to take into account a psychological effect • as a control / comparison • to avoid bias(ed results)	ignore to make it more valid unqualified ignore to provide an independent variable	2	4.3.1.9 AO2
08.7	testing on volunteers with the disease		1	4.3.1.9 AO1

4.2.2.7 Cancer

Answer 18 · Mark scheme

June 2019 | 8461/1H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.8	monoclonal antibody is attached to radioactive substance / toxin / drug / chemical monoclonal antibody will (only) attach to / target (antigen on) cancer cells / tumour (so) radioactive substance / toxin / drug / chemical will (bind to cancer cells and) stop them growing / dividing	allow radioactive substance / toxin / drug / chemical will kill / destroy the cancer cells **OR** monoclonal antibody interrupts the cell cycle **or** monoclonal antibody aids immune response (1) monoclonal antibody will (only) target cancer cells / tumour (1) (so) action of monoclonal antibody stops cancer cells growing / dividing **or** (so) action of monoclonal antibodies helps immune system kill / destroy cancer cells (1)	1 1 1	4.3.2.2 AO1 AO1 AO1
Total			**19**	

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Answer 19 · Mark scheme

November 2020 | 8461/1H | Original Q7

The full source mark scheme begins on page 28. Follow original question 7 in that document.

4.2.2.7 Cancer

Answer 20 · Mark scheme

November 2021 | 8461/1H | Original Q7

07.1	cells grow / divide abnormally / uncontrollably	ignore mutation	1	AO1 4.2.2.7

07.2	has spread to other parts / organs of the body **or** has spread to the liver / lung **or** has formed a secondary tumour	allow tumour has metastasised	1	AO2 4.2.2.7

07.3	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO2 4.2.2.3 4.3.1.6 4.4.2.1 4.4.2.2
	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: *Tiredness* • fewer red blood cells • so less haemoglobin • so less oxygen transported around the body • so less (aerobic) respiration can take place • so more anaerobic respiration takes place • less energy released for metabolic processes **or** less energy released so organs cannot function as well • lactic acid produced (during anaerobic respiration) causes muscle fatigue *Frequent infections* • fewer white blood cells / phagocytes / lymphocytes • so fewer antibodies produced **or** less phagocytosis • so fewer pathogens / bacteria / viruses killed *Bleeding* • fewer platelets • so blood does not clot as easily For **Level 3**, reference to all three symptoms must be made.		

07.4	anti-B antibodies in patient / receiver / recipient will bind to type B antigens on person's / donor's red blood cells		1	AO3
	(so) red blood cells clump together and are wider than capillaries **or** (so) red blood cells clump together and block capillaries	allow (so) red blood cells clump together and capillaries burst	1	AO3
	(so) cells have reduced supply of oxygen / glucose **or** (so) cells can't respire	ignore references to energy if no other mark awarded allow antibodies from patient and antigens from donor are matching / complementary shapes for **1** mark	1	AO2 4.2.2.3 4.3.1.6
07.5	no antigens (on type O red blood cells)		1	AO3 4.2.2.3 4.3.1.6
	(so) antibodies cannot bind (to the antigens / red blood cells)	allow no clumping (of red blood cells)	1	
07.6	hepatitis C infection		1	AO3 4.2.2.3 4.3.1.1
07.7	no / less bile reaches the small intestine	ignore less / no bile produced	1	AO3
	(so) less / no emulsification of fat	allow correct description of emulsification do **not** accept reference to chemical digestion	1	AO1
	(so) smaller surface area for lipase to break down fat		1	AO1
	pH of small intestine is not neutralised / alkaline	allow pH of small intestine is acid / low	1	AO2
	(so) lipase is not at its optimum pH to break down fat	pH (of small intestine) is not suitable for lipase to break down fat	1	AO2 4.2.2.1
Total			**19**	

4.2.2.7 Cancer

Answer 21 · Mark scheme

June 2023 | 8461/1H | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.1	any **two** from: • *(effect)* muscle fatigue **or** oxygen debt occurs (1) *(reason)* caused by (build-up of) lactic acid (1) • *(effect)* (continued) heavy / deep / fast breathing (1) *(reason)* to provide the oxygen needed to break down (built-up) lactic acid (1) • *(effect)* (continued) increased heart rate (1) (*reason)* to provide the oxygen needed to break down (built-up) lactic acid (1) • *(effect)* fewer / weaker muscle contractions (1) *(reason)* (because) less energy is released / available (1)	mark as pairs allow muscle cramp ignore fatigue / cramp unqualified allow to repay the oxygen debt allow to repay the oxygen debt do **not** accept energy being produced / made / created	4	AO1 4.4.2.1 4.4.2.2

