Collins

AQA

GCSE

BIOLOGY

H

SET B – Higher Tier

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Answers

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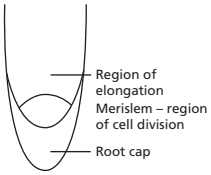
Paper 1

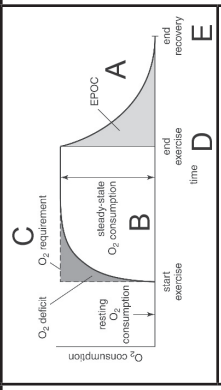
Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
01.2	poison		1	**AO1** 4.3.3.2
01.2	any **two** of: • thorns and hairs to **deter animals** • specialised leaves **which droop or curl when touched** • mimicry to **trick animals**	must include action of how defence works (in bold) do not accept bark, cellulose cell walls, waxy cuticle do not award 3 marks for 3 defences, action of defence must be linked to the defence mechanism	2 + 2	**AO1** 4.3.3.2
01.3	any **two** of: • skin • mucus • hairs in nose • trachea / bronchi • stomach acid • tears	accept any other reasonable answer	2	**AO1** 4.3.1.6
01.4	any **two** of: • phagocytosis • antibody production • antitoxin production (allow descriptions instead)		2	**AO1** 4.3.1.6
02.1	tobacco mosaic virus	allow other viral disease, if correct	1	**AO1** 4.3.1.2
02.2	it gives a distinctive 'mosaic' pattern of discolouration on the leaves, which affects the growth of the plant due to lack of photosynthesis	allow other correct answers related to student's answer above	1 1 1	**AO1** 4.3.1.2
02.3	black spot	allow other fungal disease, if correct	1	**AO1** 4.3.1.4
02.4	**either**: stunted growth caused by nitrate deficiency because nitrate ions needed for protein synthesis and therefore growth **or** chlorosis caused by magnesium deficiency because magnesium ions needed to make chlorophyll	name of correct ion must be stated – 1 related effect – 1 related reason – 1	3	**AO1** 4.3.3.1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
03.1	enzymes		1	**AO1** 4.2.2.1
03.2	proteases break down **proteins** to **amino acids** lipases break down **lipids** to glycerol and **fatty acids**	accept fats (instead of lipids)	1 1 1 1	**AO1** 4.2.2.1
03.3	amylase, buffer, starch	must be correct order	1	**AO2** 4.2.2.1
03.4	buffer must be added to the enzyme before the starch is added – as the reaction will start as soon as the enzyme and starch meet if no buffer (or added afterwards) results will not be valid as the pH will be changed after the reaction has started		1 1	**AO2** 4.2.2.1
03.5	iodine plus a drop of water		1	**AO2** 4.2.2.1
03.6	a control makes it easier to compare colours as the water in the control doesn't contain any starch / so you can be sure all the starch is gone / digested / broken down, if it is the same colour as the control		1 1	**AO2** 4.2.2.1
04.1	virus bacterium red blood cell leaf cell	**all** must be in correct order for mark	1	**AO1** 4.1.1.1 4.1.1.2
04.2	to keep specimen flat to retain liquid under it to prevent specimen drying out	allow – to prevent the specimen touching the microscope lens	1 1	**AO1** 4.1.1.2
04.3	smaller field of view with a high-power lens **because** has greater magnification	or converse: larger with low power lens because smaller magnification. must state reason (i.e. *because...* for 2 marks, not just high is smaller and low is bigger)	1 1	**AO1** 4.1.1.2 4.1.1.5
04.4	iodine solution		1	**AO1** 4.1.1.2

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
04.5	 Scale bar should be approximately 10 mm long and labelled 2 mm	1 mark for drawing, with distinct meristem area. Must state meristem, not just region of cell division 1 mark for label 1 mark for sensible units / scale 1 mark for correct scale bar	2 2	**AO2** 4.2.3.1 4.1.1.2
04.6	meristem tissue can differentiate into any type of plant cell, throughout life of plant		1	**AO1** 4.1.2.3
05.1	accept values in range 65 000–70 000		1	**AO2** 4.2.2.5 4.2.2.6
05.2	active = nearly 4000 incidences (allow ± 1000) drink less alcohol = 12 000 incidences (allow ± 1000) and therefore drinking less alcohol produced about three times fewer cancers as being active	1 mark for both readings must include the comparison for 2nd mark	1 1	**AO2** 4.2.2.5 4.2.2.6
05.3	eat fruit and veg lots of fibre low salt low processed / red meat low alcohol	must include low alcohol for 2 marks (to reward recognising alcohol / drinks are part of the diet) and at least two others	2	**AO2** 4.2.2.6 4.2.2.7
05.4	men and women make different lifestyle choices men and women are exposed to different environmental factors men and women have structural and genetic differences		1 1 1	**AO3** 4.2.2.5 4.2.2.6 4.2.2.7

