AQA GCSE Biology | 8461

SPECIFICATION POINT 4.1.3.2

Osmosis

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**17**
Available paper years	**2008–2025**

Using this booklet

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

Name: _____ **Date:** _____

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

4.1.3.2 Osmosis

Answer 01 · Mark scheme January 2008 | BLY2F | Original Q2 | Legacy

Question 2

	answers	extra information	mark
(a)	4000	award **both** marks for correct answer, irrespective of working 1500 + 2000 + 500 gains **1** mark	2
(b)	day 2 (no mark) any **two** from: • more (water in) breath / breathing • more (water in) sweat / sweating • less (water in) urine	max **1** mark if correct day not identified or if no day given accept a lot of sweating if no other marks awarded allow **1** mark for more water lost on day 2	2
(c)(i)	respiration		1
(c)(ii)	cools / removes heat owtte	ignore 'maintains body temperature' unqualified	1
(c)(iii)	osmosis		1
total			7

4.1.3.2 Osmosis

Answer 01 · Mark scheme January 2008 | BLY2F | Original Q2 | Legacy

BLY2F

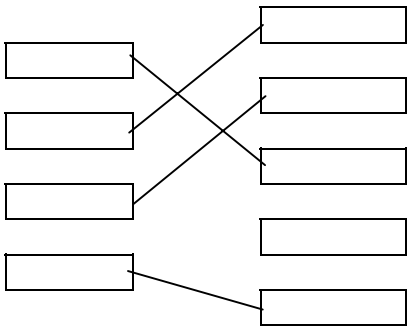
Answer 02 · Mark scheme January 2008 | BLY3F | Original Q4 | Legacy

(b)(ii)	4	1
(c)	red blood cells	1
total		5

4.1.3.2 Osmosis

BLY3F

Question 3

question	answers	extra information	mark
		**1** mark for each line extra line from List A Action cancels the mark	4
total			4

4.1.3.2 Osmosis

BLY3F

Question 4

question	answers	extra information	mark
(a)(i)	<u>on diagram:</u> arrow drawn from cell **X**, through air space and out through stoma above stoma		1
(a)(ii)	transpiration		1
(b)(i)	13 – 15	ignore units	1
(b)(ii)	any **two** from: • warmest / hottest / brightest time of day • water evaporates fastest • stomata open / more open	accept warmer / hotter **or** sun higher in sky	2
total			5

4.1.3.2 Osmosis

Answer 02 · Mark scheme January 2008 | BLY3F | Original Q4 | Legacy

BLY3F

Answer 03 · Mark scheme June 2008 | BLY2F | Original Q1 | Legacy

question	answers	extra information	mark
1(a)	**A** nucleus		1
	B (cell) membrane		1
	C cytoplasm		1
1(b)(i)	it is thin		1
1(b)(ii)	diffusion		1
Total			**5**

4.1.3.2 Osmosis

Answer 04 · Mark scheme

June 2008 | BLY2F | Original Q5 | Legacy

question	answers	extra information	mark
5(a)(i)	0		1
5(a)(ii)	osmosis		1
5(b)	0.5 no change in mass / weight **or** no (net) osmosis / same amount of water in <u>and</u> out	 allow 'chip / it stays the same'	1 1
5(c)	repeat / use more chips in each solution	allow use of other people's results do **not** allow 'get more results' unqualified do **not** allow leave longer / use more concentrations / better instrumentation	1
Total			**5**

4.1.3.2 Osmosis

Answer 04 · Mark scheme

June 2008 | BLY2F | Original Q5 | Legacy

COMPONENT NUMBER: BLY2F

COMPONENT NAME: Additional Science / Biology

STATUS: Final

DATE: June 2008

4.1.3.2 Osmosis

Answer 05 · Mark scheme June 2009 | BLY2F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	A		1
2(b)(i)	diffusion		1
2(b)(ii)	respiration		1
2(b)(iii)	mitochondria		1
2(b)(iv)	photosynthesis		1
Total			**5**

4.1.3.2 Osmosis

Answer 05 · Mark scheme

June 2009 | BLY2F | Original Q2 | Legacy

BLY2F

4.1.3.2 Osmosis

Answer 06 · Mark scheme

Question 2

question	answers	extra information	mark
2(a)	microorganisms		1
2(b)	moist		1
2(c)	respiration		1
2(d)	roots		1
Total			**4**