Answer 21 · Mark scheme

Question	Answers	Mark	AO / Spec Ref.
04.2	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5-6	AO3 4.4.2.2
	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	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1-2	
	No relevant content.	0	
	Indicative content • test a group of athletes • use at least two different types / intensities of exercise • get each athlete to do all exercises **or** have a large (≥30) group doing each exercise • record heart rate for each athlete before and after exercise **or** calculate increase in heart rate for each athlete after exercise • calculate the mean increase in heart rates for each type / intensity of exercise • compare mean increase in heart rates for each type / intensity of exercise • control variables: o same (biological) sex **or** mix of sexes o same level of activity / exercise o same age o same caffeine / drug / medicine intake o same length of time for exercise o no health issues / illnesses o return to resting heart rate before each exercise		

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.3	(athlete is) faster / stronger	allow description of improved performance allow reference to increased stamina / endurance	1	AO2 4.4.2.1 4.4.2.2
	(because more muscle mass so) more / stronger muscle contractions		1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.4	hybridoma		1	AO1 4.3.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.5	any **three** from: • (cell) is cloned • many (identical) cells are produced • all the cells make the same antibody • the antibody is (collected and) purified	 ignore name of cell allow many clones are produced	3	AO1 4.3.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.6	a monoclonal antibody only binds to the anabolic steroid		1	AO2 4.3.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.7	to show that the test is working	allow to prevent a false negative (result) ignore to show there are free / remaining monoclonal antibodies	1	AO3 4.3.2.1 4.3.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.8	*evidence* no blue / visible dye (in control area) *reason* (because) no (free) monoclonal antibodies bound to control area **or** (because) there were no (free) monoclonal antibodies on the end of the (test) strip	allow no line(s) (in control area) allow no colour change (in control area) allow the (free) monoclonal antibodies did not move up the test strip allow urine did not move up the test strip	1 1	AO3 4.3.2.1 4.3.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.9	D		1	AO3 4.3.2.1 4.3.2.2

Total Question 4	**21**

4.2.2.7 Cancer

Answer 22 · Mark scheme

June 2024 | 8461/1H | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.1	any **one** from: • (cell **or** sub-cellular structures) grows • increase in (number of) sub-cellular structures • increase in (number of) mitochondria • increase in (number of) ribosomes	do **not** accept nucleus ignore increase in cell parts / components allow increase in respiration allow increase in protein (synthesis) do **not** accept changes that occur as the cell divides	1	AO1 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.2	(cell) membrane		1	AO1 4.1.2.2 4.1.1.2

4.2.2.7 Cancer

Answer 22 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.3		allow use of π button on calculator for 3.14 allow use of $\frac{22}{7}$ for 3.14		AO2 4.1.1.5
	substitution length = $\frac{24\ 500\ 000}{3.14 \times 125^2}$		1	
	(length =) 499.363 (nm)	allow 499 (nm)	1	
	recall of equation magnification = $\frac{\text{image size}}{\text{real size}}$		1	
	correct conversion of mm to nm **or** nm to mm (4 mm = 4 000 000 nm)	allow conversion at any point	1	
	$\frac{4\ 000\ 000}{499.363}$	allow use of correctly rounded calculated value for length	1	
	×8010	allow ×8010.205 do **not** accept if unit given allow an answer consistent with an incorrectly rounded / calculated value for length	1	

Answer 22 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.4	chromosomes cannot be pulled (by the fibres) to each end of the cell (so) nucleus cannot divide	ignore chromosomes cannot be separated unqualified allow **two** (genetically identical) cells cannot be formed ignore cytokinesis ignore the cell cannot divide	1 1	AO3 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.5	tumour cannot grow / proliferate / spread	allow stops secondary tumours forming allow stops metastasis ignore stops uncontrolled cell division do **not** accept the cancer / tumour cannot become malignant	1	AO2 4.1.2.2 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.6	testing the drugs on live tissues in a laboratory		1	AO1 4.3.1.9

Total Question 8	**12**

4.2.2.7 Cancer

AQA

GCSE
BIOLOGY
8461/1H

Paper 1 Higher Tier

Mark scheme

June 2020

Version: 1.0 Final

206G8461 1H/MS

4.2.2.7 Cancer

MARK SCHEME – GCSE BIOLOGY – 8461/1H – JUNE 2020

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

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Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement
- the Assessment Objectives, level of demand and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening and underlining

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution?

