AQA GCSE Biology | 8461

SPECIFICATION POINT 4.2.2.3

Blood

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**35**
Available paper years	**2007–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

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

4.2.2.3 Blood

Answer 01 · Mark scheme

Question 4

	answers	extra information	mark
(a)	antibodies antitoxins antibiotics		1 1 1
(b)	any **two** from: • measles • mumps • rubella / German measles		2
(c)	less / low / no chance of getting named / all condition(s) if vaccinated quantitative figure(s) e.g. 5 times less likely to get convulsions	must be comparative	1 1
(d)	enzymes genes		1 1
total			9

4.2.2.3 Blood

Answer 02 · Mark scheme

Question 6

	answers	extra information	mark
(a)(i)	lives inside cells		1
(a)(ii)	inactive		1
(a)(iii)	antibodies		1
(b)(i)	1950		1
(b)(ii)	8 (years)		1
(b)(iii)	any **one** from: eg • disease could be reintroduced (from abroad) • disease would spread if it came back • protection on holiday abroad • high proportion of immune people needed to prevent epidemic	disease might come back insufficient	1
total			6

4.2.2.3 Blood

Answer 02 · Mark scheme January 2008 | BLY1F | Original Q6 | Legacy

BLY1F

Answer 03 · Mark scheme January 2008 | BLY3F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
(a)(i)	A **or** C	allow lower case	1
(a)(ii)	B **or** D	allow lower case	1
(b)(i)	60		1

4.2.2.3 Blood

Answer 04 · Mark scheme

Question 6

question	answers	extra information	mark
(a)(i)	bladder		1
(a)(ii)	glucose protein	extras – CANCEL	1 1
(b)(i)	any **two** from: • kidney functions all the time / not just 3 × 8 h sessions a week • can eat high-protein foods / high salt foods • cheaper • waste of time	allow direct quotation of correct points from the list allow can eat anything	2
(b)(ii)	have to take (immunosuppressant) drugs / consequence of this eg catch infections / may suffer brain damage / possible rejection of kidney **or** become ill more easily **or** risk of brain damage (due to anaesthetic)	allow direct quotation of correct points from the list	1
(c)(i)	urea		1
(c)(ii)	4.2		1
total			8

4.2.2.3 Blood

Answer 04 · Mark scheme

January 2008 | BLY3F | Original Q6 | Legacy

BLY3F

Answer 05 · Mark scheme

June 2008 | BLY1AP | Original Q6 | Legacy

Six	**A**	antibiotics	**2**
	B	painkillers	**4**
	C	antibodies	**3**
	D	vaccines	**1**

	A	**B**	**C**	**D**

4.2.2.3 Blood

Answer 06 · Mark scheme

question	answers	extra information	mark
2(a)	glucose ✓ urea ✓ water ✓ sodium ions ✓ protein	all 3 correct = **2** marks 2 correct = **1** mark 0 or 1 correct = **0** marks	max 2
2(b)(i)	protein cannot pass through filter **or** protein (too) large **or** protein stays in the blood		1
2(b)(ii)	reabsorbed		1
2(c)(i)	less		1
2(c)(ii)	more		1
Total			**6**

4.2.2.3 Blood

Answer 06 · Mark scheme

June 2008 | BLY3F | Original Q2 | Legacy

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: June 2008

4.2.2.3 Blood

Answer 07 · Mark scheme

June 2008 | BLY3F | Original Q4 | Legacy

question	answers	extra information	mark
4(a)(i)	red cell		1
4(a) (ii)	diffusion		1
4(a) (iii)	haemoglobin		1
4(a) (iv)	a nucleus		1
4(b)	(on diagram) arrow from any part of blood to air		1
Total			**5**

4.2.2.3 Blood

Answer 07 · Mark scheme

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: June 2008

4.2.2.3 Blood

Answer 08 · Mark scheme

January 2009 | BLY1F | Original Q7 | Legacy

question	answers	extra information	mark
7(a)	antibodies	allow antitoxins / memory cells do **not** allow antigens	1
	immune	ignore protection allow resistant	1
7(b)(i)	fell		1
	numerical qualification to zero / nothing / by 100%	allow stopped in 1995	1
7(b)(ii)	(no) % vaccination fell **or** when no vaccination	ignore circle	1
	but autism numbers did not fall / stayed high / increased **or** '(yes) might support it if time lag between vaccination and autism symptoms' / 'time lag for diagnosis' (1) 6 year time lag quantified (1)		1
Total			**6**

4.2.2.3 Blood

Answer 08 · Mark scheme

January 2009 | BLY1F | Original Q7 | Legacy

COMPONENT NUMBER: BLY1F

COMPONENT NAME: Science B / Biology

STATUS: Final

DATE: January 2009

4.2.2.3 Blood

Answer 09 · Mark scheme

question	answers	extra information	mark
7(a)(i)	pancreas	allow phonetic spelling	1
7(a)(ii)	glucose into cells / liver / muscles	allow any named organ / cell allow turned into / stored as glycogen **but** do **not** allow hybrid spellings for glycogen allow increases respiration allow stored as / turned into fat	1
7(b)(i)	reference to "98.6% of all people who used Diacure reported an improvement in their condition."	allow claim **1** / **1** / the first one	1
7(b)(ii)	(only) 30 patients **or** not enough / not many patients	allow only one trial **or** only done once **or** not repeated ignore bias	1
7(b)(iii)	little effect / difference suggest drug is not effective (in long term)	allow no effect allow only drops by 4 (±1) allow wouldn't persuade people to take it	1 1
7(b)(iv)	avoid bias / owtte	eg company could change / ignore results / might lie ignore fair / accurate / reliable / valid	1
Total			**7**

4.2.2.3 Blood

Answer 10 · Mark scheme

January 2009 | BLY3F | Original Q1 | Legacy

The full source mark scheme begins on page 61. Follow original question 1 in that document.

4.2.2.3 Blood

Answer 11 · Mark scheme

June 2009 | BLY3F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)	A = alveolus B = diaphragm	allow air sac / alveoli ignore labelling of C and D	1 1
1(b)	A		1
1(c)(i)	red blood cells		1
1(c)(ii)	plasma		1
Total			**5**

4.2.2.3 Blood

Answer 11 · Mark scheme

June 2009 | BLY3F | Original Q1 | Legacy

BLY3F

4.2.2.3 Blood

Answer 12 · Mark scheme

June 2009 | BLY3F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	mineral ions water	each extra box ticked cancels **1** mark	1 1
2(b)(i)	blood plasma		1
2(b)(ii)	dialysis fluid		1
2(b)(iii)	diffusion		1
2(b)(iv)	partially permeable		1
2(b)(v)	small		1
2(c)	drug treatment is needed to suppress the immune system		1
Total			**8**

4.2.2.3 Blood

Answer 12 · Mark scheme

June 2009 | BLY3F | Original Q2 | Legacy

BLY3F

Answer 13 · Mark scheme

November 2009 | BLY1AP | Original Q3 | Legacy

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

4.2.2.3 Blood

Answer 14 · Mark scheme

Question 3

question	answers	extra information	mark
3(a)	measles mumps rubella		1 1 1
3(b)	antibodies		1
3(c)(i)	any **two** from: • fell • then rose • any reasonable amplification eg until 2004 / to 80% • flattens off *(*between 1999–2000*)*		2
3(c)(ii)	eg fear of side effects **or** cost of vaccine **or** lack of vaccine **or** complacency / disease less common		1
Total			**7**

4.2.2.3 Blood

Answer 14 · Mark scheme

January 2010 | BLY1F | Original Q3 | Legacy

BLY1F

Answer 15 · Mark scheme

March 2010 | BLY1AP | Original Q8 | Legacy

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

4.2.2.3 Blood

Answer 16 · Mark scheme

June 2010 | BLY3F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	too large to pass through the filter		1
6(a)(ii)	passed through the filter, then reabsorbed into blood		1
6(a)(iii)	water is reabsorbed from the filtrate into the blood		1
6(a)(iv)	water, urea and sodium ions		1
6(b)(i)	less urine		1
6(b)(ii)	more concentrated		1
Total			**6**