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
06.1	lymphocytes detect antigens on dead / inactive Lumpius and produce specific antibodies against Lumpius / pathogen antibodies lock onto Lumpius	accept white blood cells instead of lymphocytes	2	**AO2** 4.3.1.6 4.3.1.7
06.2	lymphocytes remember the shape of the antigen	accept white blood cells instead of lymphocytes	1	**AO2** 4.3.1.6 4.3.1.7
06.3	lymphocytes instantly recognise live Lumpius / pathogen because it has the same antigens as the vaccine and respond **more quickly** to the infection by producing many specific antibodies, which lock onto the Lumpius / pathogen and kill them before person becomes ill / person is immune / has immunity	accept white blood cells instead of lymphocytes must state 'more quickly' or equivalent and must express concept that person does not become ill	3	**AO2** 4.3.1.6 4.3.1.7
06.4	efficacy – vaccine works / looks promising / passes to next stage of trial / positive result **because** many specific antibodies are produced when volunteers are infected with live Lumpius / pathogen dose – is good / correct **because** response elicited (i.e. production of antibodies).	must give reason for answers accept caution – insufficient data, adverse side effects / deaths – is dose too high? Can acknowledge this thought process	1 1 1 1	**AO3** 4.3.1.9
06.5	clinical trial many volunteers recruited / tested on many humans		1 1	**AO3** 4.3.1.9
07.1	oxygen		1	**AO1** 4.4.1.2
07.2	a clock / watch a ruler / other measuring device	allow thermometer, if its use is explained below	2	**AO2** 4.4.1.2

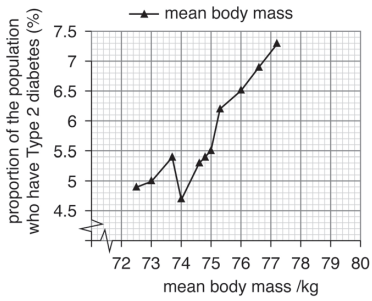
Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
07.3	**Level 3:** A detailed and coherent explanation is provided with most of the relevant content, which demonstrates a comprehensive understanding of the investigation and the order in which it is carried out. The response gives logical steps, with reasons.		5–6	**AO2** 4.4.1.2
	Level 2: A detailed and coherent explanation is provided. The student has a broad understanding of the investigation. The response makes mainly logical steps with some reasoning.		3–4	
	Level 1: Simple descriptions of the investigation are made along with reference to photosynthesis. The response demonstrates limited logical linking of points.		1–2	
	No relevant content		0	
	Indicative content • set up apparatus as in diagram • make sure plant photosynthesising (can see bubbles of oxygen) • measure and record the temperature of water in beaker; the water is intended to maintain a constant temperature (buffer), so the temperature should be taken periodically and kept constant; controlling other variables • measure and place lamp a specified distance from apparatus – control of light intensity related to distance of lamp from apparatus • carry out at several different distances of lamp (five distances) • allow plant to acclimatise to each new distance of the lamp / light intensity (2 mins) • record production rate of oxygen – count bubbles over given time period – 1 min / 5 mins, at each distance • repeat three times for each distance of the lamp / light intensity • calculate mean production oxygen rate • light intensity not linearly related to distance			
07.4	use a graduated syringe or measuring cylinder to collect the gas / oxygen		1	**AO3** 4.4.1.2
07.5	lots of sunshine = lots of oxygen produced / high rate of photosynthesis and therefore lots of oxygen good for fish in pond	allow converse lack of sunshine / in shady area = lower rate of photosynthesis / less oxygen produced allow converse in shade = not so good for fish	1 1	**AO3** 4.4.1.2