[1 mark]

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system.

[2 marks]

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. Full marks can, however, be given for a correct numerical answer, without any working shown.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation ecf in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

3.9 Ignore

Ignore is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

3.10 Do <u>not</u> accept

Do **not** accept means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1: Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

Step 2: Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this.

The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

4.2.2.7 Cancer

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1		allow correct chemical symbols ignore any attempt at balancing equation ignore light / chlorophyll		AO1 4.4.1.1
	before arrow carbon dioxide **and** water	either order	1	
	after arrow glucose	ignore sugar / carbohydrate do **not** accept starch	1	
01.2		ignore description of subsequent parts of the photosynthesis reaction		AO1 4.1.1.2 4.4.1.1
	<u>light</u>	allow sun<u>light</u> ignore sun	1	
	(light) is captured / trapped / absorbed by chlorophyll / chloroplasts	allow (light) is used by chlorophyll / chloroplasts	1	
01.3	$\frac{18.5 + 19.3 + 19.5}{3}$ **or** $\frac{57.3}{3}$		1	AO2 4.4.1.2 RPA 6
	19.1 (cm^3/hour)	allow an answer correctly calculated using only two correct values	1	
01.4	a ring around 14.2	allow clear indication of correct result	1	AO3 4.4.1.2 RPA 6

4.2.2.7 Cancer

01.5	any **one** from: • scale / value was misread • there was air / oxygen in the syringe / measuring cylinder / apparatus • the lamp / light was moved • temperature changed • had different mass / length of pondweed • pondweed had not acclimatised	ignore human error ignore references to counting bubbles or time allow measurement error allow light intensity changed ignore different bulb / lamp unqualified	1	AO3 4.4.1.2 RPA 6
01.6	did not use it in calculation (of mean)		1	AO3 4.4.1.2 RPA 6
01.7	any **one** from: • light (intensity) • carbon dioxide (concentration) • pondweed size / amount • pondweed species	do **not** accept temperature ignore time allow distance / power / colour of lamp / light allow same (piece of) pondweed	1	AO3 4.4.1.2 RPA 6
01.8	enzyme(s) lose the shape of the active site	allow enzyme(s) (start to) denature allow enzyme(s) destroyed / damaged do **not** accept enzyme(s) killed	1	AO2 4.2.2.1

4.2.2.7 Cancer

01.9	y-axis labelled '(rate of) photosynthesis in cm^3/hour'		1	AO2 4.4.1.2 RPA 6
	suitable scale on y-axis	must take up half or more of grid provided	1	
	all points plotted to within ± ½ small square	allow 3 or 4 correct plots for **1** mark ignore any attempt to plot a point at 20 °C	2	
	correct curved line of best fit	ignore line joined point to point with straight lines ignore extrapolation	1	
Total			**16**	

4.2.2.7 Cancer

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	movement / spreading out of molecules / particles	allow movement / spreading out of (named) substances / chemicals / gases / liquids ignore reference to membranes / cells	1	AO1 4.1.3.1
	from (an area of) high(er) concentration to (an area of) low(er) concentration	allow down / with the concentration gradient ignore along / across the concentration gradient do **not** accept movement from / to a concentration gradient	1	
02.2	increased carbon dioxide concentration in the air		1	AO2 4.1.3.1 4.2.3.2
	increased number of stomata that are open		1	

4.2.2.7 Cancer

02.3	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1 4.1.3.1 4.2.2.2 4.2.2.3
	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
	• (many) alveoli
	  • provide a large(r) surface area (**:** volume)
	
	• capillaries are thin
	  or alveoli / capillary walls are thin **or** one cell thick
	  or capillaries are close to the alveoli
	  • which provides short diffusion path (for oxygen / carbon dioxide)
	
	• breathing (mechanism) moves air in and out
	or lungs are ventilated
	  • to bring in (fresh) oxygen
	  • to remove carbon dioxide
	  • to maintain a concentration / diffusion gradient
	
	• large capillary network (around alveoli)
	or good blood supply
	  • to remove oxygen(ated blood) quickly
	  • to bring carbon dioxide to the lungs quickly
	  • to maintain a concentration / diffusion gradient		