4.2.2.3 Blood

Answer 16 · Mark scheme June 2010 | BLY3F | Original Q6 | Legacy

BLY 3F

Answer 17 · Mark scheme January 2011 | BLY3F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	18		1
3(a)(ii)	Z		1
3(b)(i)	red blood cells		1
3(b)(ii)	haemoglobin		1
Total			4

BLY3F

4.2.2.3 Blood

Answer 18 · Mark scheme

June 2011 | BLY1F | Original Q9 | Legacy

Question 9

question	answers	extra information	mark
9	(wbc) ingest / digest pathogens / bacteria / viruses	allow eat germs ignore swallow germs ignore ingest the disease ignore attack / kill the disease	1
	(wbc) produce antibodies		1
	(wbc) produce antitoxins		1
	any **one** from: • (antibodies) destroy or kill pathogens / bacteria / viruses / germs • (antitoxins) counteract / destroy / neutralise toxins / poisons • reasonable reference to memory cells **or** rapid production of antibodies upon re-infection	 ignore destroy / kill disease ignore attack / fight pathogens ignore attack / killing toxins	1
Total			**4**

The AQA UMS Conversion Calculator is available on the Results statistics page of the AQA Website.

4.2.2.3 Blood

Answer 19 · Mark scheme

June 2011 | BLY3F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	(protein molecules too) big **or** larger than pore size	allow cannot fit through the pores / hole / gaps	1
6(b)(i)	diffusion		1
6(b)(ii)	high to low concentration **or** high concentration in blood, low concentration in dialysis fluid **or** down concentration gradient **or** correct use of numbers	ignore along gradient / across gradient allow there is none in dialysis fluid	1
6(c)	any value between 3.15 and 3.25 (inclusive)		1
6(d)(i)	any **two** from: • kidney works all the time **or** dialysis works for short time **or** dialysis needs regular trips to hospital / regular treatment / long term treatment • kidney maintains correct concentration all the time **or** no build-up as between dialysis sessions • no need to regulate diet **or** correct example – eg low salt / low protein / low fluid intake as with dialysis • cheaper in the long term	ignore enables an active life accept kidney transplant is one off treatment	2

Question 6 continues on the next page . . .

4.2.2.3 Blood

Answer 19 · Mark scheme

June 2011 | BLY3F | Original Q6 | Legacy

BLY3F

Question 6 continued . . .

question	answers	extra information	mark
6(d)(ii)	any **two** from: • rejection / described **or** need to use immunosuppressants **or** need to take drugs for life • susceptible to other infections • hazards of operation / anaesthetic • shortage of donors / match • high initial cost	allow may need later replacement	2
Total			**8**

4.2.2.3 Blood

Answer 19 · Mark scheme June 2011 | BLY3F | Original Q6 | Legacy

BLY3F

Answer 20 · Mark scheme November 2011 | BLY1AP | Original Q2 | Legacy

Two	**A**	antibodies	**3**
	B	antibiotics	**2**
	C	toxins	**1**
	D	painkillers	**4**

4.2.2.3 Blood

Answer 21 · Mark scheme

June 2013 | BL3FP | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)	**A** artery	allow aorta	1
	B ventricle	ignore references to left and right	1
	C atrium	ignore references to left and right allow atria	1
	D vein	allow vena cava	1
5(b)(i)	stent		1
5(b)(ii)	keeps (artery) open		1
	so (more) blood can flow through	allow blood can flow (more) easily ignore ref to blood clots	1
Total			**7**

4.2.2.3 Blood

Answer 22 · Mark scheme

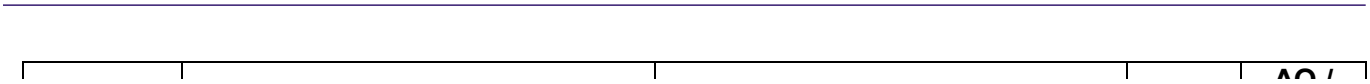
June 2014 | BL3FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.
1(a)(i)	White blood cells → help the blood to clot Red blood cells → carry oxygen around the body Platelets → destroy microorganisms carry glucose around the body	one mark for each line extra line negates a mark	3	AO1 3.2.2c, d,e
1(a)(ii)	any **one** from: • carbon dioxide / CO_2 • urea	do **not** allow urine ignore water ignore ions	1	AO1 3.2.2b
1(b)(i)	B		1	AO1 3.2.1d
1(b)(ii)	D		1	AO1 3.2.1d
1(b)(iii)	vein	accept correct named examples	1	AO1 3.2.1e
1(c)(i)	any **one** from: • keeps artery / blood vessel open **or** widens artery / blood vessel • allows (more) blood to heart / cardiac muscle • (allows) blood to flow more easily • allows (more) oxygen to heart / cardiac muscle		1	AO1 3.2.1f
1(c)(ii)	any **two** from: • bleeding • infection • damaging blood vessels • damaging the heart • risk from anaesthetic	allow blood clots	2	AO3 3.2
Total			10	

4.2.2.3 Blood

Answer 22 · Mark scheme

June 2014 | BL3FP | Original Q1 | Legacy



4.2.2.3 Blood

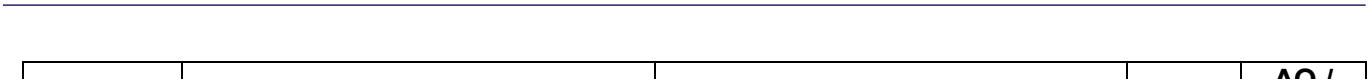
Answer 23 · Mark scheme

Question	Answers	Extra information	Mark	AO / spec ref.
3(a)	osmosis partially permeable		1 1	AO1 3.1.1b
3(b)(i)	any **two** from: • vacuole is small(er) • cytoplasm has shrunk • gap between cytoplasm and cell wall • cell wall curves inwards • the (cell) membrane has moved away from the wall	allow correct answers in terms of A allow cytoplasm is smaller allow cell B is flaccid or cell A is turgid	2	AO2 3.1.1
3(b)(ii)	any **one** from: • water will move / diffuse in • (cells) will swell • (cells) will burst	ignore turgid	1	AO2 3.1.1c
3(c)	villi give the small intestines a large surface area villi have many blood capillaries		1 1	AO1 3.1.1k,j,l
Total			7	

4.2.2.3 Blood

Answer 23 · Mark scheme

June 2014 | BL3FP | Original Q3 | Legacy



4.2.2.3 Blood

Answer 24 · Mark scheme

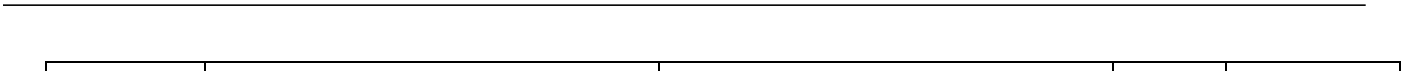
June 2015 | BL1FP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	64		1	AO2 1.1
2(a)(ii)	36	allow e.c.f from (a)(i) i.e. 100 – answer given in (a)(i)	1	AO2 1.1
2(a)(iii)	any **one** from: • only considers 16-year-olds • only about some / 5 countries	ignore lack of evidence allow does not refer to all ages allow does not refer to all countries	1	AO3 1.1
2(b)	the more exercise done the healthier a person is	allow the more exercise done the higher the health rating allow the less exercise done the lower the health rating	1	AO3 1.1.1e
2(c)	having a high cholesterol level		1	AO1 1.1.1d
2(d)(i)	antibodies		1	AO1 1.1.2c/d/e
2(d)(ii)	antibiotics		1	AO1 1.1.2i
Total			7	

4.2.2.3 Blood

Answer 24 · Mark scheme

June 2015 | BL1FP | Original Q2 | Legacy



4.2.2.3 Blood

Answer 25 · Mark scheme June 2015 | BL3FP | Original Q8 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
8(a)	any **two** from: • carbon dioxide / CO_2 • urea • protein • water / H_2O • hormones / insulin	ignore food / waste / alcohol / drugs / enzymes ignore glucose and oxygen allow **two** correct hormones for 2 marks allow **two** correct food components for 2 marks allow antibodies allow antitoxins	2	AO1 321a,322b /c,331a
8(b)(i)	plasma platelets		1 1	AO1 322a
8(b)(ii)	(cardiac) muscle	allow muscular	1	AO1 321b

4.2.2.3 Blood

Answer 25 · Mark scheme

June 2015 | BL3FP | Original Q8 | Legacy

Question	Answers	Extra Information	Mark	AO / Spec. Ref
8(c)			6	AO3 32, 321f

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content	There is a description of at least one advantage of the cow tissue valve **or** a description of at least one disadvantage of the cow tissue valve.	There is a description of at least one advantage of the cow tissue valve **and** at least one disadvantage of the cow tissue valve.	There is a description of the advantages and disadvantages of the cow tissue valve **or** a description of several advantages of the cow tissue valve and at least one disadvantage.