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
07.6	inverse square law / inverse proportion		1	**AO3** 4.4.1.2
	as light intensity increases (distance between lamp and plant decreases) the volume of oxygen (or the rate of bubble production) increases.	allow converse	1	
	this indicates the rate of photosynthesis increases with light intensity	allow converse	1	
08.1	there is incomplete oxidation of glucose		1	**AO1** 4.4.2.1 4.4.2.2
08.2		recovery label can be indicated anywhere in the shaded EPOC area labels can be either on the graph shape, or correctly placed on the x and y axes	5	**AO2** 4.4.2.1 4.4.2.2
08.3	blood flowing through the muscles transports the lactic acid to the **liver** where it is **converted** back **into glucose**		1 1	**AO1** 4.4.2.1 4.4.2.2
08.4	oxygen debt is the amount of **extra** oxygen the body needs (compared with resting) **after** exercise	must convey idea of **extra** oxygen	1	**AO1** 4.4.2.1 4.4.2.2
	to react with the accumulated lactic acid / remove it from the cells.		1	
08.5	person B		1	**AO3** 4.4.2.2
08.6	any **two** of: for person B: • heart rate increases more slowly / doesn't increase as fast • heart rate reaches a lower steady state • decreases more quickly after exercise / recovers more quickly / returns to resting rate quicker	allow converse for person A allow reaches a lower maximum allow converse for person A allow converse for person A Must be clear which person is being referred to	2	**AO3** 4.4.2.2

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
09.1	Substances are moved across a cell membrane from a more dilute solution to a more concentrated solution (against a concentration gradient).		2	**AO1** 4.1.3.3
09.2	Any **one** from: • Chemical reactions to synthesise / produce / new / larger molecules • Movement • Keeping warm		1	**AO1** 4.4.2.1
09.3	**Level 3:** A detailed and coherent description is provided with most of the relevant content, which demonstrates a comprehensive understanding of metabolism and how living processes are linked. The response is logical		5–6	**AO1** 4.1.3.1 4.2.2.1
	Level 2: A detailed and coherent description is provided. The student has a broad understanding of metabolism. The response makes mainly logical steps with some linkage.		3–4	4.4.1.3 4.4.2.1
	Level 1: Simple descriptions of living processes are made. The response demonstrates limited logical linking of points.		1–2	4.4.2.3
	No relevant content		0	
	Indicative content • conversion of glucose to starch, glycogen and cellulose • the formation of lipid molecules from a molecule of glycerol and three molecules of fatty acids • the use of glucose and nitrate ions to form amino acids which in turn are used to synthesise proteins • breakdown of excess proteins to form urea for excretion. • uses of glucose produced in photosynthesis - respiration, storage, to produce fat or oil for storage, to strengthen the cell wall • used to produce amino acids for protein synthesis.			
10.1	reduce / stop water loss / rehydration by reducing (rate of) transpiration		1 1	**AO1** 4.2.3.2
10.2	reduce / stop oxygen uptake so reducing (rate of) respiration	reduce / stop carbon dioxide uptake so reducing (rate of) photosynthesis	1 1	**AO3** 4.2.3.2 4.4.1.1 4.4.2.1

Paper 2

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
01.1	abiotic		1	**AO 1** 4.7.1.1
01.2	any two from: • light • space • water • mineral ions	do not accept food	2	**AO 1** 4.7.1.1
01.3	any two from: • food • territory • water	do not accept space	2	**AO 1** 4.7.1.1
01.4	interdependence		1	**AO 1** 4.7.1.1
01.5	a community in which all the species and environmental factors are in balance so that population sizes remain fairly constant		1 1	**AO 1** 4.7.1.1
01.6	methane		1	**AO1** 4.7.2.3
01.7	mineral ions		1	**AO1** 4.7.2.2
02.1	nervous system: • fast acting • acts for short time • acts in a specific area • electrical hormonal system: • slow acting • acts for long time • acts more generally • chemical		2 2	**AO1** 4.5.2.1 4.5.3.1
02.2	84 × 4 = 336 336 – 85 – 87 – 83 = 81 ms	must state units for third mark	1 1 1	**AO3** 4.5.2.1
02.3	as more alcohol is consumed, reaction times increase, e.g. with 0.5 units / half a can, mean reaction time is 33 ms, increasing to 84 ms with 6 units / cans of beer	reference must be made to figures / results for second mark, as candidates asked to use the results	2	**AO3** 4.5.2.1
02.4	2000 people used as part of the study, increases repeatability (in second study) / too few volunteers (in first study) lack of repeats in first study = less repeatable		1 1	**AO3** 4.5.2.1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
03.1	sensible scales on correct axis correctly plotting points drawing line – joining points or line of best fit labels on axis –y axis – percentage of population who have Type 2 diabetes (%), and x axis – mean body mass (kg)  		1 1 1 1	**AO3** 4.5.3.2
03.2	correlation / positive correlation, as mean body mass increases so does percentage / incidence of type 2 diabetes		1	**AO3** 4.5.3.2
03.3	**Level 3:** A detailed and coherent explanation is provided with most of the relevant content, which demonstrates a comprehensive understanding of the negative feedback system and how blood glucose concentrations differ in people with and without diabetes after a meal. The response gives logical steps, with reasons.		5-6	**AO1** 4.5.3.2 4.5.3.7
	Level 2: A detailed and coherent explanation is provided. The student has a broad understanding of the negative feedback system and diabetes. The response makes mainly logical steps with some reasoning.		3-4	
	Level 1: Simple description of diabetes is made along with reference to the negative feedback system. The response demonstrates limited logical linking of points.		1-2	
	No relevant content		0	
	Indicative content • (in both people) glucose levels detected by pancreas • and stimulated to release insulin in to blood • also release of glucagon is suppressed • insulin binds with receptors on cells • cells take up glucose • there are fewer of these receptors in the diabetic person • glucose is converted into glycogen in cells • and so levels in blood are reduced • after breakfast the concentrations of blood glucose increase, in both people • but person with diabetes increases **much more** • both their concentrations decrease during the morning, but person with diabetes decreases much more slowly			