4.2.2.7 Cancer

02.4	osmosis	allow diffusion	1	AO1 4.1.3.1 4.2.3.2 4.1.3.2
02.5	active transport (because) energy is needed (to move nitrate ions) from a low(er) concentration (in the soil) to a high(er) concentration (in the root / cell)	 allow (to move nitrate ions) against / up the concentration gradient allow (because) there is a lower concentration (of nitrate ions) in the soil **or** (because) there is a higher concentration (of nitrate ions) in the root / cell ignore reference to amount / number of nitrate ions ignore along / across the concentration gradient do **not** accept if reference to molecules / atoms moving	1 1 1	AO3 AO2 AO2 4.1.1.3 4.2.3.2 4.1.3.3
Total			**14**	

4.2.2.7 Cancer

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **two** from: (both have) • cytoplasm • (cell) membrane • DNA / genetic material • ribosomes	ignore reference to shape allow RNA ignore genetic information if no other mark awarded allow sub-cellular structures for **1** mark if no other mark awarded allow correct cellular process, e.g. respiration for **1** mark	2	AO2 4.1.1.1 4.1.1.2 4.1.2.1
03.2	any **three** from: • prokaryotic cell is smaller • prokaryotic cell has no mitochondria • prokaryotic cell has no nucleus **or** DNA is free in the cytoplasm **or** genetic material is free in the cytoplasm • prokaryotic cell has a single loop of DNA **or** prokaryotic cell has a single loop of genetic material • prokaryotic cell has plasmids	allow converse for eukaryotic cells allow reference to bacterium instead of prokaryotic cell ignore reference to features not shown in Figure **5** if neither mark awarded, allow prokaryotic cell has no membrane-bound organelles ignore genetic information ignore genetic information ignore circular / rings of DNA allow prokaryotic cells have smaller ribosomes	3	AO2 4.1.1.1 4.1.1.2 4.1.2.1

03.3	1 µm = 0.001 mm **or** 1 mm = 1000 µm **or** 0.05 mm = 50 µm **or** 0.05 × 1000 (1:) 50	 do **not** accept if a unit is given	1 1	AO2 4.1.1.1 4.1.1.2
03.4	mitosis	correct spelling only	1	AO1 4.1.2.2
03.5	35%		1	AO2 4.1.2.2
03.6	 (stage 1) DNA / chromosomes replicate / duplicate mitochondria / ribosomes / sub-cellular structures increase in number **or** mitochondria / ribosomes / sub-cellular structures replicate (stage 2) one set of chromosomes is pulled / moved to each end of the cell (stage 3) the cytoplasm **and** cell membrane divides (to form two cells)	ignore names of the stages of the cell cycle ignore genetic material ignore DNA / chromosomes double / reproduce allow cytoplasm increases ignore cell grows unqualified allow one of each chromosome is pulled / moved to each end of the cell ignore nucleus divides allow cytoplasm divides **and** (new) cell membranes form ignore nucleus divides	 1 1 1 1	AO1 4.1.2.2
Total			**13**	

4.2.2.7 Cancer

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	fatty acids		1	AO1 4.2.2.1
	glycerol		1	4.4.2.3
04.2	enzyme binds to the substrate because they are complementary (shapes)	allow enzyme joins to the substrate because they fit together exactly allow enzyme joins to the substrate because the substrate fits the active site ignore reference to specificity do **not** accept same shape	1	AO2 4.2.2.1
	(so) substrate is broken down (into products)	allow (so) substrate splits (into products) ignore products are formed, unqualified	1	
	(so) products are released **or** enzyme is not changed	allow enzyme is not used up allow reference to activation energy for either marking point 2 **or** marking point 3	1	
04.3	each <u>active site</u> has a specific shape (so only fits one type of lipid molecule)	allow each <u>active site</u> is a different shape do **not** accept reference to the substrate having an active site	1	AO2 4.2.2.1
04.4	add Benedict's (solution / reagent to the liquid)		1	AO1 4.2.2.1 RPA 4
	boil / heat	allow any temperature of 65 °C or above	1	
	(if glucose is present the blue) colour changes to yellow / green / orange / brown / (brick)red		1	

