PEARSON EDEXCEL GCSE BIOLOGY (HIGHER) · 1BI0

BIOLOGY



MARK SCHEME

TOPIC 1: KEY CONCEPTS IN BIOLOGY (PACK 3)

SCORE	PERCENTAGE
/108	%

STEMUP

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Mark Scheme

Q1.

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

Q2.

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

Q3.

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

Q4.

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**

Q5.

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**

Q6.

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**

Q7.

Question number	Answer	Mark
	An explanation that combines identification – amplification of knowledge (1 mark) and reasoning / justification – application of understanding (1 mark): • pepsin is specific to protein / pepsin does not break down fat / fats are digested by lipases (1) • as only protein molecules will fit into the **active site** of a pepsin enzyme / as fat will not fit into the **active site** of pepsin so cannot be broken down / **enzyme-substrate complexes** cannot form (1)	**(2)**

Q8.

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	

Q9.

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

Q10.

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**

Q11.

	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: • 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	Reject: repairs	**(2)**

Q12.

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)** **comp** AO1 (1) 4.7, 1.1

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 (1)

Q13.

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

Q14.

Question number	Answer	Mark
(i)	A 0.008 s^{-1} **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)

Q15.

Question number	Answer	Mark
(i)	C solution Y **i. The only correct answer is C** ***A*** *is not correct because the solution does not contain starch and contains protein* ***B*** *is not correct because the solution contains protein* ***D*** *is not correct because the solution does not contain starch*	**(1)** AO3(1a)

Question number	Answer	Additional Guidance	Mark
(ii)	An answer including: • add Benedict's (reagent) (1) • heat the solution / the solution turns (brick) red (1)	accept use a water bath accept colour in the range from green-yellow- orange to red	**(2)** AO1 (2)

Q16.

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**

Q17.

Question number	Answer	Mark
(i)	A does not use energy to move water into cells	**(1)**

Question number	Answer	Mark
(ii)	An explanation that combines identification – amplification of knowledge (2 mark) and reasoning / justification – application of understanding (1 mark): • water moves into the plant cell (1) • by osmosis / (water moves) into the vacuole (1) • causing the cell to become turgid / the cell wall prevents the cell from bursting (1)	(3)

Q18.

Question number	Answer	Mark
(i)	D tip of the root	(1)

Question number	Answer	Additional guidance	Mark
(ii)	to make the {chromosomes / nucleus / DNA / cell division / stages of mitosis} visible	accept mitosis can be seen more clearly	(1)

Question number	Answer	Mark
(iii)	An explanation that combines identification of knowledge (2 marks) and reasoning / justification –understanding (1 mark): • start with the {lowest / X4 / X10} objective lens / magnification (1) • {use the focusing wheel / adjust the stage / alter the resolution} until the image is clear (1) • increase the magnification of / use the objective lens to 40X (to give a total magnification X400) (1)	(3)

Q19.

Question Number	Answer	Mark
(i)	B substrate **1. The only correct answer is B** ***A*** *is not correct because oxygen and water are the products* ***C*** *is not correct because the active site is part of the catalase enzyme* ***D*** *is not correct because a control would using water and not hydrogen peroxide*	**(1)** AO 2 1

Question Number	Answer	Additional guidance	Mark
(ii)	• mass is a variable/ controlling a variable (1) • so the results could be compared/equal amount of catalase in each reaction (1)	accept the idea that different masses would need more or less oxygen/rise quicker or slower ignore references to fair test or reliable results accept enzyme for catalase	**(2)** AO 2 2

Question Number	Answer	Additional guidance	Mark
(iii)	Any two from: temperature (1) **volume** of hydrogen peroxide (1) the distance the potato had to rise (1) pH (1) size of test tube (1) age/variety/type of potato (1) surface area of potato (1)	 ignore amount of hydrogen peroxide accept mass for volume accept all discs from the same potato the same stock solution of hydrogen peroxide (1)	**(2)** AO 3 3b

Q20.

