

Mark Scheme (Results)

Summer 2025

Pearson Edexcel Advanced Subsidiary GCE

In Biology B (8BI0)

Paper 02: Core Physiology and Ecology

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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.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

  i) ensure that text is legible, and that spelling, punctuation and grammar are accurate so that meaning is clear
  ii) select and use a form and style of writing appropriate to purpose and to complex subject matter
  iii) organise information clearly and coherently, using specialist vocabulary when appropriate.

Question Number	Answer	Mark
1(a)(i)	**The only correct answer is D as V is cholesterol** *A is not correct because P is glycolipid* *B is not correct because Q is glycoprotein* *C is not correct because S is peripheral protein*	**(1)**

Question Number	Answer	Mark
1(a)(ii)	**The only correct answer is D as U is *integral protein*** *A is not correct because Q is glycoprotein* *B is not correct because R is phospholipid bilayer* *C is not correct because S is peripheral protein*	**(1)**

Question Number	Answer	Mark
1(a)(iii)	**The only correct answer is C as T allows water molecules into the cell** *A is not correct because P is glycolipid* *B is not correct because Q is glycoprotein* *D is not correct because U is cholesterol*	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(b)	An explanation that includes the following points: • oxygen is a {small / uncharged/non-polar} molecule (1) • so enters cells by diffusion / from a high concentration to a lower one/ down a concentration gradient (1) • sodium is charged (1) • therefore enters {by a channel (protein) / by active transport / by facilitated diffusion} (1)	**Accept:** atom/particle **Reject** molecule / polar	**(4)**

(Total for Question 1 = 7 marks)

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	16.7	Length of (X-Y on diagram in mm) ÷1.2mm 20 ÷ 1.2 = 16.7 Accept 17, 16.67, 16.6 with recurring dot	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(a) (ii)	An explanation that includes two of the following points: • artery has smaller lumen than vein / artery has thicker layer of smooth muscle and elastic fibers than a vein (1) • as artery needs to withstand higher pressure than vein / as artery need to have elastic recoil which the vein does not (1)	Comparative statements required for both marks **allow** converse for vein	**(2)**

Question Number	Answer	Mark
2(b)	**The only correct answer is D as M P Q N is the correct order** *A is not correct because M Q P N is not the correct order* *B is not correct because M N Q P is not the correct order* *D is not correct because N M Q P is not the correct order*	**(1)**

Question Number	Answer	Mark
2(c)(i)	• clot in arteries can stop blood reaching important organs such as {heart / brain / lungs} / arteries have narrower lumen so more likely to be blocked / clots in arteries can lead to increased blood pressure / prevent oxygenated blood reaching tissues (1)	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	An explanation that includes three of the following: • **smoking** can damage the lining of arteries increasing plaque build-up / increasing blood pressure (1) • **lack of exercise** increases the build-up of plaques / increasing blood pressure (1) • **high LDL** increases likelihood of plaque build-up or lower HDL can increase of plaque build-up risk of atherosclerosis / increasing blood pressure (1) • **increased body mass** / leads to higher blood pressure / type II diabetes which increases damage to blood vessel walls (1) • **increased stress** releases cytokines increasing inflammatory response in blood vessels leading to plaque formation / increasing blood pressure (1) • **High saturated fat** in diet increases cholesterol in the blood (1) • **High salt in diet** can lead to increased blood pressure (1)	or balance of HDL and LDL	**(3)**

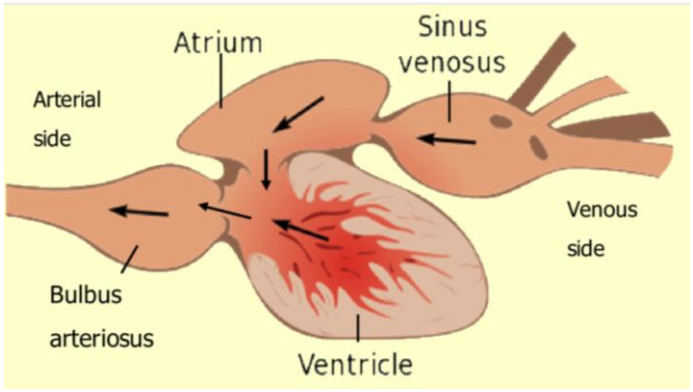
(Total for Question 2 = 8 marks)

