GradeMax

Pearson

Mark Scheme (Results)

October 2025

Pearson Edexcel International Advanced Level in Biology
WBI15/01

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Mark
1(a)(i)	The correct answer is A, cytoplasm B is not correct because glycolysis takes place in the cytoplasm C is not correct because glycolysis takes place in the cytoplasm D is not correct because glycolysis takes place in the cytoplasm	Computer (1)

Question number	Answer	Mark
1(a)(ii)	The correct answer is A ADP | ATP | NAD | reduced NAD B is not correct because reduced NAD is not converted to NAD C is not correct because ATP is not converted to ADP D is not correct because ATP is not converted to ADP and reduced NAD is not converted to NAD	Computer (1)

Question number	Answer	Additional guidance	Mark
1(b)(i)	A description that includes three of the following points: • pyruvate {moved to matrix (of mitochondria)/goes through Link reaction} (1) • (pyruvate is) oxidised by NAD (1) • pyruvate is decarboxylated / converted to an {acetyl group /2C molecule / acetate} group (1) • that (combines with coenzyme A to) form acetyl co(enzyme) A (1) • (acetyl co(enzyme) A) enters the {Krebs/ TCA} cycle (1)	ACCEPT (pyruvate is) dehydrogenated / NAD is reduced to NADH / H atoms are removed ACCEPT carbon dioxide is removed / carbon atom is removed	Expert (3)

Question number	Answer	Additional guidance	Mark
1(b)(ii)	An answer that includes three of the following points: • (pyruvate is) {reduced / converted} to lactate (in muscle fibres) (1) • {reduced NAD / NADH} is oxidised (1) • (lactate released into the blood) is transported to the liver (1) • (once exercise has finished) lactate is {oxidised / converted} back to pyruvate (1)	ACCEPT lactic acid throughout ACCEPT H atoms added to pyruvate ACCEPT excess used to {produce glucose / glycogen} ACCEPT excess excreted in {sweat / urine}	Expert (3)

Question number	Answer	Mark
2(a)(i)	the correct answer is C , 120 A is not correct because 48 is the percentage that germinated B is not correct because 52 is the percentage that did not germinate D is not correct because 130 is the number of seeds that did not germinate	Computer (1)

Question number	Answer	Additional guidance	Mark
2(a)(ii)	An explanation that includes four of the following points: • red light (rapidly) converts P_R into P_{FR} (1) • therefore {activating genes required for germination / initiates {transcription / translation / synthesis of proteins} (needed for germination)} (1) • {group C / red light / P_{FR}} results in {highest / 100%} germination (1) • far-red light (rapidly)converts P_{FR} back into P_R (1) • in the {dark / no red light / A group} P_{FR} is slowly converted back to P_R (1) • therefore {less activation of genes required for germination / less transcription} (and fewer seeds germinate) (1)	ALLOW active and inactive forms of phytochrome as alternatives to P_{FR} and P_R ACCEPT named protein ACCEPT more P_{FR} more germination	Expert (4)

Question number	Answer	Additional guidance	Mark
2(b)	An explanation that includes three of the following points: • amylase {breaks/ hydrolyses} glycosidic bonds (in carbohydrates) (1) • releasing {maltose / glucose} (1) • that can be used in {respiration / ATP production /converted to amino acids} (1) • {ATP/energy/amino acids/protein} required for {growth / cell division} (1)	ACCEPT amylase breaks down {starch / amylose / amylopectin} DO NOT ACCEPT incorrect monosaccharides and disaccharides ACCEPT respiration releases energy IGNORE produces energy ACCEPT correct uses of ATP IGNORE germination	Expert (3)

Question number	Answer	Mark
3(a)(i)	The correct answer is **C,** A is not correct because P is the fibrous capsule and Q is the cortex B is not correct because P is the fibrous capsule D is not correct because R is the medulla and Q is the cortex	Computer (1)

Cortex	Medulla
Q	R

Question number	Answer	Mark
3(a)(ii)	The correct answer is **D O** A is not correct because L is the ureter B is not correct because M is the renal vein C is not correct because N is the renal artery	Computer (1)