04.5	add iodine solution / reagent (to the liquid) (if starch is present) it changes colour to blue / black (from yellow / orange / brown)	allow add a drop of iodine ignore iodine unqualified	1 1	AO1 4.2.2.1 RPA 4
04.6	glucose from photosynthesis (excess) glucose converted to starch	do **not** accept starch made in photosynthesis allow (excess) glucose is stored as starch	1 1	AO2 4.2.2.1 4.4.1.1 4.4.1.3 4.4.2.3
04.7	starch (stores) have been converted to glucose (so the glucose can be) used for respiration / (named) metabolic reactions **or** (so the glucose can be) used to release energy (because) there is no light to make (new / more) glucose by photosynthesis	ignore reference to residual glucose from previous photosynthesis do **not** accept idea of energy being produced / created / made	1 1 1	AO3 4.4.1.1 4.4.2.1 4.4.1.3
04.8	any **one** from: • test roots / stems of plants (in the light and dark) • test other species of plant • measure the concentrations of glucose **and** starch • vary the time in the dark / light • test variegated leaves	do **not** accept reference to changing the independent variable allow test other parts of the plants allow test other types of plant ignore mass / amount allow any other valid extension ignore repeats	1	AO3 4.4.1.2 4.4.1.3
Total			**17**	

4.2.2.7 Cancer

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	mechanical	allow physical allow structural	1	AO3 4.3.3.2
05.2	any **one** from: • to deter herbivores • to prevent animals damaging it	ignore to injure animals, unqualified allow to deter animals eating it do **not** accept to deter predators	1	AO2 4.3.3.2
05.3	chemical		1	AO3 4.3.3.2

4.2.2.7 Cancer

05.4	any **two** from : • lack of magnesium (ions) (1) (so) not enough chlorophyll for (efficient) photosynthesis (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1) • infection by pathogen / bacteria / virus / fungus (1) (so) leaves become discoloured / yellow so less photosynthesis (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1) • infected by aphids (1) (which) remove sugars from phloem (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1) • lack of (available) light (1) (so) chlorophyll breaks down (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1)	allow (so) lack of chlorophyll produced causes yellow leaves (1), (so) not enough photosynthesis to produce glucose which is used to make proteins for growth (1) allow correctly named pathogen allow has rose black spot / TMV allow other symptoms of named pathogens / disease award once only award once only award once only	5	AO2 4.3.3.1 4.3.1.1 4.3.1.2 4.3.1.4 4.4.1.1 4.4.1.2 AO1 4.4.2.3 4.4.1.3

4.2.2.7 Cancer

05.5	(bacteria) obtain glucose / sugar (from the plant) (glucose used) for respiration **or** (glucose used) for making other named substances	 allow (glucose used) to release energy	1 1	AO3 AO2 4.2.3.2 4.4.1.3
05.6	(gorse plant) obtains nitrate (ions) needed for amino acids / proteins	 allow needed to make chlorophyll / DNA	1 1	AO2 4.1.3.3 4.4.2.3 AO1 4.3.3.1
05.7	willow bark		1	AO2 4.3.1.9
Total			**13**	

4.2.2.7 Cancer

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	any **two** from: • BMI / morphology / obesity level • smoking habits • diet • medication • family history of liver disease • fitness levels • ethnicity • area of UK they live in	ignore genetic factors allow mass / weight **and** height allow previous drinking habits allow medical conditions allow drug use allow level of exercise allow race	2	AO3 4.2.2.6
06.2	2.55 – 1.60 (= 0.95) $\left(\frac{0.95}{2.55} \times 100 = \right)$ 37 (.2549019608…) (%)	allow 1.60 – 2.55 (= –0.95) allow value for with meals in range 1.60 to 1.65 (for 1.60) allow answer correctly calculated from values in ranges 1.60 to 1.65 and 2.50 to 2.60 allow – 37(.2549019608...)(%)	1 1	AO2 4.2.2.6
06.3	12 × 2 × 7 = 168 (g/week) 1.8	 allow in range 1.8-1.9 allow correct reading from a calculation that omits the 2 **or** the 7 do **not** accept if a unit is given	1 1	AO2 4.2.2.6

4.2.2.7 Cancer

06.4	any **two** from: • consuming alcohol increases the RR (with / without meals) **and** supporting data • consuming less than 50 g/week of alcohol with meals does not increase the RR • even (small amounts of alcohol at) 25 g/week increases the RR if not with meals	allow risk for RR throughout allow data in terms of number of glasses of wine allow increasing alcohol consumption increases the RR at an increasing rate allow any value between 35 and 60 g/week	2	AO3 4.2.2.6
06.5	any **two** from: • large number in survey • long term / 15 year survey • well controlled	allow 800 000 in survey if neither mark awarded allow large study allow many controls	2	AO3 4.2.2.6
06.6	any **one** from: • people underestimate / overestimate alcohol consumption • people may change (lifestyle / drinking) habits over time • some people may drink all their weekly alcohol at once	allow people lie about alcohol consumption **or** people lie about other named control variables ignore survey only tested women	1	AO3 4.2.2.6