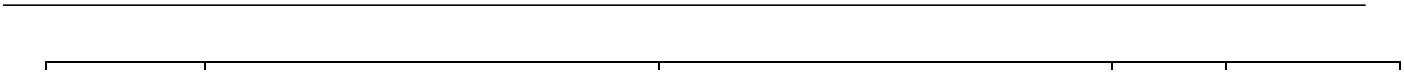
examples of the points made in the response	extra information
Advantages of cow tissue valve: • abundant supply of cows • so shorter waiting time • no need for tissue typing • quicker operation • less invasive **or** shorter recovery time • cheaper operation costs • less operation / anaesthetic risks	ignore information copied directly from the table without value added ignore can take many years to find a suitable human donor
Disadvantages of cow tissue valve: • made from cow so possible objections on religious grounds • new procedure so could be unknown risks • risks of using a stent eg. blood clots, stent breaking or valve tearing • not proven as a long term treatment • may be rejected	ignore ethical arguments allow possible transfer of disease from cow

Total			11

4.2.2.3 Blood

Answer 25 · Mark scheme

June 2015 | BL3FP | Original Q8 | Legacy



4.2.2.3 Blood

Answer 26 · Mark scheme

June 2017 | BL1FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	**either** Petri dish / culture medium sterile so no other / harmful microorganisms grow **OR** Petri dish / lid secured (with adhesive tape) (1) so microorganisms cannot leave (1) **OR** incubated at 25 °C (1) to prevent / reduce growth of pathogens (1)	reason must be consistent with safety precaution mark together ignore germs ignore other safety precautions do **not** allow viruses allow agar sterile allow so other / harmful microorganisms cannot enter ignore spread unqualified	1 1	AO2 1.1.2m
5(b)(i)	any **one** from: • largest / larger area where no microorganisms are growing • most / more microorganisms killed	allow largest clear / white area	1	AO3 1.1.2h/i/j

4.2.2.3 Blood

Answer 26 · Mark scheme

5(b)(ii)	*idea of* E may not be best on all / other (types of) microorganism eg tested on only one type of microorganism	allow antibiotics do not kill viruses allow (other) bacteria / microorganisms may be / become resistant (to E) allow deficiency diseases are not caused by microorganisms allow disease may be minor / not life threatening allow only tested once **or** not repeated allow (patient) may be allergic to E allow idea of investigation not carried out at body temperature	1	AO3 1.1.2h/i/j 1.1.1a

5(c)(i)	B **and** C **and** D	all three required in any order for mark additional letters will cancel the mark	1	AO2 1.1.2

4.2.2.3 Blood

Answer 26 · Mark scheme

5(c)(ii)	Healthy animals will produce a higher yield.		1	AO3 1.1.2
5(c)(iii)	Microorganisms become resistant to the antibiotic.		1	AO1 1.1.2h/i
5(d)(i)	white	allow phagocytes / lymphocytes / leucocytes do **not** allow other types of blood cell	1	AO1 1.1.2c/d
5(d)(ii)	These blood cells produce antibodies. These blood cells ingest pathogens.		1 1	AO1 1.1.2d
Total			**10**	

4.2.2.3 Blood

Answer 26 · Mark scheme

June 2017 | BL1FP | Original Q5 | Legacy

4.2.2.3 Blood

Answer 27 · Mark scheme

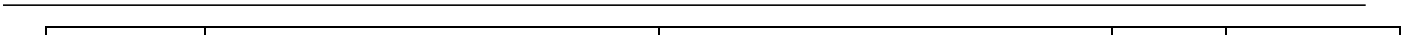
June 2017 | BL3FP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	**A** = red **B** = white	 allow lymphocyte / phagocyte	1 1	AO2 3.2.2a/c/d
3(b)(i)	low number of platelets so blood doesn't clot	ignore abnormal unqualified	1 1	AO2/3 3.2.2e
3(b)(ii)	To prevent rejection of the new blood cells.		1	AO2 3.3.1i
3(c)	carbon dioxide small intestine kidneys	allow CO_2 in this order only	1 1 1	AO1 3.2.2b
Total			**8**	

4.2.2.3 Blood

Answer 27 · Mark scheme

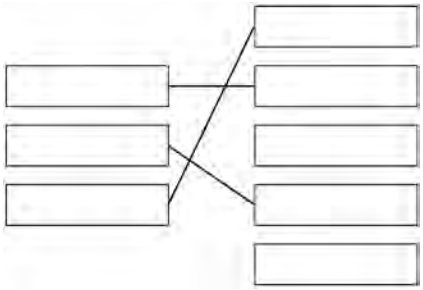
June 2017 | BL3FP | Original Q3 | Legacy



4.2.2.3 Blood

Answer 28 · Mark scheme

June 2018 | 8461/1F | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1		additional line from a blood component negates the mark for that component	1 1 1	AO1 4.2.2.3
04.2	C		1	AO3 4.2.2.2
04.3	(vessel) B thick walls **or** thick muscle / elastic tissue **or** lumen is small / narrow	 do **not** accept ref to 'cell walls' allow description of 'lumen'	 1 1	AO1 4.2.2.2
04.4	95		1	AO2 4.2.2.2
04.5	(because coronary) arteries / they are narrower	allow (because the coronary) arteries are blocked / clogged (with fat)	1	AO2 4.2.2.4
04.6	 250 × 60 (= 15 000) **or** 15 000 15	an answer of 15 scores **2** marks allow 0.25 × 60 allow $\frac{\text{answer to marking point 1}}{1000}$ an incorrect conversion to dm^3 in calculation does not negate marking point 1	 1 1	AO2 4.2.2.2

4.2.2.3 Blood

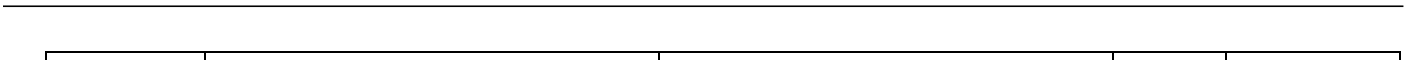
Answer 28 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	any **two** from: • no need to stay as long in hospital (after procedure) **or** can go home sooner / same day • not as / less invasive **or** no need for a major operation **or** no need for general anaesthetic • shorter recovery time **or** can get back to normal lifestyle quicker **or** less time needed off work • lower risk of a heart attack (during procedure)	allow only need to stay 2–3 hours in hospital (after procedure) allow less scarring allow less chance of infection allow only a small cut needed allow only 7 days recovery ignore reference to cost ignore idea that it takes less time overall	2	AO3 4.2.2.4
04.8	lower chance of failure (within one year) only need one operation to treat multiple blockages **or** can treat multiple blockages at one time	allow only a 5% chance of failure ignore ref to anaesthetic or CABG being a long-term treatment	1 1	AO3 4.2.2.4
Total			**14**	

4.2.2.3 Blood

Answer 28 · Mark scheme

June 2018 | 8461/1F | Original Q4



Answer 29 · Mark scheme

November 2020 | 8461/1F | Original Q6

The full source mark scheme begins on page 74. Follow original question 6 in that document.