4.1.3.2 Osmosis

Answer 06 · Mark scheme June 2010 | BLY2F | Original Q2 | Legacy

BLY2F

Answer 07 · Mark scheme January 2011 | BLY3F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)(i)	capillary		1
2(a)(ii)	diffusion		1
2(b)(i)	Z	ignore any names	1
2(b)(ii)	large / increased surface / area / **or** to absorb more food **or** improved diffusion	allow all food absorbed	1
Total			**4**

Answer 07 · Mark scheme January 2011 | BLY3F | Original Q2 | Legacy

BLY3F

4.1.3.2 Osmosis

Answer 08 · Mark scheme

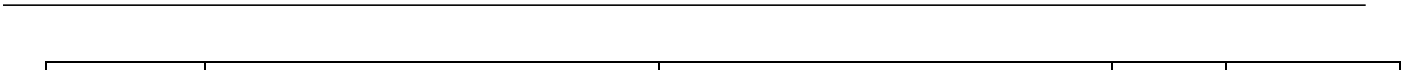
June 2015 | BL3FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)(i)	alveoli / alveolus	allow air sacs allow phonetic spelling	1	AO1 312a
1(a)(ii)	any **one** from: • protection (of lungs / heart) • help you breathe / inflate lungs		1	AO1 312a
1(b)(i)	diffusion		1	AO1 312b
1(b)(ii)	capillaries		1	AO1 311h/i/k
1(b)(iii)	any **two** from: • (have many) alveoli • large surface / area • thin (exchange) surface **or** short diffusion pathway • good blood supply / many capillaries	allow air sacs accept only one / two cell(s) thick allow (kept) ventilated or maintained concentration gradient	2	AO1 321g
Total			6	

4.1.3.2 Osmosis

Answer 08 · Mark scheme

June 2015 | BL3FP | Original Q1 | Legacy



4.1.3.2 Osmosis

Answer 09 · Mark scheme

June 2016 | BL3FP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)	diffusion active transport	this order only	1 1	AO2 3.1.1a/g
7(b)(i)	concentration (of sugar) in the bag was higher (than in the drink) **or** higher concentration of water outside the bag **or** in the drink / boiling tube (so) water moved in (to the tubing) by osmosis	allow concentration (of sugar) in the drink was lower (than in the bag) allow higher water potential outside the bag **or** lower water potential inside the bag allow water moves down **its** concentration gradient do **not** allow sugar moving allow diffusion (of water) do **not** allow sugar moving by osmosis **or** water moving by active transport	1 1 1	AO2 3.1.1.a/b/c
7(b)(ii)	**B**		1	AO3 3.1.1a/b/c
7(b)(iii)	close(st) to the concentration in the bag **or** to 5% (so rate of) diffusion / osmosis is slow	allow small(est) diffusion gradient **or** close(st) to an equilibrium allow (so) less water moves in (to the bag) ignore ref. to sugar	1 1	AO2/3 3.1.1a/b/c
Total			**8**	

4.1.3.2 Osmosis

Answer 09 · Mark scheme

June 2016 | BL3FP | Original Q7 | Legacy



4.1.3.2 Osmosis

Answer 10 · Mark scheme

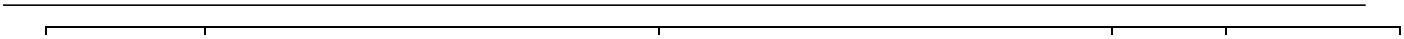
June 2017 | BL3FP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)	The movement of water from a dilute solution to a more concentrated solution through a partially permeable membrane.		1	AO1 3.1.1b
2(b)	**A** = phloem **B** = xylem		1 1	AO2 3.2.3a
2(c)	transpiration		1	AO1 3.2.3a
2(d)(i)	mass before – mass after		1	AO2 3.2.3a
2(d)(ii)	**A** has the largest surface area		1 1	AO2/3 3.1.3b/ d
2(d)(iii)	any **two** from: • hot / warm(er) • dry / drier • windy	allow turn on a heater / increase temperature allow turn on a fan	2	AO1 3.1.3d
Total			**9**	