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
04.1	zebrafish		1	**AO3** 4.6.4
04.2	fugu and green spotted puffer		1	**AO3** 4.6.4
04.3	167.7 million years ago	must give units accept mya	1	**AO3** 4.6.4
04.4	insufficient evidence currently to be more accurate		1	**AO3** 4.6.3.2 4.6.4
04.5	either: fossils or DNA profiling or antibiotic resistance (in case of bacteria)		1	**AO1** 4.6.3.4 4.6.3.5
04.6	**Level 3:** A detailed and coherent explanation is provided with most of the relevant content, which demonstrates a comprehensive understanding of speciation and how medaka and stickleback may have become separate species. The response gives logical steps, with reasons.		5-6	**AO2** 4.6.2.1 4.6.2.2 4.6.3.1 4.6.3.2
	Level 2: A detailed and coherent explanation is provided. The student has a broad understanding of speciation and refers to medaka and stickleback. The response makes mainly logical steps with some reasoning.		3-4	
	Level 1: Simple descriptions of speciation are made along with reference to the medaka and stickleback. The response demonstrates limited logical linking of points.		1-2	
	No relevant content		0	
	Indicative content • definition of species as organisms that are able to interbreed to produce fertile offspring • barriers separate ancestral species so they are no longer able to breed • most commonly physical / geological, can also be reproductive or ecological; examples given should be in relation to fish, e.g. river split course, courtship behaviour, changes in pH or salinity • 96-150 mya stickleback and medaka had a common ancestor that was a different species from either of them • this fish species got separated into two groups • random mutations occur in each isolated group of fish / different mutations in each group • the fish best suited to the environment survive and pass on their genes			

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
	• if the environment is different, for each group of fish, selection pressure means that different mutations are favoured by natural selection • over a long period of time • different characteristics will develop in the different fish groups • if the barrier were removed / the fish were able to mix again, they would no longer be able to breed and so are considered separate species			
05.1	cerebral cortex		1	**AO1** 4.5.2.2
05.2	cerebellum		1	**AO1** 4.5.2.2
05.3	medulla		1	**AO1** 4.5.2.2
05.4	A – coordination of complex functions, e.g. learning, memory,emotions and conscious thought B – unconscious / automatic functions, e.g. movement and balance C – unconscious / automatic (and homeostatic), e.g. swallowing, digestion and vomiting, breathing and heart rate	allow specific example of complex function 1 for general function plus second mark for example, for each area	2 2 2	**AO2** 4.5.2.2
05.5	strong positive correlation / as animal increases in weight so does the size of their brain not directly proportional / body weight increases a lot for a smaller increase in brain / any other comment about the relationship consistent with the graph		1 1	**AO3** 4.5.1 4.5.2.1
05.6	either: • a larger animal requires a bigger brain to control / coordinate its living processes or • metabolism of animal / energy demands of brain limits brain size so if the animal is larger it is able to support the energy requirements of a larger brain		1	**AO2** 4.5.1 4.5.2.1
05.7	other factors have more effect, e.g. evolution and ecological niche occupied		1	**AO2** 4.5.1 4.5.2.1
06.1	thymine		1	**AO1** 4.6.1.5
06.2	3		1	**AO1** 4.6.1.5