Question Number	Answer	Mark
3(a)(i)	**The only correct answer is C as N receives oxygenated blood from the lungs** ***A*** *is not correct because L does not receive oxygenated blood from lungs* ***B*** *is not correct because M does not receive oxygenated blood from lungs* ***D*** *is not correct because S does not receive oxygenated blood from lungs*	**(1)**

Question Number	Answer	Mark
3(a)(ii)	**The only correct answer is B as O has the highest pressure during the cardiac cycle** ***A*** *is not correct because M does not have the highest pressure during the cardiac cycle* ***C*** *is not correct because Q does not have the highest pressure during the cardiac cycle* ***D*** *is not correct because R does not have the highest pressure during the cardiac cycle*	**(1)**

Question Number	Answer	Mark
3(a)(iii)	**The only correct answer is B as P is the septum** ***A*** *is not correct because O is not the septum* ***C*** *is not correct because Q is not the septum* ***D*** *is not correct because R is not the septum*	**(1)**

Question Number	Answer	Mark
3(b)(i)	**The only correct answer is D as Z is the atrium** ***A*** *is not correct because W is not the atrium* ***C*** *is not correct because X is not the atrium* ***D*** *is not correct because Y is not the atrium*	**(1)**

Question Number	Answer	Mark
3(b)(ii)	correct arrows (1)  	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(iii)	An explanation that makes reference to three of the following: • fish has a single circulatory system whilst mammal has double (1) • blood passes through heart once in fish but twice in mammal (1) • fish heart only has two chambers not four (1) • therefore no separation of oxygenated and deoxygenated blood (1)	**Accept** one atrium in fish but two in mammals AND one ventricle in fish and two in mammals **Allow** converse	**(3)**

(Total for Question 3 = 8 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)	• sympatric in same (geographical) areas allopatric in different (geographical) areas (1)	**Allow** isolation/separation/barriers instead of area eg geographical isolation for allopatric	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(b)	An explanation that includes three of the following: • mutation causes variation in courtship song (1) • louder song / more distinct song / different song / attracts more female crickets (of the same species) (1) • these crickets more likely to mate successfully (1) • pass on alleles coding for courtship song onto offspring (1)	**Allow** reproduce / breed	**(3)**

Question Number	Indicative content
4(c)	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 which is indicated as relevant. Additional content included in the response must be scientific and relevant. **Overall statements** • *G texensis* **court more overall** • Both species court their own species more than an other species regardless of location **Reference to male courtship behaviour of** *G texensis* **v** *G rubens* with females of same species • *G texensis* males court more in all conditions than *G rubens* • *G texensis* males court females of same species from different location more than from same location • *G rubens* males court females of same species from same location more than from different location **Reference to male courtship behaviour of** *G texensis* **v** *G rubens* with females of different species • *G texensis* males court more • *G rubens* males court females of different species from same location (slightly) more than from different location • *G texensis* males court females of different species from same location and from different location equally **Limitations of evidence** • Role of female not considered • Role of courtship song not considered • no consideration of other behavioral factors • no consideration of chemical / visual / factors • no idea of sample size **Links to speciation** • Inconsistent difference in species between sympatric and allopatric populations suggests other mechanisms involved in speciation • *G rubens* males less likely to court different species • *G texensis* could be allopatric • *G rubens* could be sympatric