4.2.2.3 Blood

Answer 30 · Mark scheme

November 2021 | 8461/1F | Original Q7

07.1	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
07.2	eyepiece / lens	do **not** accept objective lens	1	AO1 4.1.1.5 RPA1
07.3	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
07.4	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

07.5	**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
07.6	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**	

4.2.2.3 Blood

Answer 30 · Mark scheme

November 2021 | 8461/1F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.

4.2.2.3 Blood

Answer 31 · Mark scheme

June 2022 | 8461/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	sexual intercourse		1	AO1 4.3.1.1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	increased (at first) (then) decreased	ignore numbers unqualified do **not** accept an implication of an overall increase if no other mark awarded allow (overall) decrease for **1** mark	1 1	AO3 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	better education on how to prevent the spread of HIV		1	AO3 4.3.1.1 4.3.1.2

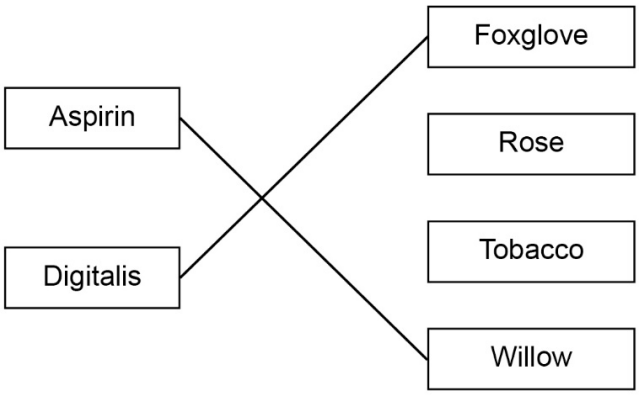
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	(C) → E → A → B → D	allow **1** mark for E → A link allow **1** mark for A → B link allow **1** mark for B → D link if no other mark awarded allow **1** mark for an answer of (C) → E → B → A → D	3	AO1 4.3.1.1 4.3.1.6 4.3.1.7 4.3.1.2

4.2.2.3 Blood

Answer 31 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	testing on healthy volunteers		1	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	drugs that destroy viruses also damage body tissues		1	AO1 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	**Drug** / **Plant the drug originated from**  do **not** accept more than one line from a box on the left		1 1	AO1 4.3.1.1 4.3.1.9

Total Question 1		11

4.2.2.3 Blood

Answer 32 · Mark scheme

Question 4

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.1	vector		1	AO1 4.3.1.5

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.2	any **two** from: • (it has) mitochondria • (it has a) nucleus • (it has) no plasmids	if neither mark awarded, allow **1** mark for protist has membrane-bound structures allow it does not have a loop of DNA allow other appropriate features do **not** accept (it has) cytoplasm do **not** accept (it has) a (cell) membrane do **not** accept it has no cell wall	2	AO2 4.3.1.5 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.3	Salmonella		1	AO2 4.1.1.1 4.3.1.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.4	only one parent is involved		1	AO1 4.3.1.5 4.6.1.1

4.2.2.3 Blood

Answer 32 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.5	14		1	AO2 4.3.1.5 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.6	decreased haemoglobin		1	AO2 4.3.1.5 4.2.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.7		allow alternative route allow correct conversion to standard form at any stage		AO2 4.3.1.5
	$\frac{210\ 000\ 000}{2}$ **or** 105 000 000	allow $\frac{210 \text{ million}}{2}$ **or** 105 million	1	
	105 000 000 × 3	allow 105 million × 3	1	
	315 000 000	allow 315 million	1	
	3.15×10^8		1	

4.2.2.3 Blood

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.8	any **two** from: • wear long(er) sleeves / clothes • use insect repellent or insecticides • don't go out in the evening • avoid going to countries / places with malaria / mosquitos • destroy breeding grounds • release sterile male mosquitos	ignore vaccination / anti-malarial drugs allow reduce bare skin exposure allow insect repellent methods such as citronella candles allow close doors / windows in the evening allow methods of destroying breeding grounds such as drain water holes allow other correct suggestions	2	AO2 4.3.1.5

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.9	percentage / chance (of getting malaria) decreases (with age) correct use of data such as two pairs of data from **Table 4**	do **not** accept percentage / chance of having disorder **S** decreases with age allow use of processed data	1 1	AO3 4.2.2.5 4.3.1.5

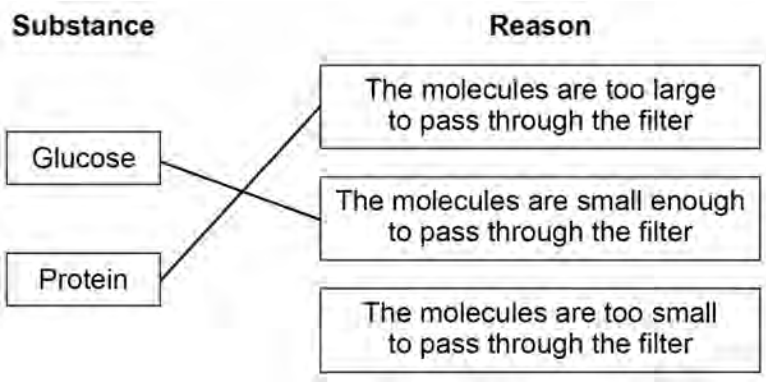
Total Question 4	15

4.2.2.3 Blood

Answer 33 · Mark scheme

June 2023 | 8461/2F | Original Q6

Question 6

Question	Answers	Mark	AO / Spec Ref.
06.1	 do **not** accept more than one line from a box on the left	1 1	AO3 4.5.3.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.2	158.1 (dm^3)		1	AO2 4.5.3.3

4.2.2.3 Blood

Answer 33 · Mark scheme

June 2023 | 8461/2F | Original Q6

Question	Answers	Mark	AO / Spec Ref.
06.3	**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	AO3
	Level 1: Relevant points are made. They are not logically linked.	1–2	AO2
	No relevant content	0	
	Indicative content **points for transplant:** • transplant is cheaper • numerical comparison, eg £18 000 cheaper in first year and £30 000 cheaper in subsequent years • less / no inconvenience, eg time **or** cost for hospital visits • less / no restriction on lifestyle • less / no restriction on diet or fluid intake • no danger of infection from eg puncturing skin or blood in contact with machine • less / no possibility of blood clots • no need to take anti-clotting drugs • transplanted kidney keeps water / urea / ions in blood at correct level at all times • feel well all the time **points against transplant:** • danger of rejection • need tissue match for transplant • donors in short supply • possibility of organ damage due to anaesthetic • possibility of infection in surgery • possibility of damage due to surgery • need to take immunosuppressant drugs • may suffer other infections due to suppressed immune system • may need repeat operation (after about 10 years) For **Level 3** students should refer to both points for and points against.		4.5.3.3

4.2.2.3 Blood

Answer 33 · Mark scheme

June 2023 | 8461/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.4	4 × 5 000 = 20 000		1	AO2 4.5.3.3
	20 000 + 17 000	allow 25 000 + 17 000	1	
	(£) 37 000	allow (25 000 + 17 000) = (£) 42 000	1	