Question Number	Answer	Additional guidance	Mark
(i)	• spread {each bacterial species/the bacteria} on a different agar plate, add myxopyronin discs and incubate the plates (1) • {measure / compare} the zone of inhibition (1)	accept filter discs for myxopyronin discs accept descriptions of a zone of inhibition	**(2)** AO 1 2

Question Number	Answer	Additional guidance	Mark
(ii)	An explanation that links four of the following: • antibiotics destroy bacteria / prevent them reproducing (1) • doesn't affect {eukaryotic cells/host cells/human cells/human RNA polymerase} (1) • prevents production of mRNA /prevents RNA polymerase binding (1) • during transcription /prevents transcription (1) • prevents proteins being produced /no protein synthesis (1)	 ignore inhibit the bacteria/inhibit cell processes accept does not harm humans accept RNA polymerase produces mRNA	**(4)** AO 2 1

Q21.

	Answer	Acceptable answers	Mark
(i)	A description including the following points: • increase in concentration of glucose / glucose diffused into water/eq (1) • levels off after 20 mins / at 0.79 g/cm^3(1)	small increase, followed by greater increase / eq	**(2)**
(ii)	An explanation including **three**of the following points: • starch broken down into glucose (1)		**(3)**

	• by enzymes / amylase / carbohydrase (1) • glucose passes through visking tubing / eq (1) • by diffusion (1) • down the (glucose) concentration gradient (1) • (net) diffusion stops when {all starch is broken down / concentration of glucose is equal inside and outside the tubing}	reject: references to osmosis or active transport accept: from area of high concentration to area of low concentration	

		Indicative Content	
QWC	***(iii)**	An evaluation including some of the following points: Strengths • thin membrane • permeable membrane • presence of amylase • presence of (large) starch molecules • digestion into glucose • glucose diffuses out • concentration gradient • water represents the blood weaknesses • membrane not one cell thick • not a large surface area • shorter length / not same size • no villi /micro villi • only carbohydrate digestion • no other enzymes present • no peristalsis • no blood movement • other factors e.g. pH	
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited evaluation of the model including **at least one**strength OR weakness of the model • 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 evaluation of the model showing evidence of **at least one**strength AND at least one weakness of the model OR a detailed evaluation of several strengths or several weaknesses of the model • 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 evaluation, commenting on **several**of the strengths AND weaknesses of the model and its limitations • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Q22.

Question number	Answer	Mark
(i)	D retina **The only correct answer is D** ***A*** *is incorrect because the cornea does not contain light receptor cells* ***B*** *is incorrect because the iris does not contain light receptor cells* ***C*** *is incorrect because the lens does not contain light receptor cells*	**(1)** **AO1 1**

Question number	Answer	Mark
(ii)	mitochondria / mitochondrion accept phonetic spellings	**(1)** **AO1 1**

Question number	Answer	Mark
(iii)	nucleus / nuclei accept phonetic spellings	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
(iv)	rods / rod cells	reject cones	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
(v)	A description including **two** of the following: • cell B is a cone cell (1) • involved in colour vision (1)	accept respond to bright light / high light intensities accept responds to different {wavelengths / frequencies} of light (1)	**(2)** **AO1 1**

Q23.

Question number	Answer	Mark
(i)	Substitution 6mm ÷ 750 (1) Evaluation = 0.008 mm (1) Conversion = 8.0×10^{-3} mm	**(3)**

Question number	Answer	Mark
(ii)	**B**	**(1)**

Q24.

Question number	Answer	Mark
(i)	chloroplast / chloroplasts accept phonetically correct misspellings	(1) AO1 1

Question number	Answer	Additional guidance	Mark
(ii)	(aerobic) respiration / release energy	ignore make / produce energy accept word equation for respiration accept to produce ATP	(1) AO1 1

Question number	Answer	Additional guidance	Mark
(iii)	Any two from: • no nucleus/ chromosomal DNA (in the cytoplasm) (1) • no membrane-bound organelles (1) • circular/plasmid DNA (1) • no mitochondria (1) • no chloroplasts (1) • no vacuole (1)	accept: presence of flagellum (1) presence of a slime coat (1) presence of pili (1) accept cell wall not made of cellulose (1)	(2) AO1 1

Q25.

Question number	Answer	Mark
	amino acids / polypeptides / dipeptides	(1)

Q26.