Level	Mark	Descriptor
	0	No awardable content
1	1-2	The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context. ***Makes reference to one difference between courting (same and different species or location or*** *G texensis* ***vs*** *G rubens)* ***=1*** ***Makes reference to two differences between locations = 2***
2	3-4	An explanation will be given with occasional evidence of analysis, interpretation and/or evaluation of the scientific information. The explanation shows some linkages and lines of scientific reasoning with some structure. ***Makes reference to three differences in behaviour =3*** ***Makes reference to three differences in behaviour and includes one limitation =4***
3	5-6	An explanation is given which is supported throughout by evidence from the analysis, interpretation and/or evaluation of the scientific information. The explanation shows a well-developed and sustained line of scientific reasoning which is clear, coherent and logically structured. ***Makes reference to three differences in behaviour and includes one limitation and one link to speciation = 5*** ***Makes reference to three differences in behaviour and includes two limitations and one link to speciation =6***

(Total for Question 4 = 10 marks)

Question Number	Answer	Mark
5(a)	• Lama (1)	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(b) (i)	An explanation that includes two of the following: • because of the co-operative binding of oxygen to the 4 polypeptide chains (1) • binding of the first oxygen molecule changes the shape of haemoglobin molecule (1) • therefore facilitates binding of other oxygen molecules (1)	**Accept** Increases affinity/easier for other oxygen molecules	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	54%	6kPa = 94% 2kPa = 40% 94-40 **Allow** range of 52-54	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(b) (iii)	An explanation that includes two of the following: • vicuna curve is to left of horse / moves up (1) • so has higher affinity for oxygen at same partial pressure (1) • therefore vicuna hemoglobin is more saturated (at lower partial pressure) than horse / vicuna can absorb more oxygen at lower partial pressure (1)	**allow** converse for horse **ignore** reference to Bohr shift / steepness	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(c)	An explanation that includes two of the following: • llama hemoglobin more saturated / saturated at lower partial pressure than horse (1) • lower partial pressures of oxygen at higher altitude (1) • so more oxygen is taken up (1) • more oxygen available to muscles (1)	allow converse for horse **accept** higher affinity for oxygen at lower partial pressures **accept** llama's haemoglobin has a higher affinity to oxygen than the horse / curve to the left of the horse **Accept** oxygen density is lower as atmosphere is thinner	**(3)**

Question Number	Answer	Additional Guidance	Mark
5(d)	An answer which includes one of the following: • mouse is smaller so has larger SA/Vol (so curve is to right of horse) (1) • mouse has a higher respiration rate (so curve is to right of horse) (1)	**Allow** converse for both marking points **Accept** metabolic rate for respiration rate	**(1)**

(Total for Question 5 = 10 marks)

Question Number	Answer	Additional Guidance	Mark
6(a)	An answer that includes the following: • movement of water from a region of high(er) water potential to a region of lower water potential (1) • through a partially permeable membrane (1)	**Ignore** dilute to concentrated **Accept** semi-permeable membrane	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	• Calculation of Volume (1) • Calculation of ratio (1) • Answer to one decimal place (1)	**Example of calculation** Vol = 3.93cm3 **Do not accept 3.92 cm^3** SA/Vol = 17.3/3.9 = 4.402 4.4:1 **Correct answer gets 3 marks** 2 marks ecf for 3.92 cm^3 2 marks 1:0.2 2 marks π=3.1 Vol = 3.875 Ratio = 4.5:1	**(3)**

Question Number	Answer	Additional Guidance	Mark
6(b) (ii)	• calculation of $\Sigma(x\text{-mean})^2$ (1) • calculation of S (1) • calculation of $\sqrt{S}$ 1.1 (1)	<u>Example of calculation</u> 4.99 or 5 (1) 1.2475 or 1.25 (1) $\sqrt{1.2475} = 1.1169$ $\sqrt{1.25} = 1.118$ 3 marks =1.1 Correct answer gains full marks.	**(3)**