4.1.3.2 Osmosis

Answer 10 · Mark scheme

June 2017 | BL3FP | Original Q2 | Legacy



4.1.3.2 Osmosis

Answer 11 · Mark scheme June 2019 | 8461/1F | Original Q1

01.1	rice		1	4.2.2.1 AO3
01.2	25 (%)	allow an answer between 23 and 27 (%) ignore ¼ / 0.25	1	4.2.2.1 AO2
01.3	(beans) contain all (four) food groups	allow converse for chicken allow chicken contains no / less carbohydrate **or** beans contain carbohydrate allow beans contain more nutrients ignore references to water / fat / protein	1	4.2.2.1 AO3
01.4	amylase		1	4.2.2.1 AO1
01.5	Benedict's reagent		1	4.2.2.1 AO1
01.6	(brick) red / green / yellow / orange / brown		1	4.2.2.1 AO1
01.7	C		1	4.2.2.1 AO3
01.8	small intestine	allow ileum ignore intestine unqualified do **not** accept large intestine / duodenum	1	4.1.3.3 4.2.2.1 AO1
01.9	active transport osmosis		1 1	4.1.3.2 4.1.3.3 AO1 AO1
Total			**10**	

4.1.3.2 Osmosis

Answer 11 · Mark scheme

June 2019 | 8461/1F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.

4.1.3.2 Osmosis

Answer 12 · Mark scheme

June 2019 | 8461/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	protein		1	AO1 4.4.2.3 4.5.3.3
06.2	urea is a waste (product)	allow toxic / poisonous **or** may damage cells **or** denatures proteins ignore harmful / dangerous	1	AO1 4.5 4.5.3.3
06.3	respiration breathing	in this order	1 1	4.4.2.1 4.4.2.2 4.7.4.3 AO1
06.4	least medium most	in this order 3 correct = **2** marks 1 or 2 correct = **1** mark	2	AO3 4.5.2.4 4.5.3.3
06.5	diffusion		1	AO1 4.1.3.1 4.5.3.3
06.6	protein (molecules too) large	this mark may only be awarded if mp1 is correct or not attempted allow pores in membrane are too small	1 1	AO3 4.5.3.3
06.7	3	allow three	1	AO3 4.5.3.3
06.8	increases	ignore numbers	1	AO3 4.5.3.3

4.1.3.2 Osmosis

Answer 12 · Mark scheme

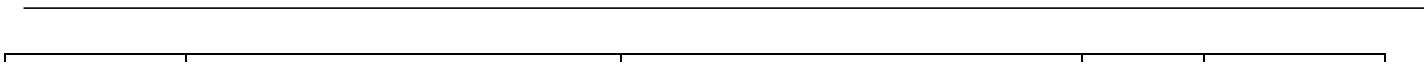
June 2019 | 8461/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.9	any **two** from: • has a low(er) concentration of urea • constant urea concentration / level • less time attached to machine **or** fewer hospital visits • no / less restriction on travel • not piercing skin repeatedly • less chance of infection / blood clots • cheaper in the long term • no restrictions on diet	allow converse points for person **A** / dialysis allow substance (if named must be correct) ignore cheaper unqualified	2	AO3 4.5.3.3
Total			**13**	

4.1.3.2 Osmosis

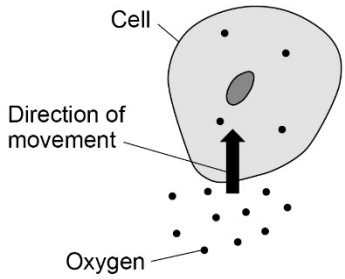
Answer 12 · Mark scheme

June 2019 | 8461/2F | Original Q6



4.1.3.2 Osmosis

Answer 13 · Mark scheme November 2021 | 8461/1F | Original Q1

01.1			1	AO3 4.1.3.1

01.2	water mineral ions energy	in this order only allow minerals / ions	 1 1 1	AO1 4.1.3.2 4.1.3.3 4.2.3.2

01.3	root hair (cell)	ignore root / hair unqualified	1	AO1 4.1.1.3 4.2.3.2

01.4	large surface / area	allow it has a long projection allow the walls are thin allow it has lots of mitochondria	1	AO1 4.1.1.3 4.2.3.2

