

Mark Scheme (Results)

Summer 2025

Pearson Edexcel Level 3 Advanced GCE
In Biology B (9BI0)
Paper 02: Advanced Physiology, Evolution 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.

Question Number	Answer	Additional guidance	Mark
1(a)	A description that makes reference to the following: • (rough endoplasmic reticulum) performs {polypeptide synthesis / translation / protein synthesis} (1) • (Golgi apparatus) {modifies proteins / glycosylates proteins / adds carbohydrates to proteins / packages proteins / forms quaternary structure of proteins / produces lysosomes / modifies lipids / forms glycolipids} (1) • (mitochondria) {makes ATP / performs respiration} (1)	**Allow** makes proteins **Allow** forms {primary / secondary / tertiary structure} **Do not accept** forms quaternary structure **Do not accept** forms cell walls **Do not accept** anaerobic respiration	**3**

Question Number	Answer	Additional guidance	Mark
1 (b)(i)	A description that makes reference to three of the following: • (DNA) helicase {breaks hydrogen bonds / separates strands / unzips the two strands / unzips the DNA} (1) • complementary {nucleotides / bases} pair up (1) • (DNA) polymerase forms {phosphodiester bonds / forms sugar-phosphate backbone} (between nucleotides bound to strand) (1) • (DNA) ligase {joins (Okazaki) fragments} (1)	**Allow** adenine pairs with thymine **and** cytosine pairs with guanine **Allow** A,T,C,G for names **Do not accept** polymerase forms hydrogen bonds **Allow** joins breaks in DNA strands	**3**

Question Number	Answer	Additional guidance	Mark
1(b)(ii)	An explanation that makes reference to two of the following: • altered form {has a missing OH group / has sulfur instead of carbon}(1) • so phosphodiester bonds cannot form (between neighbouring / adjacent nucleotides) (1) • (and) **sugar phosphate backbone** cannot form (1)	**Allow** S instead of C-OH **Do not accept** S instead of OH	**2**

(Total for Question 1 = 8 marks)

Question Number	Answer	Mark
2 (a)(i)	The only correct answer is C (primary oocyte) *A is incorrect as ovule is not part of oogenesis* *B is incorrect as an ovum is not formed at this stage* *D is incorrect as X is not a secondary oocyte*	**1**

Question Number	Answer	Additional guidance	Mark
2(a)(ii)	A description that makes reference to three of the following: • nuclear membrane disintegrates / nucleolus disintegrates (1) • centrioles move to poles / begin to form spindle (1) • chromosomes condense / chromosomes become visible (1) • **homologous chromosomes** {pair up / form bivalent} (1) • {chiasmata form / crossing over occurs} {between chromosomes / between (non-sister) chromatids} (1)	**Allow** alternatives to disintegrate **Allow** chromatin condenses **Allow** description of DNA coiling around histones **Allow** recombination occurs between homologous chromosomes	**3**

Question Number	Answer	Additional guidance	Mark
2(a)(iii)	An answer that makes reference to three of the following: Similarities (**max 2**): 1. both begin with {stem cells / primordial germ cells} (1) 2. both involve mitosis and meiosis (1) 3. both produce **haploid {**cells / gametes} (1) 4. both produce {gametes / cells} with genetic variation (1) Differences (**max 2**): 5. oogenesis produces one (gamete) **and** spermatogenesis produces {four / more than one} (gametes) (1) 6. oogenesis begins before birth **and** spermatogenesis starts at puberty (1) 7. oogenesis {pauses / arrests / is blocked at} {at prophase I / metaphase II} and spermatogenesis has no pause / arrests (1)	**At least one similarity and one difference** **Allow** oogenesis produces polar bodies **but** spermatogenesis does not **Allow** oocytes present {before / at} birth **but** sperm are {not present / only made after puberty} **Allow** oogenesis is only completed at fertilisation **but** spermatogenesis is continuous (1)	**3**