Question Number	Answer	Additional Guidance	Mark
6(b) (iii)	An explanation that includes 5 marks out of the following: • as temperature increases so does the percentage change in mass of cylinders (1) • due to increased kinetic energy (of water molecules) (1) • so water diffuses by osmosis into potato faster (1) • as fewer intermolecular bonds / hydrogen bonds between water molecules (1) • shown by decrease in water viscosity with increased temperature (1) • changes in membrane structure increased permeability (1)	**Accept** (increased K.E) breaks H-bonds **Accept** named changes to do with temp e.g. increased movement of phospholipids, denaturing of membrane proteins	**(5)**

(Total for Question 6 = 13 marks)

Question Number	Answer	Mark
7 (a)	• the loss of water (vapour) by evaporation from the leaf (and the stem) (1)	**(1)**

Question Number	Answer	Mark
7(b)(i)	An explanation that makes reference to three of the following points: • during the day transpiration increases from early morning (until midday) then decreases (1) • due to increase in light causing more stomata to open or stomata to open wider / stomata close as light reduces in afternoon (1) • temperature also increases kinetic energy of water molecules (1) • increasing rate of evaporation (1)	**(3)**

Question Number	Answer	Mark
7(b)(ii)	An answer that makes reference to four of the following points: • as soil temperature increases so does transpiration rate (1) • across all air temperatures and all relative humidities (1) • relative humidity has little effect / has inconsistent effect (1) • air temperature increases the rate at soil temp of 25°C but not at other temperatures (1) • relative humidity and air temperature had least / little effect when soil temperature was low (1) • soil temperature is the major factor at determining transpiration rate in this experiment (1)	**(4)**

Question Number	Answer	Additional Guidance	Mark
7(c)	A description that makes reference to three of the following points: • use a bubble / weight potometer and leafy shoot (1) • measure change in position of bubble / change in mass over a stated time period (1) • how light intensity is varied to achieve different levels (1) • repeat readings at least three times and calculate mean (1) • method to control temperature / humidity / stated abiotic variable (1)	**Accept** detailed description of potometer using the shoot **Accept** stated distances	**(3)**

(Total for Question 7 = 11 marks)

Question Number	Answer	Additional Guidance	Mark
8 (a)	An explanation that makes reference to three of the following: • larger organisms have a smaller SA to volume ratio (1) • many cells far from surface (1) • diffusion too slow to supply or remove gases (1) • metabolic demand may be higher (1)	**Accept** (gas exchange system) increases the animals SA to vol ratio	**(3)**

Question Number	Answer	Additional Guidance	Mark
8 (b)	An answer makes reference to three of the following: Similarities (max two) • large surface area (1) • moist gas exchange surface (1) • thin gas exchange surface (1) • concentration gradient achieved by ventilation (1) Differences (max two) • transport (circulatory) system in mammals but not in insects (1) • the gas exchange / respiratory surface in mammals is the alveoli, in insects it is the junction between the tracheoles and the respiring tissues (1) • mammals have cartilage / insects have chitin (1) • Insects have air sacs to store air (1)	**max two from similarities or differences**	**(3)**

Question Number	Answer	Mark
8 (c)(i)	• {mixture/composition} of gas (1)	**(1)**

Question Number	Answer	Mark
8(c) (ii)	An answer that refers to four of the following • lowest in 100% pure oxygen (1) • highest rate in 4 and 17 % carbon dioxide (1) • carbon dioxide has greater effect than oxygen (1) • relatively small sample so high variability in results (1) • most variable at 88% oxygen and 12% carbon dioxide (1) • little increase in rate above 4% carbon dioxide (1) • correlation with carbon dioxide stronger than with oxygen (1) • no mention of other gas in mixtures 2 / 3 (1)	**(4)**

Question Number	Answer	Additional Guidance	Mark
8(c) (iii)	A description that refers to two of the following • keep oxygen / carbon dioxide constant (1) • vary temperature by placing syringe in water bath (1) • stated (at least) 5 temperatures between 5 and 40) (1)	**Accept** air composition/mixture of gases same **Accept** AC / temp controlled room / incubator / heater	**(2)**

(Total for Question 8 = 13 marks)

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