01.5	**Feature of sperm cell** / **How the feature helps** Contains a nucleus → To provide the chromosomes for fertilisation Has a long tail → To help the cell to swim to the egg To break the outer layer of the egg To release energy do **not** accept more than one line from a box on the left		 1 1	AO1 4.1.1.3

4.1.3.2 Osmosis

01.6	nerve (cell) any **one** from: • long • has branches • has insulation	allow neuron(e) ignore motor / sensory / relay allow myelin / fat	1 1	AO1 4.1.1.3
Total			**10**	

4.1.3.2 Osmosis

Answer 13 · Mark scheme

November 2021 | 8461/1F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.

4.1.3.2 Osmosis

Answer 14 · Mark scheme

June 2022 | 8461/1F | Original Q7

Question 7

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

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

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

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

4.1.3.2 Osmosis

Answer 14 · Mark scheme

June 2022 | 8461/1F | Original Q7

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

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	$\frac{0.2}{2.5} \times 100$ 8(%)	allow $\frac{2.7 - 2.5}{2.5} \times 100$ if no other mark awarded allow **1** mark for $\frac{2.5 - 2.7}{2.5} \times 100 = -8\ (\%)$	1 1	AO2 4.1.3.2 RPA3

4.1.3.2 Osmosis

Answer 14 · Mark scheme

June 2022 | 8461/1F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7 Mark with 07.8	correct scale **and** axis labelled (concentration (of salt solution) in mol/dm^3)	max **3** marks for bar chart scale must take up at least 50% of grid	1	AO2 4.1.3.2 RPA3
	all points plotted correctly	allow a tolerance of ± ½ small square allow 3 or 4 correct plots for **1** mark	2	
	curved line of best fit	ignore line extended beyond 0.4 mol/dm^3 ignore line joined point to point with straight lines	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.8 Mark with 07.7	correct answer from their line drawn on **Figure 9**	allow a tolerance of ± ½ small square ignore line joined point to point with straight lines if a line of best fit is drawn if no line of best fit is drawn, allow an answer in the range 0.31 – 0.33 (mol/dm^3)	1	AO2 4.1.3.2 RPA3

4.1.3.2 Osmosis

Answer 14 · Mark scheme

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

Total Question 7		17

4.1.3.2 Osmosis

Answer 15 · Mark scheme

June 2023 | 8461/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.1	a leaf		1	AO2 4.2.1 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.2	$\frac{1.1 + 1.1 + 1.4}{3}$ **or** $\frac{3.6}{3}$ 1.2 (grams)	if no answer given on answer lines, allow an answer in **Table 1**	1 1	AO2 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.3	ring around −32.4 (grams)	table takes precedence allow (−)32.4 (grams) written by question	1	AO3 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.4	did not include it	allow ignored it	1	AO2 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.5	control variable		1	AO1 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.6	time in the salt solution		1	AO3 4.1.3.2 RPA3

4.1.3.2 Osmosis

Answer 15 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.7	osmosis		1	AO2 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.8	some particles		1	AO1 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.9	use more concentrations of salt solution		1	AO3 4.1.3.2 RPA3

Total Question 1	10

Answer 16 · Mark scheme

Question 6

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.1	any **two** from: • size of piece of potato • the (type of) potato • volume / 100 cm^3 of salt solution • time (pieces of potato are kept) in the solution / beaker • the potato was uncooked	ignore size of potato allow amount of salt solution allow 20 minutes (the pieces of potato are kept) in the solution / beaker ignore time unqualified	2	AO1 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.2	blot **or** dry (the surface)	allow descriptions of blotting allow descriptions of drying (the surface)	1	AO3 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.3	balance **or** weighing scale		1	AO1 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.4	0.1 g		1	AO2 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.5	D		1	AO3 4.1.3.2 RPA3

4.1.3.2 Osmosis

Answer 16 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.6	$\frac{1.1}{6.0} \times 100$ 18.333… 18.3(%)	ignore minus sign throughout allow correct conversion to 1 decimal place from student's incorrect calculation using figures from potato piece **D**	1 1 1	AO2 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.7	line graph		1	AO2 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.8	water osmosis permeable (membrane)	must be in this order allow diffusion	1 1 1	AO2 AO1 AO2 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.9	answer in the range 0.15 to 0.25 (mol/dm^3)		1	AO3 4.1.3.2 RPA3

