PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

BIOLOGY



MARK SCHEME

TOPIC 1: KEY CONCEPTS IN BIOLOGY (PAPER 2, PACK 2)

SCORE	PERCENTAGE
/125	%

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Mark Scheme

Q1.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	ligase	accept reasonable misspellings e.g. lygase reject lipase	**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	Two from the following • leaves single stranded ends /overhangs / sticky ends (1) • complementary / bases pair up (1) • hold gene in place while ligase joins the DNA / makes inserting gene into plasmid more successful (1)	 accept (single stranded DNA) matches up ignore join together easily	**(2)**

Question Number		Indicative Content	Mark
QWC	* **(b)**	A description to include some of the following points Sweets • made using invertase/sucrase • converts sucrose into glucose and fructose • reduces viscosity of sugar mixture • increases simple sugar content, increasing sweetness • production of soft centred sweets • production of lower calorie sweets Vegetarian Cheese • made using chymosin • produced by genetically modified organisms • Chymosin initiates clotting/protein coagulation • reduces the use of rennet extracted from animals Lactose free milk • made using lactase • using immobilised enzymes • lactose converted to galactose and glucose • beneficial to people with lactose intolerance	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of the use of enzymes in the production of at least one food **or** naming an enzyme linked to its use • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description of at least two food products linked to their named enzyme **or** a detailed description of the production of one food including the name and role of the enzyme • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description of most stages of the production of two or more food products made using enzyme technology including the name and role of the enzymes • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
(c)	A description including two from the following **digestive** enzymes/named digestive enzyme (1) breakdown **named biological** stain (1) stains into soluble products (1)		**(2)**

Q2.

Question Number	Answer	Acceptable answers	Mark
(a)	**D** mRNA mRNA		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	A description linking two of the following: • leaves the nucleus / moves to the cytoplasm • through the nuclear membrane • attaches to ribosome	Accept through a nuclear pore	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)	A explanation linking three of the following: • (enzyme and substrate have) complementary shapes • substrate fits into enzyme / enzyme substrate complex formed • reference to <u>active site</u> • enzymes break (chemical) bonds / form chemical bonds / (causes) reaction to occur / make products • Idea of products leaving enzyme (so that enzyme can be used again)	this may be awarded if clearly shown in an unlabelled diagram reject if active site is part of substrate	**(3)**

Question Number		Indicative Content	Mark
QWC	*** (d)**	A description to include some of the following points Temperature • (temperature) too low – not enough energy to make reactions occur (fast enough) • reference to optimum temperature • optimum for most (humans) - 37°C • over 37°C changes enzyme shape / changes active site shape of enzyme • therefore rate of reaction decreases / stops • enzymes denatured (if temperature too high) pH • optimum pH – around 7.3 / 6 to 8 for most enzymes • specific optimum quoted eg pepsin – pH 2 to 3 • pH either side of optimum – changes the shape of the enzyme / shape of the active site • therefore rate of reaction decreases / stops • enzymes denatured (if pH too high / too low) substrate / enzyme concentration • higher concentrations faster reactions • due to more collisions • until maximum rate reached / all enzymes being used	**(6)**
Level	**0**	No rewardable content	
1	**1 – 2**	• a limited description of how temperature OR pH OR substrate concentration affects the rate of enzyme action • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 – 4**	• a simple description of two or more factors OR a detailed description of one factor • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 – 6**	• a detailed description of at least two factors • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Q3.

Question Number	Answer	Acceptable answers	Mark
(a)	**D** mRNA mRNA		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	A description linking two of the following: • leaves the nucleus / moves to the cytoplasm • through the nuclear membrane • attaches to ribosome	Accept through a nuclear pore	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)	A explanation linking three of the following: • (enzyme and substrate have) complementary shapes • substrate fits into enzyme / enzyme substrate complex formed • reference to <u>active site</u> • enzymes break (chemical) bonds / form chemical bonds / (causes) reaction to occur / make products • Idea of products leaving enzyme (so that enzyme can be used again)	this may be awarded if clearly shown in an unlabelled diagram reject if active site is part of substrate	**(3)**