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
06.3	**Level 3:** A detailed and coherent explanation is provided with most of the relevant content, which demonstrates a comprehensive understanding of protein synthesis and how it may be disrupted in Leigh syndrome. The response gives logical steps, with reasons.		5-6	**AO2** 4.6.1.5
	Level 2: A detailed and coherent explanation is provided. The student has a broad understanding of protein synthesis and that errors can cause the wrong protein to be made. The response makes mainly logical steps with some reasoning.		3-4	
	Level 1: Simple descriptions of protein synthesis are made along with reference to errors. The response demonstrates limited logical linking of points.		1-2	
	No relevant content		0	
	Indicative content • proteins consist of chains of amino acids, coded for by a triplet of bases • each protein has a particular number and sequence of amino acids • if this is altered, then the wrong protein is made • transcription happens in the cell nucleus where the DNA is copied • the two DNA strands unzip, complementary bases pair up with bases on the template strand • C pairs with G, U pairs with A to form a strand of mRNA, which travels to the ribosome, where it is translated • the ribosome reads off the triplet codes and carrier molecules bring specific amino acids to the protein chain in the correct order • the amino acids bond together to form a polypeptide chain, which folds to a specific shape to form a protein • Leigh syndrome could be a problem with unzipping, or a problem with transcription – the wrong base pairs with the template strand. Or the ribosome may read the codon incorrectly or the carrier molecule brings the wrong amino acid. All of which would cause the wrong protein to be made.			

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
06.4	any two from: • search for genes linked to different types of disease • understanding and treatment of inherited disorders • use in tracing human migration patterns from the past	allow specific correct examples	2	**AO1** 4.6.1.4
07.1	any one from: • green plants • algae / weed • producers / primary producers		1	**AO2** 4.7.2.1 4.7.4.1
07.2	*T. sarasinorum* numbers increase and they eat lots of fish eggs therefore fewer fish survive from the eggs and there are fewer to eat, so 'elongated' eats more shrimp 'thicklip' numbers decrease as they are now in direct competition for shrimp, not enough shrimp for all		1 1 1	**AO2** 4.7.1.1 4.7.1.3 4.7.2.1
07.3	live in different habitats (1 mark only) *T. opudi* lives in bush cover and rocks, whereas *T. wahjui* lives on the muddy bottom		1 1	**AO2** 4.7.1.1 4.7.2.1
07.4	any one from: • sewage • fertiliser run-off • toxic chemicals		1	**AO1** 4.7.3.2
07.5	energy (/stored in biomass) is lost at each stage through waste products, respiration, movement and maintaining a constant body temperature therefore there is insufficient energy to maintain another population at the top		1 1 1	**AO1** 4.7.4.2 4.7.4.3
08.1	A – nucleus containing DNA removed from egg cell B – electric pulse causes skin cell to fuse with egg cell C – cell fusion D – cell division E – (early-stage) embryo is implanted into surrogate		5	AO2 4.6.2.5
08.2	variation		1	**AO2** 4.6.2.1
08.3	any two from: plants that reproduce with tubers or runners (1 mark each) bacteria aphids / insects that reproduce asexually any other valid example	accept specific plants, e.g. potatoes, strawberries	2	**AO1** 4.6.1.1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
08.4	any two from: • only one parent needed • more time and energy efficient as do not need to find a mate • faster than sexual reproduction • many identical offspring can be produced when conditions are favourable • genetically identical, so if parent is well adapted to environment offspring will be too		2	**AO1** 4.6.1.3
08.5	the gardener's method: • involves **selective breeding** • is the traditional method of breeding together individuals with desired characteristics • is the more natural method • takes a long time (many generations) • offspring won't definitely have trait the gardener wants the farmer's method: • involves **genetic engineering** • is more technical • is faster by transplanting specific genes for desired characteristics • is more expensive • offspring will definitely have the desired traits		2 (two points required) 2 (two points required)	**AO2** 4.6.2.3 4.6.2.4
09.1	population size means the number of individuals of a species that live in a habitat (number) population density is the number of individuals in a given / specific area		1 1	**AO1** 4.7.1.1
09.2	transect		1	**AO2** 4.7.1.1
09.3	systematic sampling: at regular intervals (e.g. every 50 cm) intervals must be sufficient to capture the changes in vegetative cover		1 1	**AO2** 4.7.1.1
09.4	construct further transects at 10 m intervals / other sensible distance down the path take quadrats at the same distances as before (as suggested in Q09.3) along these transects calculate the means at each quadrat place along the length of the path (add up all the plantains and divide by number of quadrats along the length of the path) to give mean number across the path		1 1 1	**AO2** 4.7.1.1
09.5	plants complete with each other for limited resources / many plants at verge, lots of competition plantain leaves are tough / have adapted to being trampled and may out complete more delicate plants, which are trampled in the middle of the path		1 1	**AO3** 4.7.1 4.7.1.3 4.7.1.4