Question number	Answer	Mark
3(a)(iii)	The correct answer is **C** Q A is not correct because Bowmans capsule's are located in the cortex not the renal pelvis B is not correct because Bowmans capsule's are located in the cortex not the fibrous capsule D is not correct because Bowmans capsule's are located in the cortex not the medulla	Computer (1)

Question number	Answer	Additional guidance	Mark
3(b)(i)	A description that includes two of the following points: • the wetter the habitat the {more dilute the urine / lower the urine concentration} (1) • smaller animals produce more concentrated urine (than large(er) animals in same habitat) (1) • the kangaroo rat has the most concentrated urine / the beaver has the least concentrated urine (1)	ACCEPT the drier the habitat the more concentrated the urine ACCEPT larger animals produce {more dilute urine/ lower urine concentration}	Expert (2)

Question number	Answer	Additional guidance	Mark
3(b)(ii)	An explanation that includes three of the following points: • long(er) loop of Henle' (1) • more {Na^+/ K^+/ Cl^-} {carrier proteins / channels / pumps} (1) • more sodium ions move {out of ascending limb/into medullary fluid} (1) • greater countercurrent effect (1) • {more / greater} **reabsorption** of water by osmosis (1)	ACCEPT more aquaporins ACCEPT {water potential gradient steeper / decrease in water potential solute concentration higher} {in interstitial fluid/medulla} IGNORE salt	Expert (3)

Question number	Answer	Additional guidance	Mark
4(a)	A calculation showing the following steps: • calculation of rate before dive (1) • 87 (1)	<u>Example of calculation</u> (60÷3) x 5 = 100 1.667 (bps) / 100 (bpm) Correct answer with no working shown scores full marks Allow ECF of 105 -13 = 92 = 1 mark	Graduate (2)

Question number	Answer	Mark
4(b)	Answers will be credited according to 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 indicated as relevant. Additional content included in the response must be scientific and relevant. Indicative content **Factors** Graph 1 • concentration of oxygen in blood decreases during dive • concentration of oxygen in (skeletal) muscle decreases during first 10 minutes of dive • aerobic respiration at start of dive using oxygen in skeletal muscle • there is a switch from aerobic respiration to mainly anaerobic respiration Graph 2 • concentration of lactic acid in skeletal muscle increases (after 4 minutes) • so anaerobic respiration must be taking place in the skeletal muscle (after 4 minutes) • concentration of lactic acid in blood increases after 15 minutes / dive has finished • concentration of lactic acid in muscle drops at the end of the dive • because the lactic acid is moved to the arteries (then liver) to be converted to {pyruvate / glucose / glycogen} • aerobic respiration at the end of the dive repays the oxygen debt Table • flow of blood to skeletal muscle is reduced during a dive • flow of blood to heart muscle is reduced during a dive • blood flow to cardiac and skeletal muscle drops so muscle has no oxygen and must be carrying out anaerobic respiration	

	• blood flow reduces to the heart because the heart rate slows down significantly • flow of blood increases to the brain • blood flow to brain continues so that aerobic respiration can continue • blood flow is directed away from extremities so essential organs can aerobically respire **General comments** • seals have myoglobin to store oxygen • aerobic respiration produces (large quantities) ATP for muscle contraction • anaerobic respiration generates less ATP • ATP required for muscle contraction • seals have a high tolerance for lactic acid • comment on method – no details on type of seal/sample size etc. • no error bars so we cannot tell if the differences are statistically significant • (the ECG showed) the heart rate had slowed down significantly. • the heart rate will slow down because there are fewer waves of depolarisation Expert (6)

Level	Marks	Descriptor	
	0	No awardable content.	
1	1-2	Limited number of the most important or relevant scientific factors from the data/information provided are synthesised. No judgement is made.	1 mark = 1 comment 2 marks = 2 comments
2	3-4	Some of the most important or relevant scientific factors from the data/information provided are synthesised.	3 marks = 3 comments one of which must be an explanation

		A straightforward but accurate judgement is made.	4 marks = 4 comments two of which must be explanations or one explanation and one general comment
3	5-6	Most of the important or relevant scientific factors from the data/information provided are synthesised. A detailed and accurate judgement is made.	Discussion of aerobic and anaerobic respiration 5 marks = 5 comments to include two explanations and one general comment OR three explanations 6 marks = 6 comments to include 2 explanations and 2 general comments OR 3 explanations and one general comment