Question Number		Indicative Content	Mark
QWC	*** (d)**	A description to include some of the following points Temperature • (temperature) too low – not enough energy to make reactions occur (fast enough) • reference to optimum temperature • optimum for most (humans) - 37°C • over 37°C changes enzyme shape / changes active site shape of enzyme • therefore rate of reaction decreases / stops • enzymes denatured (if temperature too high) pH • optimum pH – around 7.3 / 6 to 8 for most enzymes • specific optimum quoted eg pepsin – pH 2 to 3 • pH either side of optimum – changes the shape of the enzyme / shape of the active site • therefore rate of reaction decreases / stops • enzymes denatured (if pH too high / too low) substrate / enzyme concentration • higher concentrations faster reactions • due to more collisions • until maximum rate reached / all enzymes being used	**(6)**
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1	**1 – 2**	• a limited description of how temperature OR pH OR substrate concentration affects the rate of enzyme action • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 – 4**	• a simple description of two or more factors OR a detailed description of one factor • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 – 6**	• a detailed description of at least two factors • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Q4.

Question Number	Indicative content	Mark
*	**AO2 3 marks/AO3 3 marks** **Analysis of data** • the egg in the water has gained mass / water • the egg in the 5% salt has no mass change • the egg in the 10% salt has lost mass / water • mass increase is 7 g for the egg in water • mass increase is 0 g for 5% salt • the mass decrease is 2g for 10% salt • % mass change +9% / 0% / -3% **Water movement** • osmosis is the movement of water • across a partially permeable membrane • from a high concentration of water molecules to a low concentration of water molecules • 5% salt is an isotonic solution	**(6)**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. • Presents an explanation with some structure and coherence.
Level 2	3–4	• Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. • Presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	5–6	• Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. • Presents an explanation that has a well-developed structure which is clear, coherent and logical.

Additional Guidance

Level 1	1–2	• a brief analysis of the experimental data. • with reference to the movement of water.
Level 2	3–4	• an evaluation of the data including a calculation of mass gain or loss. • with reference to the direction of movement of the water for tap water or 10% salt.
Level 3	5–6	• a detailed evaluation of the data including a % mass change calculation. • with reference to the direction of movement of water by osmosis for tap water and 10% salt.

Q5.

Question Number	Answer		Mark
(i)	**Conclusion for 1 mark** • increasing the concentration of hydrogen peroxide {increases the rate of reaction/decreases the time taken for the disc to rise} (1) **and any three from:** • provides more substrate (1) • increases collisions (1) • more active sites occupied (1) • forming more enzyme-substrate complexes (1) • oxygen is released faster (1)	accept hydrogen peroxide for substrate accept more oxygen released	**(4)** AO 3 2a AO 3 2b

Question Number	Answer	Additional guidance	Mark
(ii)	substitution 1÷75 = 0.013333 / 0.01 (1) correct number of decimal places 0.013 (s^{-1}) (1)	2 marks for correct answer to 3 decimal places with no working	**(2)** AO 2 2

Question Number	Answer	Additional guidance	Mark
(iii)	substrate is not the rate limiting factor/all active sites (of catalase) are occupied	accept the {enzyme/another factor} is the limiting factor	(1) AO 2 1

Q6.

Question Number	Answer	Mark
(i)	C the volume of milk and the concentration of chymosin **The only correct answer is C** ***A*** *is not correct because time is being measured* ***B*** *is not correct because the temperature is being changed* ***D*** *is not correct because the temperature is being changed*	(1) **AO2 2**

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation linking **two** from: • 40°C is the {optimum / closer to the optimum} / there is a faster **rate of reaction** (1) • because as temperature increases (kinetic) energy increases (1) • more chance of collision (between the chymosin and the milk protein) (1) • more enzyme-substrate complexes are formed (1)	accept the enzyme works faster	**(2)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
(iii)	An explanation linking: • time taken would be longer / the milk would not curdle (1) • because the enzyme is denatured / the active site has changed shape (1)	accept slow rate of reaction / a time greater than 75 seconds	**(2)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
(iv)	Any **one** from: • it is a control (1) • to confirm that the milk doesn't curdle at that temperature without chymosin (1) • allows for a comparison with the results (1)	accept to see the effect of not adding chymosin	**(1)** **AO2 2**