Total Question 6	14

4.1.3.2 Osmosis

Answer 17 · Mark scheme

June 2025 | 8461/1F | Original Q8

Question 8

Question	Answers	Mark	AO / Spec Ref.
08.1	**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	AO3
	No relevant content.	0	4.1.3.2 RPA3

4.1.3.2 Osmosis

Answer 17 · Mark scheme

June 2025 | 8461/1F | Original Q8

	Indicative content: *(strengths)* • same / a / one plant / potato used • all potato pieces used were cubes • mass was recorded before and after • change in mass was calculated • different concentrations of salt solution were used *(improvement and reason)* • use the same / a / one potato for all pieces o (because the student) may have used different potatoes • remove skin **or** peel the potato o (because) skin (may still be) present • blot / dry cube before measuring mass o (because) cube will have excess water on surface • use same / set size / surface area of potato piece each time o (because) size / surface area of cubes not controlled / specified • repeat (whole investigation **or** at each concentration) o (because there were) no repeats o to spot anomalies • calculate mean (from repeats) o (because there was) no mean calculated • same time for each piece to be in solution o (because) length of time in solution not specified • control temperature of solution using water bath o (because) temperature (of solution) not controlled / specified • use same volume of solution for each piece of potato **or** ensure all pieces are completely submerged o (because) volume of solution not specified / controlled • calculate percentage change in mass o (because) percentage change in mass not calculated **or** (because) each potato piece had a different starting mass • include control experiment with boiled cube o (because) no control experiment included • increase the number of concentrations (of salt solution) used o (because) only 3 different concentrations (of salt solution) used For **Level 3**, a strength and improvements / reasons must be included.		

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.2	the solution in the potato cells was more concentrated than the distilled water		1	AO2 4.1.3.2

4.1.3.2 Osmosis

Answer 17 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.3	any **one** from: • requires energy • (transports substances) against / up a concentration gradient • transports minerals / ions (and not water)	ignore it is active allow it is not passive allow (transports substances) from low concentration to high concentration ignore (transports substances) along / across the concentration gradient do **not** accept (transports substances) down a concentration gradient allow transports other named substances such as glucose allow does not transport water	1	AO2 4.1.3.2 4.1.3.3

Total Question 8	**8**

4.1.3.2 Osmosis

Answer 14 · Examiner comments

June 2022 | 8461/1F | Original Q7

Question 7 (Standard demand)

07.1 Students' knowledge of sub-cellular structures was generally well evidenced in this question, however, the common error of referring to energy production / creation in the mitochondria was still seen. In addition, students often referred to energy being released 'for respiration', which is not creditworthy. There was also frequent confusion between cell membranes and cell walls. Just under a third of students gained 2 marks in this question.

07.2 Less than 45% of students were able to correctly reference the function of chloroplasts. Of those that did, most referred to the role in absorbing sunlight, rather than referencing photosynthesis. A few students simply stated that the role was to make the cell or plant green, which was insufficient.

07.3 Only 15% of students were able to name a plant cell that was lacking in chloroplasts, with the majority often giving other types of cell (such as a bacterium), or other sub-cellular structures, as an answer.

07.4 Just under 45% of students were able to correctly identify the independent variable in the investigation.

07.5 It was clear that many students had carried out the required practical on osmosis assessed in this question. However, this did not always translate to an articulate answer regarding blotting. The 45% of students who gained credit in this question were able to articulate the need to remove excess water, or that any extra water would add to the mass recorded, rather than just repeat the stem of the question, as was commonly seen.

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

07.7 Graph drawing skills still prove difficult for some students, and many make their lives more difficult by using unusual scales or, as often seen in this question, by shifting their x-axis scale. These ideas in themselves are acceptable, but only when the scales remain even and

4.1.3.2 Osmosis

Answer 14 · Examiner comments

June 2022 | 8461/1F | Original Q7

the zero is clearly identified, which often, they were not. While many students were able to plot accurately, a number incorrectly transcribed the reading of (0.3, 0.4) from the table, instead plotting the x-value at 4.0. Many students were unable to draw a correct curve of best fit, either drawing a straight line, or a curve that did not hit all of the points, or that was broken or 'feathered'. Curves of best fit should fall within ½ a small square of all of the points and should be a single, unbroken line. Students should also be reminded that their scale should take up at least 50% of the grid space provided.