Question number	Answer	Mark
5(a)(i)	the correct answer is D rhodopsin A is not correct because opsin is a lipoprotein that combines with retinal to form rhodopsin B is not correct because L-DOPA is a drug used to treat Parkinsons C is not correct because phytochrome is a light sensitive pigment found in plants.	Computer (1)

Question number	Answer	Mark
5(a)(ii)	The correct answer is B A is not correct because the rod cell membrane becomes hyperpolarised C is not correct because the sodium ion channels close and rod cell membrane becomes hyperpolarised D is not correct because the sodium ion channels close	Computer (1)

Sodium ion channels	Rod cell membrane becomes
close	hyperpolarised

Question number	Answer	Additional guidance	Mark
5(a)(iii)	Choose an item. • active transport (of sodium ions) (1)	ACCEPT reforming rhodopsin (from opsin and retinal)	Graduate (1)

Question number	Answer	Additional guidance	Mark
5(b)(i)	A description that includes the following points: • circular muscles (in the iris) relax (1) • radial muscles (in the iris) contract (1)	DO NOT ACCEPT ciliary muscles DO NOT ACCEPT radial muscles constrict	Graduate (2)

Question number	Answer	Additional guidance	Mark
5(b)(ii)	An answer that includes the following points: • correct radius found (1) • correct change in area (1) • answer to 2 or 3 significant figures (1)	Example of calculation (4.92÷2) πr^2 = 3.14 x 2.46^2 = 19.0 2.46 (mm) 19.0 – 16.9 = 2.11 Correct answer gains full marks 2.1 / 2.11 ACCEPT answer to more than 2 decimal places = 2 marks ECF 59.1 = 2 marks ECF 2 = 2 marks	Expert (3)

3 marks	2 marks	1 mark
2.1	59.1	19
2.11	2	19.01
		2.46
		1.3
		1.31
		4.95/2

Question number	Answer	Additional guidance	Mark
5(b)(iii)	A description that includes three of the following points: • diameter of pupils is greater in children than adults (for each level of difficulty / with or without learning tasks) (1) • being given a learning task results in dilation of the pupil / converse for {control / no learning task} (1) • in children {pupil dilation peaks at a difficulty level at 5 whereas in adults it is still increasing (at a difficulty level of 8 /peaks at 8)}(1) • adults have a greater increase in pupil diameter (than children) (1)	ACCEPT converse ACCEPT mean diameter is less in both controls	Expert (3)

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Question number	Answer	Mark
5(b)(iv)	The correct answer is A cerebral hemisphere B is not correct because it is the cerebral hemisphere that is involved in learning and memory C is not correct because it is the cerebral hemisphere that is involved in learning and memory D is not correct because it is the cerebral hemisphere that is involved in learning and memory	Computer (1)

Question number	Answer	Additional guidance	Mark
5(b)(v)	• cerebral hemispheres are less well developed in children / fewer synapse in the cerebral hemispheres of children	ACCEPT converse for adults ACCEPT children have less developed {brain / nervous system} ACCEPT children have {fewer neurone connections / different levels of neurotransmitters} ACCEPT ageing weakens eye muscles ACCEPT children give up with very difficult tasks	Expert (1)

Question number	Answer	Additional guidance	Mark
6(a)(i)	• Schwann cell (1)	ACCEPT first answer ACCEPT phonetic spellings ACCEPT oligodendrocyte / glial cell	Graduate (1)

Question number	Answer	Additional guidance	Mark
6(a)(ii)	An answer that includes one of the following points: • {action potential / impulse} jumps from one node (of Ranvier) to another (node of Ranvier) (1) • {depolarisation/action potential} only occurs at the nodes (of Ranvier) (1)	DO NOT ACCEPT signals/messages	Expert (1)

Question number	Answer	Additional guidance	Mark
6(a)(iii)	• (electrical) insulator (1)	ACCEPT impermeable to ions	Graduate (1)