Question Number	Answer	Additional Guidance	Mark
(v)	Any **two** from: • use a smaller interval between the temperatures (1) • measure temperatures between the range of 35°C and 45°C (1) • controlling a variable not identified in the method (1) • keep the tubes at the required temperature after adding chymosin by using a water bath (1) • repeat the test at each temperature (1)	 ignore a wider range of temperatures accept e.g. volume of milk / type of milk / enzyme concentration accept use a water bath to control temperature accept calculate a mean / identify anomalies	**(2)** **AO3b**

Q7.

Question Number	Answer	Additional guidance	Mark
	• selection of 40 x **objective** lens (1) • combines with 10 x **eye piece** lens (1)	accept other combinations that multiply together to make 400 x with the eye piece as equal or the lower power accept use two lenses with correct magnification to make 400x for 1 mark	**(2)** AO 1 2

Q8.

Question number	Answer	Mark
*	Answers will be credited according to the candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant ○ tube 1 will be larger ○ as water will move into the tube by osmosis ○ from a high water potential outside tube 1 ○ into the low water potential inside tube 1 ○ across the partially permeable membrane of the visking tubing ○ tube 2 will shrink ○ as water will move out of the tube by osmosis ○ moving from a high water potential inside tube 2 ○ to a lower water potential outside of tube 2 ○ across the partially permeable membrane of the visking tubing	**(6)**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• The explanation attempts to link and apply knowledge and understanding of scientific enquiry, techniques and procedures, flawed or simplistic connections made between elements in the context of the question. • Lines of reasoning are unsupported or unclear. (AO2)
Level 2	3–4	• The explanation is mostly supported through by linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, some logical connections made between elements in the context of the question. • Lines of reasoning mostly supported through the application of relevant evidence. (AO2)
Level 3	5–6	• The explanation is supported throughout by linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, logical connections made between elements in the context of the question. • Lines of reasoning are supported by sustained application of relevant evidence. (AO2)

Q9.

Question Number	Answer	Additional guidance	Mark
	An explanation that links: • no chloroplasts (in the potato) (1) • (as there is no light) for **photosynthesis** / potato cells do not **photosynthesise** / ORA (1)	accept fewer chloroplasts /chlorophyll (in the potato) more amyloplasts / starch grains in the potato (1) for storage (1)	**(2)** AO 2 1

Q10.

Question Number	Answer	Additional Guidance	Mark
	An explanation linking **three** from: • **plasmid** is cut with **restriction** enzymes/ chymosin gene is cut with a **restriction** enzyme (1) • sticky ends are complementary (1) • ligase is used to connect the chymosin gene and the plasmid (1) • recombinant plasmid is inserted back into the bacterial cell (1)	accept insert a plasmid with chymosin gene into the bacteria	**(3)** **AO2 1**

Q11.

Question number	Answer		Mark
(i)	An explanation including the following: • lipase digests {fat/lipid} (1) • forming fatty acids (and glycerol) (1) • which are acidic / **lowering** the pH of the mixture / making the mixture more acidic (1)	accept breakdown for digest accept removing fat makes the milk more acidic	**(3)** **A01 2**

Question number	Answer	Additional guidance	Mark
(ii)	An explanation linking **two** from: • milk A did not contain any/much fat (1) • fatty acids were not produced • as there was no **substrate** (1)	accept lipids accept fewer fatty acids were produced	**(2)** **A02 2**

Question number	Answer	Additional Guidance	Mark
(iii)	An explanation linking **three** of the following: • the temperature is above the optimum (1) • the {lipase / enzyme} **denatures** (1) • so **active site** changes shape (1) • no enzyme -substrate complexes formed / no longer complementary to the substrate / cannot bind the substrate (1)	accept the temperature was high reject {enzyme / lipase} is killed accept so it could not break down the fat / no fatty acids produced	**(3)** **A02 2**

Q12.