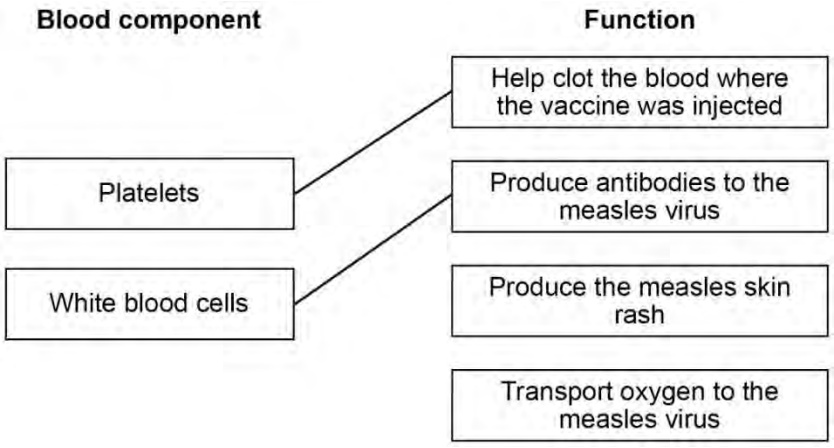
Total Question 6	12

4.2.2.3 Blood

Answer 34 · Mark scheme

June 2024 | 8461/1F | Original Q3

Question 3

Question	Answers	Mark	AO / Spec Ref.
03.1	 do **not** accept more than one line from a box on the left	1 1	AO2 4.3.1.7 4.3.1.6 4.2.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.2	1968	allow 1969	1	AO3 4.3.1.2 4.3.1.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.3	increases (then) levels off / plateaus (then) decreases	 allow (then) stays the same allow reaches a maximum between 1956 and 1968 ignore use of numbers of people if no other mark awarded allow **1** mark for (overall) decrease	1 1 1	AO3 4.3.1.2

4.2.2.3 Blood

Answer 34 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.4	(the percentage) decreased	allow (the percentage) decreased then increased allow (the percentage) changed from 92% to 80%	1	AO3 4.3.1.2 4.3.1.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.5	parents were worried their children would get condition **X**		1	AO3 4.3.1.2 4.3.1.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.6	have the research peer reviewed		1	AO2 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.7	any **one** from: • (the author was) biased • (the author was) influenced by money • because the research was not peer reviewed • there was not enough evidence • small sample size	ignore (the author) was paid	1	AO3 4.3.1.9

Total Question 3	**10**

4.2.2.3 Blood

Answer 35 · Mark scheme

Question 3

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.1	pathogens antitoxins	in this order only	1 1	AO1 4.3.1.1 AO1 4.3.1.6 4.2.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.2	*measurement* 60 (mm) *conversion* 60 000 (µm) *substitution* $= \frac{60\,000}{4\,000}$ *real width* 15 (µm)	allow measurement in the range 59 (mm) to 61 (mm) allow correct conversion from incorrect measurement allow correct substitution using incorrect conversion allow correct calculation using incorrectly converted value	1 1 1 1	AO2 4.1.1.5

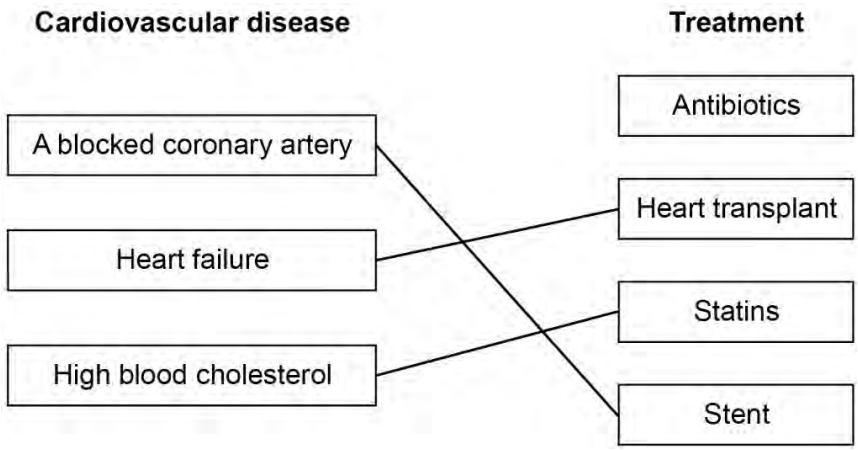
Question	Answers	Extra information	Mark	AO / Spec Ref.
03.3	capillary		1	AO3 4.2.2.2 4.2.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.4	(blood in arteries) has high pressure (so need thick walls) to withstand / maintain the pressure **or** (so need thick walls) to prevent bursting	 ignore to increase the pressure allow **2** marks for to withstand / maintain high pressure	1 1	AO3 4.2.2.2

Answer 35 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.5	deposits / build-up / increase of fat(ty material)	allow deposits / build-up / increase of cholesterol allow deposits / build-up / increase of plaque	1	AO1 4.2.2.4

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.6	less / no blood flow (so) less / no oxygen / glucose transported (to heart / body)	 allow **2** marks for less oxygenated blood flows if no other marks awarded allow **1** mark for idea that it will lead to a heart attack	1 1	AO1 4.2.2.4

Question	Answers	Mark	AO / Spec Ref.
03.7	 do **not** accept more than one line from a box on the left	1 1 1	AO1 4.2.2.4

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.8	because it cannot be spread / passed on (from one person to another) **or** because it is not caused by a pathogen / bacterium / virus / fungus / protist / microorganism / microbe	allow not contagious / infectious ignore because it is a lifestyle disease	1	AO2 4.2.2.4

Total Question 3	16

4.2.2.3 Blood

Version 1: 0109

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Biology 4411

BLY3F Unit Biology 3

Mark Scheme

2009 examination – January series

4.2.2.3 Blood

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' 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.

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Dr Michael Cresswell Director General

4.2.2.3 Blood

MARK SCHEME

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 and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

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

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 lines 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.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates 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.

4.2.2.3 Blood

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

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate 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

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

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 are 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 e.c.f. 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.

4.2.2.3 Blood

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
1(a)(i)	artery		1
1(a)(ii)	capillary		1
1(b)	alveoli		1
	red blood cells		1
	nucleus		1
Total			**5**

4.2.2.3 Blood

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
2(a)(i)	energy		1
2(a)(ii)	microorganisms		1
2(b)(i)	25°C		1
2(b)(ii)	pathogens		1
Total			**4**

4.2.2.3 Blood

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

<table>
<tr><th>question</th><th>answers</th><th>extra information</th><th>mark</th></tr>
<tr><td>3(a)</td><td>178</td><td>ignore working or lack of working

correct working: 180 – 2 but no answer / wrong answer = 1 mark</td><td>2</td></tr>
<tr><td>3(b)</td><td><table><tr><th>Man A</th><th>Man B</th></tr><tr><td>higher</td><td>lower</td></tr><tr><td>lower</td><td>higher</td></tr><tr><td>lower</td><td>higher</td></tr></table></td><td>all 4 cells correct = 2 marks
2 or 3 cells correct = 1 mark
0 or 1 cells correct = 0 mark</td><td>2</td></tr>
<tr><td>Total</td><td></td><td></td><td>4</td></tr>
</table>

4.2.2.3 Blood

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
4(a)	yeast		1
4(b)(i)	**two** sensible suggestions, each linked to correct explanation:	max **4** marks	
	does not release CO		1
	gas is toxic / harms living organisms		1
		allow ethanol <u>only</u> releases CO_2 and H_2O for **1** mark	
	does not release NO_x / SO_2	do **not** allow more pollution / more gases released	1
	gas(es) cause acid rain / eq / harms organisms		1
	or		
	does not cause acid rain (1)		
	(acid rain) damages building / harms organisms (1)		
	made from crops / not a fossil fuel (1)		
	crops can re-grow / source is renewable / fossil fuels are non-renewable (1)		
4(b)(ii)	any **one** from • releases less energy (per litre) • need to burn more to cover same distance / travel shorter distance • land not being used for food crops / less food available • raises food prices		1
Total			**6**

4.2.2.3 Blood

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
5(a)	40–60 hours		1
5(b)(i)	decrease 1st slowly then faster / appropriate detail from the graph eg from 7.8 to 0 / faster after 4-10 h		1 1
5(b)(ii)	oxygen after glucose oxygen less than glucose	extra box ticked cancels **1** mark	1 1
5(b)(iii)	aerobic respiration		1
Total			**6**