Question number	Answer	Additional guidance	Mark
6(b)	A description that includes three of the following points: • (action potential / impulse) causes {calcium ions channels to open / calcium ions to enter (presynaptic neurone)} (1) • (calcium ions cause) vesicles {move towards / fuse with} the presynaptic membrane (1) • release of neurotransmitter (from presynaptic vesicles) (1) • neurotransmitter **diffuses** {across the synapse / to post synaptic membrane / to the receptors} (1) • neurotransmitter binds to receptors (on postsynaptic membrane) causing {sodium channels to open / influx of sodium ions / depolarisation / action potential / nerve impulse in post synaptic membrane} to occur (1)	ACCEPT vesicles bind to the presynaptic membrane ACCEPT named neurotransmitter ACCEPT exocytosis of neurotransmitter IGNORE sodium ion channel as a receptor	Expert (3)

Question number	Answer	Additional guidance	Mark
6(c)(i)	An explanation that includes the following points: • they {stop responding / stop clicking / respond less often / response decreases} (to the stimulus) (1) • (therefore) the children learn that they get no {reward / food} for {pressing / clicking} the button (1)	ACCEPT less depolarisation occurs / calcium ion channels become less responsive	Expert (2)

Question number	Answer	Additional guidance	Mark
6(c)(ii)	An answer that includes the following points: • correct use of figures in equation (1) • correct answer to two significant figures (1) All of the following gain 1 mark: 42.4, 42.42, 0.42, 0.424, 70 ÷ 165, $\frac{200-130}{165}$ $\frac{200-130}{\frac{(200+130)}{2}}$	<u>Example of calculation</u> (200 – 130) ÷ ((200 + 130) ÷ 2) or 70 ÷ 165 or 0.4242 42 (%) 42.4 or 42.42 = 1 mark Correct answer with no working shown scores full marks	Expert (2)

Question number	Answer	Additional guidance	Mark
6(c)(iii)	An answer that includes three of the following points: • the number of {button presses/clicks} is higher for the high BMI group (1) • the decrease (in number of button presses) is less for the high BMI group (1) • the **difference** becomes significant after the sixth (two-minute time block) because the error bars no longer overlap (1) • relevant comment on methodology (1)	ACCEPT 12 minutes as alternative to sixth two min time block ACCEPT converse ACCEPT converse ACCEPT the **difference** is not significant for first six (two min time block) because the error bars overlap e.g. idea of how high is high BMI (and converse) / range of {high / low} BMI not stated / whether the children have eaten recently / type of food	Expert (3)

Question number	Answer	Additional guidance	Mark
7(a)(i)	A description that includes three of the following points: • (fast twitch fibres) have {large stores of / more} glycogen (1) • (fast twitch fibres) have high concentrations of phosphocreatine (1) • (fast twitch fibres) have extensive sarcoplasmic reticulum (1) • more Ca^{2+} in sarcoplasmic reticulum (1)	ACCEPT more {creatine phosphate / PC} NB fast twitch has more sarcoplasmic reticulum to release calcium ions only scores mp3	Expert (3)

Question number	Answer	Additional guidance	Mark
7(a)(ii)	An explanation that includes three of the following points: • differential gene expression / different genes activated (1) • (chemical signals stimulate) transcription factors {produced / to bind to different {genes / promoters}} (1) • therefore {transcription/translation} (results in different myosin proteins made in each fibre) (1) • activation of M7 gene results in {type I fibres / slow twitch muscle} / activation of {M1 / 2 / 4} gene(s) result in {type 2 fibres /development of fast twitch muscle} (1)	ACCEPT the converse for genes being switched off ACCEPT epigenetic modification / gene switched on ACCEPT RNA polymerase to bind to (promoter region) /post-transcriptional modification ACCEPT M7 protein production results in {type I fibres / slow twitch muscle}	Expert (3)

Question number	Answer	Additional guidance	Mark
7(b)(i)	• correct slopes (1) • correct answer (1)	<u>Example of calculation</u> (9÷20) or (10÷22) =0.45 **and** 4 ÷ 100 = 0.04 11.25 (: 1) ACCEPT 11(:1) to 11.5(:1) correct answer scores 2 marks	Graduate (2)