Question number	Answer	Mark
	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (2 marks): • penicillin prevents the bacteria from dividing as they cannot make a new cell wall (1) • because humans cells do not have a cell wall (1) • they are unaffected by penicillin (1)	(3)

Q13.

Question number	Answer		Mark
(i)	An explanation linking: • largest amount of growth seen with the highest concentration of nitrates / the higher the concentration of nitrates the more growth /ORA (1) • nitrates are needed to make proteins (1)	accept faster growth for more growth accept nitrates stimulate growth accept amino acids	(2) AO 3 2a AO 3 2b

Question number	Answer	Additional guidance	Mark
(ii)	An explanation that links the following: • by the roots/ root hair cells (1) AND • by diffusion (1) • from a high concentration to a low concentration / down the concentration gradient (1) OR • by active transport (1) • from a low concentration to a high concentration / against the concentration gradient / using energy (1)	 reject osmosis reject osmosis	(3) AO 2 1

Q14.

Question number	Answer	Mark
	An explanation linking: • the stomach is {acidic/low pH/pH 2}(1) • which will denature the {amylase/enzyme} (1) • changes the shape of the active site/substrate will not {bind/fit} into the active site (1)	**(3)** **AO2 1**

Q15.

Question number	Answer	Mark
	An explanation that makes reference to: identification – knowledge (1 mark) and reasoning /justification – knowledge (1 mark): • the active site of an enzyme has a specific shape because of the order of the amino acids (1) • the substrate must have a shape which is complementary to the active site (1)	**(2)**

Q16.

Question Number		Indicative Content	Mark
QWC	*	An explanation including some of the following points Data trends • pH of milk is 6.8 • pH reduces to pH 4.5 in 6 hours at 40°C • pH reduces to pH 4.5 in 9 hours at 20°C • pH not significantly reduces at 60°C Interpretation • fermentation faster at the optimum temperature • optimum temperature for bacteria growth at 40°C • enzymes more active at optimum temperature • no fermentation/bacteria killed/enzymes denature at high temperatures Yogurt production • lactose in the milk • converted into lactic acid • by bacteria/named bacteria • reduces pH • thickens/clots/coagulates the milk	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation of the data **OR** the interpretation of the data **OR** the production of yogurt e.g. At 60°C the pH does not decrease or bacteria causes the milk to thicken • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation of the data trends linked to the interpretation **OR** a detailed description of the production of yogurt • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation of the data/interpretation linked to the production of yogurt including the production of lactic acid causing the decrease in pH • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Q17.

Question Number		Indicative Content	Mark
QWC	*	An explanation including some of the following points Data trends • pH of milk is 6.8 • pH reduces to pH 4.5 in 6 hours at 40°C • pH reduces to pH 4.5 in 9 hours at 20°C • pH not significantly reduces at 60°C Interpretation • fermentation faster at the optimum temperature • optimum temperature for bacteria growth at 40°C • enzymes more active at optimum temperature • no fermentation/bacteria killed/enzymes denature at high temperatures Yogurt production • lactose in the milk • converted into lactic acid • by bacteria/named bacteria • reduces pH • thickens/clots/coagulates the milk	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation of the data **OR** the interpretation of the data **OR** the production of yogurt e.g. At 60°C the pH does not decrease or bacteria causes the milk to thicken • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation of the data trends linked to the interpretation **OR** a detailed description of the production of yogurt • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation of the data/interpretation linked to the production of yogurt including the production of lactic acid causing the decrease in pH • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Q18.

	Answer	**Acceptable answers**	**Mark**
	C store bile		**(1)**

Q19.

	Answer	Acceptable answers	Mark
	C store bile		**(1)**

Q20.

Question number	Answer	Additional guidance	Mark
	milk B contains fat / milk B had a high fat content	accept milk B is less dense accept lipid / oil	**(1)** **AO2 2**

Q21.