06.7	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3-4	AO2 4.4.2.3 4.2.2.1
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1-2	AO1 4.4.2.2 4.2.2.6 4.2.2.5 4.5.3.3
	No relevant content	0	
	Indicative content Responses may refer to either total or partial liver failure • no bile made (in the liver) ○ fats / lipids are not emulsified ○ surface area of fats / lipids not increased ○ pH of small intestine will not be alkaline / neutralised ○ enzymes (in small intestine) will not work effectively **or** (named) food not digested / absorbed ○ so may lose weight • lactic acid not broken down / oxidised ○ accumulation of lactic acid in blood / body ○ lactic acid is toxic **or** body will be poisoned ○ oxygen debt higher / prolonged ○ so muscle pain / fatigue • proteins / amino acids will not be broken down (in liver) ○ (amino acids) not deaminated ○ amino acids not made into urea **or** will not form ammonia ○ (however) any ammonia formed is toxic ○ so accumulation of amino acids in blood / body • liver does not break down / remove other toxins (like alcohol) ○ toxins accumulate in blood / body ○ body will be poisoned ○ so pain **or** jaundice **or** swollen liver **or** portal hypertension occurs • glycogen stores will not be formed ○ cannot control blood glucose ○ so hyperglycaemia / hypoglycaemia / diabetes / coma may occur		

Total			**15**

4.2.2.7 Cancer

Question	Answers	Extra information	Mark	AO / Spec.Ref.
07.1		ignore add mAbs and dye to slide (unbound)		AO2 4.3.2.2
	bind fluorescent dye to mAbs		1	
	put (bound) fluorescent mAbs on the slide (and rinse off)		1	
	mAbs will bind to Candida albicans / pathogens and show up under the microscope	allow mAbs will bind to Candida albicans / pathogens and show up under UV (lamp)	1	
07.2	more Candida albicans / pathogens will be engulfed / killed by phagocytes / white blood cells	allow Candida albicans / pathogens will be engulfed / killed by phagocytes / white blood cells more quickly do **not** accept white blood cells produce antibodies do **not** accept lymphocytes engulf Candida albicans	1	AO2 4.2.2.3 4.3.1.6 4.3.1.7
	therefore less damage to cells / tissues / organs	ignore less toxin released (by Candida albicans)	1	

07.3	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.		4-6	AO1 4.3.1.9
	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 • given first to healthy volunteers ○ at (very) low dose ○ to test it is safe **or** to test for toxicity **or** to check for any side effects • then to some patients (with the disease) **or** people with the disease ○ to test for the correct / optimum dose ○ to check for any side effects ○ to test for efficacy **or** to test if it works ○ in a double blind trial ○ where neither patients nor doctors know who has the mAbs and who has a placebo (or alternative treatment) • reference to large trial **or** long duration **or** control variables			
07.4	any **one** from: • (the body will) not reject the mAbs **or** (the body is) less likely to reject the mAbs • mouse mAbs are (more likely to be) rejected • the human lymphocytes have already responded to that infection / cancer cell so they are known to work against the disease	do **not** accept idea of rejection of cells	1	AO3 4.3.2.2 4.3.2.1 4.3.1.6
Total			**12**	

4.2.2.7 Cancer

Answer 17 · 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)

4.2.2.7 Cancer

Answer 19 · Examiner comments

November 2020 | 8461/1H | Original Q7

Question 7 (standard/high & high demand)

Many students unnecessarily explained how monoclonal antibodies were produced for **07.1**, and very few scored marks on this question. Many students misunderstood the context of the question, and indicated that the mAbs would be injected into the slide. Some students thought that the mAbs were made of lymphocytes. In **07.2**, several students incorrectly stated that the mAbs themselves or lymphocytes would engulf the pathogen.

In **07.3**, many students were able to access Level 2, however, a number of students made blanket statements about clinical trials that applied to all participants. Several students were unable to clarify the difference between patients and healthy volunteers, with some using confusing terminology such as ‘healthy patients’.