07.8 Very few students understood the idea that where the curve crosses the x-axis is where there is no net loss or gain of water in osmosis, and those that did often did not gain credit because of inaccurate readings. Again, readings must be within ½ a small square to be creditworthy. 76% of students scored zero in this question.

07.9 As in previous years, many students continue to make the same error when describing 'concentration' in osmosis explanations. If water concentration is not specified, it is assumed that solute concentration is being described and this often results in an incorrect answer (for example, 'water moves from an area of high concentration to an area of low concentration' is **not** correct). Some students correctly articulate themselves in terms of water concentration, but then go on to contradict themselves with incorrect references to concentration gradients (again, solute is assumed unless water is specifically quoted). A number of students did not make the link to osmosis, instead describing how the salt absorbed the water, dissolved the potato pieces or dried them up. Over two thirds of students scored zero in this question.

4.1.3.2 Osmosis

Answer 15 · Examiner comments

June 2023 | 8461/1F | Original Q1

Question 1 (Low demand)

01.1 Over 70% of students correctly selected the leaf as the largest part of the plant.

01.2 Students were asked to calculate a mean and nearly 75% were able to do this correctly. Errors included multiplication (rather than addition) of the three numbers before dividing by 3, and the selection of tests 1 and 2 only, reflecting the anomaly in the 3rd test for concentrated salt solution. Students are always asked to show their working out and if this was correct, but linked with a final wrong answer, one mark could still be awarded.

01.3 Almost 6% of students did not attempt this question possibly because they did not read the instruction and missed the mark unintentionally. Answers that ambiguously showed a ring around more than one result failed to gain credit.

01.4 Two thirds of students were able to gain the mark here. Some failed to answer the question, however, which specifically asked for what they should do with the result when calculating the mean. The idea of doing another test was clearly inappropriate. Others gave general descriptions of how to work out mean values; others suggested using a figure of 0.7 (the mean of the first 2 tests); others attempted to 'explain' the anomaly instead. None of these answers gained credit.

01.5 A pleasing number of students correctly identified the control variable here, with around 40% of students missing out on the mark.

01.6 Only 20% of students failed to identify the variable that students kept the same as 'Time in the salt solution'.

Answer 15 · Examiner comments

June 2023 | 8461/1F | Original Q1

01.7 Almost 80% of students knew that osmosis was the process described.

01.8 Over 85% of students knew that some particles can pass through a partially permeable membrane.

01.9 Over two thirds of students correctly identified 'use more concentration of salt solution' as a means to improving the investigation.

4.1.3.2 Osmosis

Answer 16 · Examiner comments

June 2024 | 8461/1F | Original Q6

Question 6 (low and standard demand)

06.1 Less than 20% of students were able to correctly identify two control variables the student used in the investigation in the question, with 43% managing one. Any variable which might have been controlled but which had not been referred to in the method, such as temperature, was, therefore, inappropriate. Students should be encouraged to qualify their suggestions in answers to questions of this nature. Credit was not given, for example for time, unless this was clearly associated with time 'in the solution or beaker'. Similarly, volume had to be linked with the 'salt solution' and size to the actual 'pieces' of potato. Several answers referred to 'mass' but this was clearly not controlled.

06.2 62% of students understood the need for drying the pieces of potato in this question, but answers such as 'let it dry out' were not credited as they implied possible complete desiccation. Similarly, marks were not awarded for other suggestions such as the piece should be 'washed and cleaned' or its 'length and width should be measured'. Those responses which mentioned taring or zeroing the balance before weighing gained no credit as the question asked for what should be done to each 'piece of potato'.

06.3 36% of students were able to name the correct piece of apparatus in this question, with many giving the uncreditworthy answer of 'scale'.

06.4 61% of students achieved the mark in this question.

06.5 57% of students achieved the mark in this question.