4.2.2.3 Blood

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
6(a)(i)	kill / destroys (micro)organisms / bacteria / fungi / living things	do **not** allow get rid of microorganisms	1
6(a)(ii)	entered from environment / already in flask **or** insufficient heating to kill all microorganisms		1
6(b)	any **two** from: • heated more thoroughly / for longer / higher temperature • destroyed / killed all microorganisms • sealed better eg flask melted / sealed immediately after heating / no pouring through air • microorganisms unable to enter (from air) / can only enter when neck broken / open		2
6(c)	biogenesis		1
Total			**5**

4.2.2.3 Blood

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
7(a)(i)	19 800	for correct answer ignore working or lack of working 165 × 120 but no answer / wrong answer = **1** mark (ignore extras)	2
7(a)(ii)	any **two** from: • for respiration • energy released • prevents anaerobic respiration • prevents build-up of lactic acid	 ignore oxygen debt allow energy produced	2
7(b)	any **two** from: • increased breathing rate • increased depth of breathing **or** deep breathing • dilation of arteries / vasodilation • blood diverted from elsewhere	 } more breathing is max **1** mark ignore increase in heart rate allow heavier breathing do **not** allow harder breathing allow blood vessels dilate do **not** allow veins / capillaries dilate ignore name of organ	2
Total			**6**

4.2.2.3 Blood

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
8(a)	transpiration / evaporation / diffusion	ignore osmosis	1
8(b)(i)	D		1
8(b)(ii)	any **two** from: • <u>more</u> / <u>faster</u> diffusion **or** evaporation **or** transpiration • molecules move faster • maintains concentration gradient **or** keeps water concentration low in the air **or** brings in more dry air **or** removes damp air / water		2
Total			**4**

4.2.2.3 Blood

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
9(a)	prevents denaturation / change / damage of proteins / enzymes **or** prevents bacteria being killed / destroyed	allow protein is 'destroyed' do **not** allow 'bacteria denatured' **or** 'protein killed'	1
9(b)(i)	any **two** from: • anaerobic respiration • lactic (production) • acid (produced)	do **not** allow 'bacteria are acidic' allow max **1** mark if incorrect named acid	2
9(b)(ii)	any **one** from: • thickens / clots / solidifies (milk) • kills other microorganisms **or** prevents other microbes growing • preserves yoghurt **or** prevents yoghurt going off **or** makes yoghurt last longer **or** keeps it fresh • reference to (improved) flavour	allow reference to germs	1
9(c)	reduce / prevent growth / reproduction of microorganisms **or** to prevent decay **or** to preserve it **or** to keep it fresh **or** to prevent it becoming <u>too</u> sour	allow reference to germs ignore curdling	1
Total			**5**

4.2.2.3 Blood

AQA

GCSE
BIOLOGY
8461/1F

Paper 1 Foundation Tier

Mark scheme

June 2020

Version: 1.0 Final Mark Scheme

jun2084611F/MS

4.2.2.3 Blood

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

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

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.

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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.

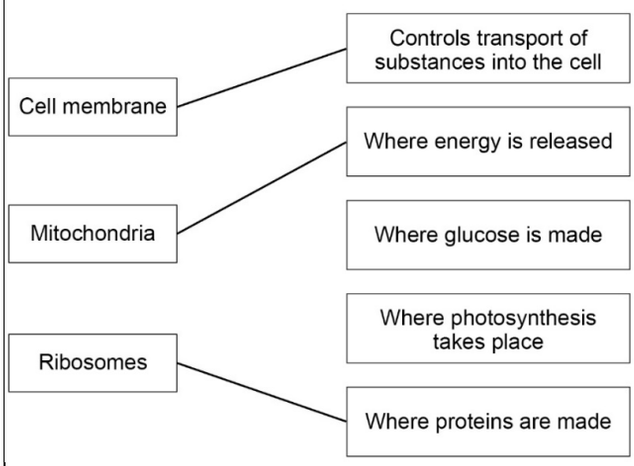
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

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.

4.2.2.3 Blood

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

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	bacterium		1	AO2 4.1.1.1
01.2	to strengthen the cell		1	AO1 4.1.1.1 4.1.1.2
01.3	chloroplast		1	AO2 4.1.1.2 4.2.3.1
01.4	**Structure** **Function**  additional line from a box on the left negates the mark for that box		3	AO1 4.1.1.2 4.1.3.1
01.5	adjust the focus knob		1	AO3 4.1.1.2 RPA1
01.6	(A =) 15 (mm) (B =) 60 (mm)	allow a tolerance of ± 1mm	1 1	AO2 4.1.1.2 RPA 1
01.7	$\frac{60}{15} = 4(.0)$	allow ecf from question **01.6**	1	AO2 4.1.1.2 RPA 1

4.2.2.3 Blood

01.8	$\frac{40}{0.1}$ 400	 do **not** accept if a unit is given	1 1	AO2 4.1.1.5 RPA 1
Total			**12**	

4.2.2.3 Blood

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	mitosis		1	AO1 4.1.2.2
02.2	all lines correct = **2** marks 1 or 2 lines correct = **1** mark **Stage of cell cycle** / **What happens during that stage** Stage 1 → The cell grows and the chromosomes replicate Stage 2 → One set of chromosomes is pulled to each end of the cell Stage 3 → The cytoplasm and cell membrane divide to form two new cells additional line from a box on the left negates the credit for that box		2	AO1 4.1.2.2
02.3	$\frac{7}{10} \times 100$ 70(%)	allow $\frac{252}{300} \times 100$ allow answer calculated from angle in range 250° to 254° if no other mark awarded, allow 0.7 for **1** mark	1 1	AO2 4.1.2.2
02.4	3		1	AO2 4.1.2.2
02.5	DNA	allow deoxyribonucleic acid	1	AO1 4.1.2.1 4.1.2.2
02.6	a gene		1	AO1 4.1.2.1

4.2.2.3 Blood

02.7	(bone marrow) cells differentiate into many / other types of (named) cell (so) will cure diseases where new cells are needed **or** will cure diseases where cells are damaged	allow (bone marrow) cells can become many / other types of (named) cell allow (so) will cure anaemia / leukaemia **or** blood cancer **or** blood disorders allow (so) will cure paralysis / diabetes	1 1	AO1 AO2 4.1.2.3
Total			**10**	

4.2.2.3 Blood

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **one** from: • bacteria • fungi • protists	allow singular allow names of pathogens e.g. Salmonella ignore virus / germ	1	AO1 4.3.1.1 4.3.1.3 4.3.1.5
03.2	hydrochloric acid is produced by the stomach the skin is a barrier covering the whole body		1 1	AO1 4.2.2.1 4.3.1.6
03.3	white blood cells engulf the microorganisms.		1	AO1 4.2.2.3 4.3.1.6
03.4	weakened fast	in this order only	1 1	AO1 4.3.1.7
03.5	by coughs / sneezes	allow 'by droplets in the air' do **not** accept other means of transmission e.g. touch	1	AO1 4.3.1.1 4.3.1.2
03.6	(from day) 10 (to day) 18	allow (from day) 18 (to day) 10	1	AO2 4.3.1.2
03.7	14 (days)	allow in the range 13 to 15 (days)	1	AO3 4.3.1.2
03.8	any **one** from: • they had been vaccinated • they already had antibodies • they were immune • they had had it before • they did not get any / enough virus from infected child • they did not play (much) with the infected child	ignore they were resistant ignore they wore a mask unqualified	1	AO3 4.3.1.2 4.3.1.7

4.2.2.3 Blood

03.9	antibiotics do not kill viruses	allow antibiotics do not work on viruses allow antibiotics only kill bacteria	1	AO3 4.3.1.8
Total			**11**	

4.2.2.3 Blood

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	increased (at first) until 4 minutes **or** 50 breaths per minute (then) stayed constant (from 4 minutes **or** at 50 breaths per minute)		1 1 1	AO2 4.4.2.2
04.2	175 (beats per minute)		1	AO2 4.4.2.2
04.3	140 (beats per minute)		1	AO2 4.4.2.2
04.4	because his rate is lower than the maximum safe rate	allow ecf for incorrect values in question **04.2** and question **04.3**	1	AO3 4.2.2.2 4.4.2.2