4.2.2.7 Cancer

Answer 19 · Examiner comments

Concluding Remarks

Generally, the standard of this paper was broadly comparable to previous years. Students generally scored well on simple recall of knowledge questions (AO1) and the topics of cell structure, photosynthesis and movement across membranes were well answered. Most students were able to apply their knowledge effectively in straightforward questions (AO2), but some found application of knowledge to new situations more difficult. Many student's understanding of the structure and function of enzymes is limited and a lack of clear knowledge meant that some students articulated answers poorly on paper. Many students struggle to answer AO3 questions, particularly where complex data needs to be analysed or improvements to practical techniques need suggesting. A lack of precision when quoting, plotting or describing data is common.

As in previous years, details of the Benedict's test for sugar and iodine solution test for starch had not been recalled well, indicating that many students understanding of this practical activity was below expectations. Students continue to find the role of the liver in the human body a challenge.

4.2.2.7 Cancer

Answer 19 · Examiner comments

Mark Ranges and Award of Grades

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

4.2.2.7 Cancer

Answer 20 · Examiner comments

November 2021 | 8461/1H | Original Q7

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

In **07.4** and **07.5**, many students had not read the stem of the question in detail and therefore gave ideas about the donor transferring antibodies to the patient. In **07.5**, several students stated that the red blood cells do not have a specific antigen 'shape' so therefore all of the antibodies can fit and bind.

In **07.7**, most students were able to describe the function of bile as an emulsifier, and many students gave long explanations of how bile works, however, they did not link this to a lack of bile and why this would cause difficulty digesting fat.

This question highlighted several misconceptions in this area. Some students thought that fat, lipase or food molecules pass through the bile duct and that big molecules of fat would not fit past the blockage. Some students stated that bile is an enzyme and were confused over the difference between lipase and bile, often thinking that they are one in the same.

Concluding Remarks

The standard of responses seen in this paper was lower than in previous years. Students generally scored well on simple recall of knowledge questions (AO1) and questions on the topic of cell structure were generally well answered. Some students were able to apply their knowledge effectively in straightforward questions (AO2), but many found application of knowledge to new situations more difficult. There was indication that many students had not carried out the Required Practical Activities assessed throughout the paper. Many student's understanding of the structure and function of plant tissues was limited and a lack of clear knowledge meant that some students did not articulate themselves well throughout the paper. Generally, students scored well on the mathematical skills, however, a lack of precision when reading data from graphs was common.

4.2.2.7 Cancer

Answer 20 · Examiner comments

Mark Ranges and Award of Grades

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

4.2.2.7 Cancer

Answer 21 · Examiner comments

June 2023 | 8461/1H | Original Q4

Question 4 (Standard, standard/high and high demand)

04.1 Students were asked to explain two effects of anaerobic respiration on the body. Over 87% of students scored some marks on this question but only around 12% managed to score full marks. Many students mentioned lactic acid and were able to put this in the context of oxygen debt or muscle fatigue, though some answers were vague and referred to pain, aches or stitch which were not deemed sufficient to gain credit at this level. Lots of students gave increased breathing and heart rate as effects but less were able to relate this to the reason of needing the oxygen to break down lactic acid. Oxygen debt was frequently referred to but only gained credit as an explanation if reference was made to it being repaid in this context. While a significant number of students referred to 'less energy' being available, very few students correctly linked this idea to 'weaker muscle contractions'.

04.2 This levelled response question required students to design an investigation to show the effects of different exercise on heart rate. Most students attempted an answer, seemingly familiar with such an investigation. Over 16% of students were successful at entering level 3, with around 32% reaching level 2. The main barrier to students achieving higher marks seemed to be using just one athlete for the investigation which then limited the maximum mark achievable, as this would not lead to a valid outcome. Most understood the importance of measuring heart rate before and after exercise, although some students forgot about measuring the initial heart rate first, which again would not lead to a valid outcome. There were many references to technology such as heart rate monitors or watches to measure heart rate, which was creditworthy as long as heart rate was recorded before and after exercise. Students were generally very competent at describing control variables for their investigation.

4.2.2.7 Cancer

Answer 21 · Examiner comments

04.3 Nearly 58% of students managed to gain the first marking point about anabolic steroids making athletes faster or stronger, or gave specific descriptions of improved performance or enhanced stamina. Only 6% of students also gained the second marking point, and were able to develop this and explain that the increased muscle mass caused more or stronger muscle contractions. Students must take care not to repeat information in the question stem without adding value to this; thus, an answer stating that anabolic steroids improve performance was insufficient.

04.4 Over 92% of students correctly identified 'hybridoma' as the type of cell created when a mouse lymphocyte and tumour cell combine.