06.6 60% of students achieved full marks in this calculation question. Those who did not often made simple transfer errors from the table of results or reversed the numerator and denominator in the equation. The final marking point was given for a correct conversion to 1 decimal place. Students who wrote 18.3 with a dot over the 3 did not gain credit as it clearly suggested an answer of 18.3 recurring.

06.7 58% of students achieved the mark in this question, with the most common incorrect answer being 'bar chart'.

06.8 Despite this being a 'sentence completion' question, as the words were not provided, some students found it difficult to access. 25% of students gained three marks, with just over 20% gaining two marks and another 20% gaining one mark. Common incorrect answers for the first marking point included 'salt', 'starch', 'mass', 'moisture' and 'solution'. Incorrect answers for the second marking point included 'transpiration', 'translocation' and 'respiration'. For the third marking point, a frequently seen wrong suggestion was 'broken' or 'damaged'.

06.9 42% of students were able to offer a response within the creditworthy range.

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4.1.3.2 Osmosis

Answer 17 · Examiner comments

June 2025 | 8461/1F | Original Q8

Question 8 (standard demand)

08.1 This was a levelled, extended response question based on a required practical. Students were asked to evaluate a given method to investigate osmosis in pieces of potato.
Students achieving Level 1 (35%) made very few relevant points. Students achieving Level 2 (33%) suggested further improvements to the method and often gave reasons as to why these might be required, but judgements were always incomplete.
Students achieving Level 3 (1%) made full use of the command word 'evaluate' and considered both strengths and weaknesses of the method in addition to indicating the ways it could be improved.
Few students gave responses which allowed them to match the Level 3 requirements. Most omitted any consideration of strengths, so their judgements were incomplete. Many, nevertheless, seemed confident in their attempts at answers and this was pleasing to see.
The question asked for ways to improve the validity of results, and these needed to be clear. Discussion of controlled variables such as size, time and volume required quantification, or clarification that they needed to be the same or specific on each

Answer 17 · Examiner comments

occasion, rather than just 'similar', 'recorded' or 'precise'. A large number of students suggested that the mass of the cubes should be kept the same, but this was neither plausible, nor required.
The use of specific pieces of equipment only gained credit if they were linked to clear improvements to validity. Several responses referred to the use of a cork borer to obtain cylinders of potato but then neglected to add anything about the control of size; others suggested the use of stop watches but with no link to control of time.
Points which were frequently seen from the indicative content included drying the cubes before measuring mass, repeats and calculation of mean values and the use of more, different concentrations. Some students focused on aspects such as safety considerations, tables of results, graphs or explanations of osmosis. These were not appropriate additions to an evaluation, which asked for ways to improve the validity of results. Discussion of a 'wider range' of concentrations was only relevant if mention was made of 'more than 3' values within it.

08.2 23% of students scored the mark in this question.

08.3 This question asked for one way in which active transport differs from osmosis. It was most easily answered by one clear, distinctive point about active transport being given, without any further mention of osmosis. 33% of students achieved the mark in this question.

The most common correct answer seen was BP1, relating to energy. BP2 was more problematic, as answers often showed confusion in understanding. Some students gave the correct description of active transport being movement from low to high concentration but then continued to make an incorrect statement about osmosis; others gave incorrect descriptions of active transport in the first place. The following examples did not gain credit:

- 'active transport goes from low to high concentration, but osmosis goes from high to low'.
- 'active transport goes down a concentration gradient'.
- 'active transport goes from a high concentration gradient to a low concentration gradient'.

Other answers were not necessarily incorrect but lacked the further detail or qualification required to warrant the mark. These included 'active transport goes along (or across) the concentration gradient' or 'active transport goes from low to high'.
Fewer students referred to the ideas in BP3 and answers which could not gain credit were either incomplete or incorrect. They included those which:

- discussed the vague 'involvement' of minerals rather than their 'transport' or 'movement'.
- stated that 'molecules' or 'substances' were transported rather than, or as well as, water.
- suggested that 'water' was 'actively', rather than passively, transported.

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Some students mistakenly thought that active transport happened in both directions whereas osmosis was only one-way. References to partially permeable membranes and to the speed of movement were not, on their own, creditworthy.

4.1.3.2 Osmosis

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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.