Question Number	Answer	Acceptable answers	Mark
(a)	**D** leaf palisade cell		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	An explanation linking two of the following: • by osmosis • from an area of high **water** concentration to an area of low **water** concentration • through (partially permeable) membrane	Ignore references to diffusion reject active transport accept water moves down a concentration gradient	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(i)	• all four bars plotted correctly (+/- 1/2 small square) (1) • X axis correctly labelled for plotted bars , eg North A, North B, South A, South B (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(ii)	**D** a quadrat		**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)(iii)	A suggestion including two of the following: • Species B **is able to** grow on both (North and South) sides (1) • (there are more) on the south side because of a specific difference in a named abiotic factor eg lighter /darker on South side , temperature, pH, water level, (1) • there are fewer on the north side because they are out competed by species A / idea of eaten more on North side (1)	Ignore species B is found / grows on both sides Ignore carbon dioxide concentration Accept less pollution / less sulphur dioxide on South side	**(2)**

Q27.

	Answer	Acceptable answers	Mark
(a)(i)	met, val, lys met – val – lys MET VAL LYS	Accept mix of upper and lower case Accept: metvallys / metvalys Not necessary to separate the words out.	**(1)**
(a)(ii)	translation	Accept spellings such as transation, transalation reject: transcription	**(1)**
(a)(iii)	**D** ribosome		**(1)**
(b)	An explanation including **two** of the following points: • ref to specific shape (1) • to bind to substrate / form enzyme substrate complex (1) • for reaction to take place / catalysed(1) • joining together {substrates / molecules} / break down {substrates / molecules} (1) • ref to lock and key mechanism / hypothesis (1)		**(2)**
(c)	A description including **three** of the following points: • a mutation is a change in a gene (sequence) / base pairs (1) • (change in DNA) causes a change in amino acid(s) /order of amino acids (1) • change in shape of {active site / protein / enzyme} (1) • prevent / reduce binding to substrate (1)	accept change enzyme function / stops the function of the enzyme	**(3)**

	• enzyme can no longer function / reduced function (1) • enzyme could be more effective (1)	ignore: refs to denaturation	

Q28.

Question number	Answer	Mark
(i)	(pH) 2/two	(1)

Question number	Answer	Additional guidance	Mark
(ii)	using a pH probe/using universal indicator paper/using universal indicator solution	accept meter for probe ignore references to other indicator paper or solutions	(1)

Question number	Answer	Additional guidance	Mark
(iii)	An explanation that combines identification – improvement of the experimental procedure (1 mark) and justification / reasoning which must be linked to the improvement (1 mark): measure the {mass/volume} of egg white (1) find the (percentage) change (in mass / volume) (1)	 accept measure both length and width / area accept the difference between the start and the end	(2)

Q29.

	Answer	Acceptable answers	Mark
	A ☒ enzymes to help get through the membrane of the egg cell		**(1)**

Q30.

Question number	Answer	Mark
(a)(i)	A description that combines analysis via a judgement (1 mark) to reach a conclusion (1 mark) • as the pH of the hydrogen peroxide increases to pH 7 the catalase activity increases / above pH7 the activity of catalase decreases / less oxygen is produced (1) • catalase activity is optimal at pH7 (1)	**(2)**

Question number	Answer	Mark
(a)(ii)	An explanation that combines application of knowledge (1 mark) and reasoning/justification – application of understanding (2 marks) • decrease in volume of oxygen produced (1) • as catalase denatures and there is less breakdown of hydrogen peroxide (1) • because less enzyme substrate complexes form (1)	**(3)**

Question number	Answer	Mark
(a)(iii)	Any two variables from: • catalase concentration • catalase volume • hydrogen peroxide concentration • hydrogen peroxide volume • temperature	**(2)**

Question number	Indicative content	Additional Guidance	Mark
(b)(i)	61 to be left out of the calculation (1) Substitution $\frac{53.0 + 51.2 + 52.8}{3}$ Evaluation = 52.3	Accept correct calculation using all 4 numbers for 1 mark (54.5)	**(2)**

Question number	Answer	Mark
(b)(ii)	An analysis to develop an experimental procedure (2 marks) • only test the range between 6 and 8 (1) • with more intervals within this range (1)	**(2)**