	Answer	Acceptable answers	Mark
(a)	Gametes correctly labelled (1) X X X Y Female zygote X X Male zygote X Y (1)	X X Y X	**(2)**
(b)	**A** ☒ enzymes to help get through the membrane of the egg cell		**(1)**
(c)	to supply / contain (a large amount of) nutrients / energy (for the zygote / embryo)	food /named nutrient Ignore references to foetus Reject baby	**(1)**
(d)	An explanation linking **two** of the following: • rising oestrogen levels (1) • (stimulate production of) LH (1) • (LH) levels increase / when it reaches a set level / peaks (which causes ovulation) (1)	accept high oestrogen levels / oestrogen peaks / oestrogen released	**(2)**
(e)	An explanation linking: • Uterus lining maintained/	Reject: repairs	**(2)**

	thickened (more) (1) With one of: • Because progesterone levels maintained / progesterone is still produced • So that the embryo can embed on it / So that the uterus lining can supply the embryo with nutrients		

Q22.

	Answer	Acceptable answers	Mark
(a)	Gametes correctly labelled (1) X X X Y Female zygote X X Male zygote X Y (1)	X X Y X	**(2)**
(b)	**A** ☒ enzymes to help get through the membrane of the egg cell		**(1)**
(c)	to supply / contain (a large amount of) nutrients / energy (for the zygote / embryo)	food /named nutrient Ignore references to foetus Reject baby	**(1)**
(d)	An explanation linking **two** of the following: • rising oestrogen levels (1) • (stimulate production of) LH (1) • (LH) levels increase / when it reaches a set level / peaks (which causes ovulation) (1)	accept high oestrogen levels / oestrogen peaks / oestrogen released	**(2)**
(e)	An explanation linking: • Uterus lining maintained/ thickened (more) (1) With one of:	Reject: repairs	**(2)**

	• Because progesterone levels maintained / progesterone is still produced • So that the embryo can embed on it / So that the uterus lining can supply the embryo with nutrients		

Q23.

Question number	Answer	Mark
	B	(1)

Q24.

Question number	Answer	Mark
(i)	B	(1)

Question number	Answer		Mark
(ii)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • the bacteria convert the ammonia into nitrites then nitrates maintaining the pH (1) • (this prevents an increase in pH) which would cause enzymes to denature and kill the fish (1)		(2)

Question number	Answer	Mark
(iii)	An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark): • the aquatic plant will take up nitrates by active transport (1) • against the concentration gradient/from where there is a low concentration to where there is a high concentration of nitrates (1)	(2)

Q25.

Question number	Answer	Mark
(i)	A Eukarya **i. The only correct answer is A** ***B*** *is not correct because plants are not single celled prokaryotic organisms* ***C*** *is not correct because plants are not single celled prokaryotic organisms and Monera is a kingdom* ***D*** *is not correct because Protista is a kingdom and not a domain*	**(1)** AO1 (1)

Question number	Answer	Mark
(ii)	A oxygen produced sunlight absorbed by chlorophyll **ii. The only correct answer is A** ***B*** *is not correct because photosynthesis doesn't produce carbon dioxide and sunlight is not absorbed by mitochondria* ***C*** *is not correct because sunlight is absorbed by chlorophyll not mitochondria* ***D*** *is not correct because photosynthesis doesn't produce carbon dioxide it produces oxygen*	**(1)** AO1 (1)

Question number	Answer	Mark
(iii)	Any one from: • (improved) genetic analysis (1) • DNA/RNA {screening/sequencing} (1) • domain theory is based on genetics (1) • differences between coding and non-coding DNA (1)	**(1)** AO1

Q26.

Question Number	Answer	Additional guidance	Mark
(i)	Any two from: • wash hands after contact (1) • avoid direct contact / wear {gloves/protective clothes} (1) • wear a (protective) mask (1) • **sterilise** equipment {before /after} use (1)	 accept hand gels accept protect your face be immunised (1)	**(2)** AO 2 2

Question Number	Answer	Additional guidance	Mark
(ii)	subtraction 5943 - 2830 = 3113 (1) 3113 ÷2830 x 100 = 110 %	accept 5943 - 2830 ÷ 2830 award full marks for correct numerical answer without working accept other valid methods for the calculation	**(2)** AO 2 1

Question Number	Answer	Mark
(iii)	A it does not have flagella **1. The only correct answer is A** ***B*** *is not correct because plasmids do not allow motility.* ***C*** *is not correct because it does have ribosomes.* ***D*** *is not correct because acrosomes are not found in bacteria.*	**(1)** AO 2 1

Q27.