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04.5	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO3
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO2
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO2
	No relevant content	0	

	Indicative content
	
	• heart rate increased
	  ○ to increase blood flowing to muscles / lungs
	  ○ to provide more oxygen (to muscles)
	  ○ to provide more glucose (to muscles)
	  ○ to remove carbon dioxide more quickly (from the muscles / blood)
	  ○ to remove lactic acid more quickly (from the muscles)
	
	• breathing rate increased
	  ○ supplies more oxygen / air to lungs
	  ○ so more oxygen to blood
	  ○ more carbon dioxide removed
	
	• more oxygen to muscles
	  ○ needed for (increased) respiration
	  ○ to release / provide energy
	  ○ for muscle contraction
	
	• anaerobic respiration occurs
	  ○ due to lack of oxygen
	  ○ which causes a build-up of lactic acid
	  ○ oxygen debt
	  ○ muscle fatigue / pain
	
	To reach **Level 3**, there must be reference to heart rate, breathing rate and respiration
			4.2.2.2
			4.2.2.3
			4.4.2.1
			4.4.2.3
			4.4.2.2

Total			**12**

4.2.2.3 Blood

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	will stop animals / herbivores eating it	allow it will not be eaten	1	AO3 4.3.3.2
05.2	chemical		1	AO1 4.3.3.2
05.3	thorns / spikes / spines / prickles (to stop animals / herbivores eating it)		1	AO3 4.3.3.2
05.4	for respiration to store as starch		1 1	AO1 4.4.1.3 4.4.2.1
05.5	add Benedict's (solution / reagent to the liquid) boil / heat (if glucose is present the blue) colour changes to yellow / green / orange / brown / (brick)red	 allow any temperature of 65 °C or above	1 1 1	AO1 4.2.2.1 RPA 4
05.6	(nitrate ions are needed) to make proteins / amino acids which are needed for growth / enzymes / new cells	allow to make chlorophyll / DNA / ATP / nucleic acid allow correct process for named molecule in mp1	1 1	AO1 AO2 4.1.3.3 4.4.1.3 4.4.2.3
05.7	in / on the (soil) water	allow through air (spaces) in the soil	1	AO3 4.3.1.1 4.3.1.4
05.8	dosage toxicity		1 1	AO1 4.3.1.9

4.2.2.3 Blood

05.9	placebos		1	AO1 4.3.1.9
Total			**14**	

4.2.2.3 Blood

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	all lines correct = **2** marks 1 **or** 2 lines correct = **1** mark **Type of blood vessel** / **Structure of blood vessel** Artery Capillary Vein One cell Muscle tissue Muscle tissue additional line from a box on the left negates the credit for that box		2	AO2 4.2.2.2

4.2.2.3 Blood

06.2	any **one** from: • thick(er) (muscle) walls / tissue (1) to push blood (all) around the body (1) **or** • thick(er) elastic walls / tissue (1) to maintain / withstand high (blood) pressure **or** to retain / regain shape (1) **or** • narrow lumen (1) to maintain high (blood) pressure (1)	allow to withstand high (blood) pressure do **not** accept to pump blood (all) around the body	2	AO1 4.2.2.2
06.3	(A) – white (blood) cell(s) (B) – platelet(s)	allow any named white (blood) cell(s)	1 1	AO2 4.2.2.3
06.4	(no nucleus) more space for haemoglobin / oxygen (has haemoglobin) to bind / carry oxygen	allow to carry more oxygen ignore carries carbon dioxide	1 1	AO3 4.1.1.2 4.1.1.3 4.2.2.3
06.5	plasma		1	AO1 4.2.2.3
06.6	platelets		1	AO3 4.2.2.3

4.2.2.3 Blood

06.7	any **one** from: • (continued) bleeding • (more) bruising	allow described allow blood does not clot (at cuts) allow ecf from answer to question **06.6**	1	AO3 4.2.2.3
Total			**11**	

4.2.2.3 Blood

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1		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	
07.2		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	
07.3	$\frac{(18.5 + 19.3 + 19.5)}{3}$ **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	
07.4	a ring around 14.2	allow clear indication of correct result	1	AO3 4.4.1.2 RPA 6

4.2.2.3 Blood

07.5	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
07.6	did not use it in calculation (of mean)		1	AO3 4.4.1.2 RPA 6
07.7	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
07.8	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

4.2.2.3 Blood

07.9	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**	

4.2.2.3 Blood

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	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	
08.2	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	

4.2.2.3 Blood

08.3	**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		

4.2.2.3 Blood

08.4	Osmosis	allow diffusion	1	AO1 4.1.3.1 4.2.3.2 4.1.3.2
08.5	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**	

4.2.2.3 Blood

Answer 29 · Examiner comments

November 2020 | 8461/1F | Original Q6

Question 6 (low & standard demand)

A lack of specificity in use of scientific language meant that few students were able to accurately articulate their ideas in **06.2**, resulting in a high level of discrimination between lower- and higher-attaining students. Many students referenced thick cell walls, lots of muscle in cells, as well as arteries having a large surface area.

06.3 highlighted that some students may not have been exposed to alternative images of blood cells, and many thought that the blood cells were actually cell parts, such as nuclei and cytoplasm. Half of the students gained marks in this question.

In **06.7** several students were able to make the link between platelets and blood clotting, but many incorrectly stated that the blood would clot too much as a result of reduced platelets.

Answer 31 · Examiner comments

June 2022 | 8461/1F | Original Q1

Question 1 (Low demand)

01.1 The majority of students correctly identified sexual intercourse as causing the spread of HIV.

01.2 Many students failed to recognise that there were 2 marks available for this question, and only described the overall trend shown in the table, rather than the increase followed by the decrease. Students are encouraged to check the number of marks available for each question and structure their answer accordingly. Nearly 60% of students were awarded the fallback mark on this question, describing an overall decrease.

01.3 Nearly all students who attempted this question answered correctly.

01.4 Just under half of all students gained full marks in this question. Students would benefit from crossing off the letters they have already used in questions such as these, to prevent the same letter being used twice, as was seen on rare occasions.

01.5 Over 70% of students could identify the next stage in testing a vaccine following testing on live animals.

01.6 Over 80% of students knew that drugs that destroy viruses also damage body tissues.

01.7 Less than a third of students gained full marks in this question, and nearly 40% were awarded zero marks.

4.2.2.3 Blood

Answer 32 · Examiner comments

June 2023 | 8461/1F | Original Q4

Question 4 (Low and standard demand)

04.1 Nearly two thirds of students knew the term 'vector' correctly describes the mosquito.

04.2 Although the question states that Figure 2 showed a (single) cell of a malarial protist, some students remained confused and believed that there were 'cells depicted within a cell'. Others incorrectly discussed the absence of plant cell features, such as 'no chloroplasts', while others got prokaryotic and eukaryotic cells muddled. Reference to size was ignored. While 25% of students failed to gain any marks, the most frequently seen correct feature was 'nucleus', followed by 'mitochondria'. Phonetic spellings were obviously allowed as students have difficulty in spelling both of these words. As in all questions of this nature, the 'list rule' applied so that where a student gave 3 answers, 2 of which were correct and 1 wrong, only one mark could be given.

04.3 Over two thirds of students gained the mark by selecting *Salmonella* to be prokaryotic. While the remaining students indicated 'cow' or 'grass', in equal amounts.

04.4 Around 77% of students knew that asexual reproduction involved only one parent.

04.5 It is clear that many students still remain unclear about the number of chromosomes involved in mitosis. Only around a third of students correctly selected '14' as the number of chromosomes each new protist cell would have after mitosis. The most common incorrect answer seen was '28', which was selected by a further third of the students.

04.6 Around half of students were correct in selecting 'decreased haemoglobin' as a change that would happen in the blood of a person with malaria.