04.5 The process of creating monoclonal antibodies is clearly well known by some students, though others have varied misconceptions including that the lymphocyte or monoclonal antibodies are cloned, rather than the hybridoma. Just under 3% of students were able to get the full 3 marks as a result.
Many students spent a lot of their answer describing that a hybridoma is formed when a mouse lymphocyte and tumour cell combine, but this gained no credit as it had been assessed in the previous question, and so wasted time and answer space. Very few described that the hybridoma is cloned (simply dividing by mitosis was frequently stated but gained no credit). Additionally, very few were able to describe that all the cells produced made the same antibody. The most common point made that gained credit was that monoclonal antibodies need to be purified after collection. This question was set at high demand and required correct use of terminology, which very few students were able to do; consequently, almost 59% of students scored zero marks.

04.6 Almost 90% of students were able to correctly identify that a monoclonal antibody only binds to the anabolic steroid.

04.7 Around 47% of students were able to correctly suggest the purpose of the control area in a test strip, and suggested that it was to show that the test had worked. Some were distracted into giving other irrelevant details of the test process here and discussed the complementary nature of monoclonal antibodies, rather than focus on the question posed.

04.8 Many students were able to give correct evidence with 58% gaining 1 mark. Sadly, less were able to suggest a possible reason for the evidence they had selected and consequently, only around 26% of students successfully gained both available marks. Some students referred to other processes involved in the test when discussing the reason, rather than focussing on the idea of monoclonal antibodies not binding to, or reaching, the control area. Lots of students described the test not being used properly, or the urine not having any steroids in it as their reason, neither of which gained credit.

04.9 Just over 75% of students correctly identified athlete D as testing positive for anabolic steroids.

4.2.2.7 Cancer

Answer 22 · Examiner comments

Question 8 (standard, standard/high demand and high demand)

08.1 59% of students achieved the mark in this question, with most stating that the cell grows in size or increases its number of organelles. The increase in number was expressed in many different ways (replication, duplication, multiplication, etc.), all of which were creditworthy.

The most common incorrect answers contained descriptions of what happens during mitosis, such as the chromosomes being pulled to either end of the cell, or of the cell membrane and cytoplasm dividing.

08.2 78% of students answered this question correctly. The most common incorrect answers seen were cell wall and nucleus/nuclear membrane.

08.3 There were many ways in which students achieved a variety of marks in this question. 34% of students achieved 6 marks, and 33% achieved 5 marks, with the conversion from nm to mm being the difference between them. The conversion method was not well understood, with both divisions and multiplications with a large range of factors of 10 seen. Some students began by trying to convert the volume given in the question, which often led to further mistakes later on. Many students were able to substitute the numbers from the question into the equation given and calculate an answer, thus gaining two marks if they went no further (13% of students). Answers using any representation of *pi* (3.1, π or $^{22}/_{7}$) were accepted and seen, despite students being told to use 3.14 in the question.

Students could gain credit for quoting the magnification equation or for showing its use without writing it out in words. However, just quoting the triangular representation of the equation was not creditworthy. A significant minority of students gave the equation upside down and so were not awarded marking point 3 and, if they used it in that incorrect form, were not able to access marking point 5 or marking point 6, either.

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4.2.2.7 Cancer

Answer 22 · Examiner comments

08.4 47% of students scored no marks in this question, with 11% scoring full marks and 40% scoring one mark. A simple description of what normally happens during mitosis was not creditworthy, yet was seen regularly. Of the two marking points, marking point 1 was achieved more commonly than marking point 2. Where the mark for marking point 1 was not achieved, the most common errors included: a simple description of chromosomes not being pulled apart with no destination described; vague references to the edges/sides of the cell; or an implication that chromosomes were unable to move (unaided), rather than be moved. Attempts at marking point 2 were often too vague to be creditworthy, with a large number of answers just repeating that the cell couldn't divide, as was given in the question stem.

08.5 16% of students gained credit in this question and, as in question 08.4, a reference to what would be unable to happen in the situation described was required. Many students gave a simple statement linking cancer to uncontrolled cell division and those that went on to say that this could not happen often just paraphrased what had been written in the question, which was not creditworthy. Those that did score the mark mainly mentioned the prevention of the tumour growing, with a minority stating that secondary tumours would be stopped from forming. References to individual cancer cells rather than tumours were seen frequently and were not creditworthy. Some answers referred to preventing the formation of tumours rather than stopping the spread of tumours that were already there and thus did not answer the question.

08.6 83% of students answered this question correctly.

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Mark Ranges and Award of Grades

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

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