Question number	Answer	Additional guidance	Mark
7(b)(ii)	An explanation that includes four of the following points: • ligaments to connect bone to bone / tendons connect muscles to bones (1) • both (ligaments and tendons) contain a high proportion of collagen (1) • collagen provides strength (1) • ligaments contain (more) {elastin / elastic fibres} to allow {stretch / flexibility / (some) movement of bones} (1) • tendons allow more force to be applied to bone / tendons allow {flexion / extension of the joint / movement of the bones} (1)	ACCEPT tendons contain more collagen ACCEPT elastic fibres allow movement of the bones ACCEPT rotation	Expert (4)

Question number	Answer	Additional guidance	Mark
8(a)	An answer that includes the following points: • {presence / inheritance} of allele(s) (1) • that confers advantageous phenotype / selective advantage (1)	IGNORE gene ACCEPT change to advantageous allele / changes in the (DNA) base sequence / mutation / change in allele frequencies over generations / genome ACCEPT larger chance of survival / more likely to reproduce ACCEPT description e.g. that {control / affect} {sugar metabolism / insulin production}	Expert (2)

Question number	Answer	Additional guidance	Mark
8(b)	An explanation that includes the following points: • pancreas has different {tissues / cell types} (1) • (different) {cells / tissues} (type) release {different hormones / insulin / glucagon} (1) • that work together to maintain a set glucose concentration in the blood (1)	 ACCEPT contains alpha and beta cells (to regulate blood glucose concentration) do not piece together ACCEPT descriptions as to how insulin (and glucagon) control blood sugar concentration	Expert (3)

Question number	Answer	Additional guidance	Mark
8(c)	A description that includes two of the following points: • **selective** reabsorption (1) • by active transport (1) • in the {proximal tubules / loop of Henle / DCT / collecting duct} (1)	IGNORE reabsorption back into the blood	Expert (2)

Question number	Answer	Additional guidance	Mark
8(d)	An explanation that includes the following points: • as a result of DNA methylation / histone modification (1) • {DNA / chromatin} could be {more tightly wrapped around histones / bound to histones} (1) • therefore {binding of transcription factors (to promotor region) / transcription} is reduced (1)	answer must be in logical sequence ACCEPT converse for mark points 1-3 for more transcription ACCEPT histone acetylation ACCEPT heterochromatin ACCEPT therefore mRNA is not produced / RNA polymerase cannot bind (to promotor region)	Expert (3)

Question number	Answer	Additional guidance	Mark
8(e)	An answer that includes the following points: • produce a {chemical / anticoagulant} (in their saliva) (1) • that blocks a named stage in the coagulation process (1)	 ACCEPT enzymes / inhibitors / protein (in saliva) e.g. conversion of prothrombin to thrombin / fibrinogen to fibrin / inhibition of platelet action	Expert (2)

Question number	Answer	Additional guidance	Mark
8(f)	An explanation that includes three of the following points: • pathogens are a selective pressure (1) • mutations in genes involved in recognition of antigens (1) • could therefore provide a survival advantage to the individual (1) • these {mutations / alleles} can be passed on to the next generation (1)	 ACCEPT mutations in genes to target pathogens ACCEPT increase in frequency of favourable allele	Expert (3)

Question number	Answer	Additional guidance	Mark
8(g)	A description that includes the following points: • released by virally infected cells and bind to neighbouring cells (1) • blocks virus {binding to / replicating in} uninfected cells / prevents genetic material entering uninfected cells (1)	IGNORE prevent binding to cells IGNORE preventing viral replication with no context DO NOT ACCEPT reproduce	Expert (2)

Question number	Answer	Additional guidance	Mark
8(h)	An explanation that includes three of the following points: • sequence the {genes / genomes} (of bats) (1) • use microarrays to identify **active genes** (1) • use bioinformatics to {compare / analyse / identify} genes (1) • compare gene activity of bats dying young with those dying at an older age (1)	ACCEPT {electrophoresis / (DNA)profiling} (of bat DNA) ACCEPT use of cDNA to identify mRNA (produced from **active genes**) ACCEPT identify which gene might be responsible for the longer lifespan	Expert (3)