Question number	Answer	Mark
4(a)(i)	A 0.008 s^{-1} **i. The only correct answer is A** ***B** is not correct because 1 ÷ 25 is not a rate calculation* ***C** is not correct because 25 ÷ 120 is not a rate calculation* ***D** is not correct because 120 ÷ 25 is not a rate calculation*	**(1)** AO2(2)

Question number	Answer	Additional guidance	Mark
(ii)	An explanation including: • increasing the {beads /enzyme/lactase} {decreases the time taken for glucose to be produced / increases the rate of reaction} (1) and two of the following: • more beads increases the concentration of enzyme / more {enzyme / **lactase**} present (1) • increased chance of collisions (1) • with the active site (1) • which means more enzyme-substrate complexes are formed (1)	accept reverse argument increasing the amount of lactase/enzyme {decreased the time for glucose to be produced/increases the rate of reaction} is worth 2 marks	**(3)** **AO3 2a+2b**

Question number	Answer	Additional guidance	Mark
(iii)	An explanation linking the following: • lactose is the substrate (1) • to control a **variable** / it is a controlled **variable** (1) • allow results to be compared (1) • to allow a valid conclusion to be drawn /to make the experiment valid /to make the results valid (1)	ignore it is a control accept so that only **enzyme** (concentration) affects the reaction ignore: references to fair test / accurate / reliable results	**(2)** AO2(2)

Q28.

Question Number	Answer	Mark
(i)	A metaphase anaphase **The only correct answer is A** ***B*** *is not correct because cell Q is not telophase* ***C*** *is not correct because cell R is not interphase* ***D*** *is not correct because cell R is not interphase*	**(1)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
(ii)	A description including **two** from: • chromatids condense (1) • identical chromatids are joined (1) • nuclear membrane breaks down (1)	accept chromosomes condense / coil up / become visible accept chromosomes join accept nucleus breaks down accept spindle fibres form (1)	**(2)** **AO1 1**

Question Number	Answer	Mark
(iii)	cytokinesis	**(1)** **AO1 1**

Question Number	Answer	Mark
(iv)	B 75 µm **The only correct answer is B** ***A*** *is not correct because 0.75 µm is 0.00075 mm* ***C*** *is not correct because 750 µm is 0.75mm* ***D*** *is not correct because 75 000 µm is 75 mm*	**(1)** **AO1 1**

Q29.

Question number	Answer	Mark
(i)	D chloroplast The only correct answer is **D** chloroplast A is incorrect because the nucleus does not photosynthesise B is incorrect because the vacuole does not photosynthesise C is incorrect because the mitochondrion does not photosynthesise	**(1)** **AO1.1**

Question number	Answer	Mark
(ii)	C sucrose The only correct answer is **C** sucrose A is incorrect because glycerol is not a sugar B is incorrect because although ribose is a sugar this is found in DNA D is incorrect because starch is not a sugar	**(1)** **AO1.1**

Question number	Answer	Additional guidance	Mark
(iii)	A description including two from: • in the phloem (1) • dissolved (in water) (1) • by translocation (1) • using active transport (1)	 reject xylem accept by diffusion	**(2)** **AO1.2**

Q30.

Question number	Answer	Mark
(i)	Any one variable from • temperature • amount of drying • type of potato • age of potato	**(1)**

Question number	Answer	Mark
(ii)	To get an accurate reading of mass	(1)

Question number	Answer	Mark
(iii)	An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): any **one** identification point from: • there is no change in mass at 0.3 mol dm^{-3} (check once drawn) (1) • this is the isotonic salt concentration in the potato (1) **Plus** reasoning/justification • because there is no net movement of water/no salt concentration gradient (1)	(2)

Question number	Answer	Mark
(iv)	• repeat the test using intermediate concentrations (between 0.2 and 0.4 mol dm^3)	(1)