04.7 Nearly 35% of students who are adept at mathematics found this question very straightforward and an easy route to four marks. A further 31% managed three marks, via many routes, but most commonly by reaching the point of 350 million but then failing to convert to standard form or incorrectly doing so. Others forgot that the question referred to 'millions' of people being infected and used 105 and 315 but, nevertheless, an answer of 3.15×10^2 was still awarded three marks.

04.8 Many students were aware of what should be done to reduce the chance of being bitten by mosquitoes but then used inadequate scientific language to express themselves and as such only around 13% of students gained both available marks. Answers such as 'cover yourself up' or 'use bug spray / repellent' were not credited. 'Wear more / thicker clothes' was also deemed insufficient and 'close windows / doors' also failed to get credit without qualifying that this was only important in the evenings. Some correctly suggested not going to places with mosquitoes or where there was an incidence of malaria and a few answers referred to destruction of breeding grounds. Other correct suggestions were also awarded credit, but overall 42% of students scored zero marks.

04.9 Nearly three quarters of students gained one mark here for correctly describing that the chance of getting malaria decreased with age. A few incorrectly understood the context of disorder S, however, and said that the likelihood of having this, rather than malaria, was lower as age increased. Even though the instruction given in the question was to use data

4.2.2.3 Blood

Answer 32 · Examiner comments June 2023 | 8461/1F | Original Q4

from Table 4 only around 10% of students went on to gain the second mark for an appropriate use of figures. Some, unfortunately, glanced too quickly at the results and believed there was a decrease of 5% every 2 years.

Answer 33 · Examiner comments June 2023 | 8461/2F | Original Q6

Question 6

This question was about filtration in the kidney and the benefits of a kidney transplant compared with dialysis for the treatment of kidney disease.

06.1 The vast majority of students were able to link the boxes correctly to show that glucose molecules were small enough to pass through the kidney's filter and that protein molecules were too large, as shown in Figure 10.

06.2 This should have been a simple subtraction of the data in Table 4:

160.0 – 1.9 = 158.1

To show the volume of water reabsorbed by the kidneys in one day. However, only one-half of students did this correctly. Some added the figures, some multiplied and some divided them.

06.3 This was an extended response question to evaluate the claim that it is better to treat a person with kidney disease by using a kidney transplant rather than by dialysis. Students were instructed to make use of the 8 points of information given in Figure 11.
Students only had to assign information from Figure 11, or their own knowledge, as being in favour of or against kidney transplant. No further overall judgement was required.
The most common omission was for students to simply copy information from Figure 11, without identifying the ideas as being in favour of a transplant or against one.
Those students who gained marks commonly referred to the lower cost of transplant or that the transplant may only last for 10 years. Many others described the inconvenience of dialysis, as being in favour of a transplant.

4.2.2.3 Blood

Answer 33 · Examiner comments June 2023 | 8461/2F | Original Q6

Most students appeared unaware that patients on dialysis must also take drugs, so simply referring to the inconvenience of drug taking was insufficient; the consequences of the different types of drug were required.
A few students referred to the danger of rejection or having to wait for a suitable donor; but such ideas were usually offered only by better students, as was the idea that transplant patients tend to feel well all the time.
In order to gain marks at the highest level, answers needed to include both advantages and disadvantages of a kidney transplant.

06.4 Given some information about the cost of a transplant operation and the subsequent annual cost of drugs, students had to calculate the overall cost for the first 5 years.
Many students arrived at the correct answer of £37 000, although a few added £5 000 to the first year as well, giving £42 000. If they did the latter, 2 marks out of 3 were still available. Weaker students added the first year's cost and the subsequent annual cost, then multiplied the whole by 5, and could not be awarded any credit. Around half of the students were completely successful.

Answer 34 · Examiner comments June 2024 | 8461/1F | Original Q3

Question 3 (low and standard demand)

03.1 85% of students gained at least one mark in this question. As with other linking questions, some students drew more than one line from each box on the left, meaning no marks could be awarded for that box.

03.2 Over 70% of students were awarded the mark for this question, with the most common incorrect answers being 1945 and 1970. A minority of students gave a range of years.

03.3 Students found this question relatively easy to access, with nearly half being awarded full marks. The command word in this question was 'describe' and no credit was given for added explanatory detail, which a number of students provided. A number of students did not acknowledge the period where the number of people remained the same. A number of students who did acknowledge it used inappropriate terminology that was not creditworthy, such as the graph being 'consistent' or references to 'nothing happening' or there being 'no new cases' at the time, which were incorrect. A small number of students described the number of cases rather than the trend and linked the number of cases to the vaccination rate or vaccine introduction, which was not relevant here.

03.4 Nearly 64% of students achieved the mark in this question.

03.5 88% of students answered this question correctly.

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4.2.2.3 Blood

Answer 34 · Examiner comments June 2024 | 8461/1F | Original Q3

03.6 76% of students answered this question correctly.

03.7 Nearly 36% of students gave a creditworthy response to this question, with many articulating the idea of bias. A large proportion of students repeated the stem of question by saying simply 'because he was paid' and many were unable to express their answer succinctly or precisely enough for the mark to be awarded. A variety of different responses were given credit here but those such as 'it was not proper research', 'the person might not have been a scientist' or 'it was not proven' were insufficient.

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Question 3 (low demand)

03.1 85% of students scored both marks in this question. The most commonly seen error was confusion between antitoxins and antibiotics.

03.2 Over half of all students scored full marks in this question, with the next most common mark being 3, indicating that the majority of students found this question easy to access. Guidance was provided through the use of scaffolding for each of the steps involved and this allowed many students to access at least 3 marks. A mistake made in one step did not necessarily preclude credit being awarded elsewhere. Common errors included:

- incorrect measurements of the white blood cell, giving answers in cm or inches, or referring to the vertical line rather than to the horizontal line for width.
- incorrectly carrying out the conversion by dividing, rather than multiplying, by 1000
- incorrectly transferring numbers from one step to another by omitting or adding zeros
- using the original pre-conversion width, rather than the calculated one in micrometres, in the final substitution.

03.3 Just under half of all students were able to identify the capillary shown in the figure.

4.2.2.3 Blood

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03.4 Although some students had a clear appreciation of why arteries needed to have thick walls, many (40%) were unable to gain even one mark here. The reasons behind this reflected both a lack of understanding and ineffective expression. MP1 required reference to high pressure, i.e. the conditions that made thick walls essential, and not just to 'pressure' without qualification that the pressure was 'high'. References to volume, rate of flow, direction of flow or the concentration of blood were also not creditworthy. To achieve MP2, responses then had to go on further, with an explanation of what the thick walls allowed or prevented. Responses that did not gain credit here were either:

- too vague, such as 'to stop damage', 'to prevent bleeding' or 'to keep the blood inside'.
- incorrect, such as 'to pump blood around', 'stop backflow' or 'protect from pathogens'.

03.5 10% of students did not attempt this question and a further 60% did not score credit. Many misinterpreted what was being asked for and answered in terms of risk factors, such as 'smoking', outcomes such as 'reduced blood flow' or treatments such as 'stents'. In some cases, responses were too vague to be creditworthy, such as 'blockages occur'. Incorrect answers included 'muscles in the walls contract', 'they shrink' or 'fatty acids build up'.

03.6 Many students gave answers which matched MP1 but fewer gained MP2 and as such, 50% of students scored one mark, with a further 15% scoring two marks. Responses such as 'it will create a blockage', 'it can lead to a reduction (or increase) in blood pressure', 'it causes blood to clot', 'it leads to blood flowing backwards' or 'the vessels are more likely to burst' were either insufficient or incorrect and gained no credit.
A significant number of students gained the fall-back mark by referring to the idea of the narrowed arteries leading to a heart attack.

03.7 Nearly half of all students scored full marks in this question, with the most common being a link between 'high blood cholesterol' and 'antibiotics'. The majority of students correctly associated 'heart failure' with 'heart transplant'.

03.8 Nearly three quarters of students gained credit in this question. Responses which were unable to gain credit included 'it cannot be treated', 'it is caused by the build-up of plaque', 'it has symptoms which are not easy to see' and 'it happens inside the body'.