Question Number	Answer	Additional guidance	Mark
2(b)(i)	• 35 x 1 000 ×4 = 140 000 (1)	**Allow** answers between 136 000 and 144 000	**1**

Question Number	Answer	Additional guidance	Mark
2(b)(ii)	An explanation that makes reference to the following: • percentage that develop increase up to **35 000** sperm (per oocyte) **and** then decrease (1) • so that (at low ratios) zona (pellucida) cannot be digested / not enough enzymes from acrosomes (1) • at higher ratios {several sperm fertilise egg / zygote is polyploid / has too many sets of chromosomes} (1)	**Allow** 35x1000 **Allow** more digestion of zona as sperm concentration increases **Allow** polyspermy occurs	**2**

(Total for Question 2 = 10 marks)

Question Number	Answer	Mark
3 (a)(i)	The only correct answer is B *A is incorrect as this is atrial systole* *C is incorrect as this is diastole* *D is incorrect as this is diastole*	**1**

Question Number	Answer	Additional guidance	Mark
3(a)(ii)	A description that makes reference to three of the following: • {sinoatrial node / SAN} initiates {depolarisation / electrical wave / wave of excitation} action potential} (1) • (depolarisation) causes {atria to contract / atrial systole} (1) • AVN {has a delay / pauses} (1) • (AVN) transmits (depolarisation) down {bundle of His / Purkinje fibres} (1) • depolarisation passes {from apex / up ventricle walls} stimulating (ventricle) **contraction** (1)	**Allow** impulses / action potential **Allow** SAN depolarises . **Allow** ventricles contract from {base / apex} upwards	**3**

Question Number	Answer	Additional guidance	Mark
3(b)(i)	• calculation of mean heart rate (1) • calculation of blood volume, conversion to dm^3 (1)	Example of calculation 75 75 x 0.15 = 11 dm^3 **if anomaly included, then** **11 = 2 marks** **One mark for** 11.25 / 11.3 / 11.2 **OR** 75 in working **(if anomaly not included)** **10 = 2 marks** **One mark for** 10.125 / 10.12 / 10.13 / 10.1 **OR** 67.5 **correct answer gets all marks**	**2**

Question Number	Answer	Additional guidance	Mark
3(b)(ii)	An answer that makes reference to four of the following: 1. drug binds to (noradrenaline) receptors / prevents {noradrenaline / adrenaline} binding (to receptor) / acts as a competitive inhibitor (for adrenaline / noradrenaline) (1) **and three from** 2. heart rate increases after fright with **and** without drug (1) 3. heart rate is lower with drug (1) 4. heart rate **increases less** with the drug (after fright) (1) 5. heart rate increase is {**less / decreases}** with repeated frights without drug (1) 6. {fright number 4 with drug / 105} is {anomalous / does not fit pattern / is an outlier} (1)	**Allow** blocks receptors (for noradrenaline) **Allow** converse **Allow** heart rate **increases more** without drug (after fright) **Allow** is too high compared with others	**4**

(Total for Question 3 = 10 marks)

Question Number	Answer	Mark
4 (a)(i)	The only correct answer is B (hydrogen) *A is incorrect as disulfide bonds do not form secondary structure* *C is incorrect as ionic bonds do not form secondary structure* *D is incorrect as peptide bonds do not form secondary structure*	**1**

Question Number	Answer	Mark
4 (a)(ii)	The only correct answer is C (substitution) *A is incorrect as no bases are deleted* *B is incorrect as no bases are added* *D is incorrect as no chromosome sections are moved*	**1**

Question Number	Answer	Additional guidance	Mark
4(a)(iii)	An explanation that makes reference to two of the following: • {valine / new amino acid} is {non-polar / not charged} (1) • so valine is hydrophobic (1) • so the **haemoglobin** (molecules) are {less soluble in water} / so the **haemoglobin** (molecules) {form fewer hydrogen bonds with water / **haemoglobin** (molecules) associates with {fewer water molecules} (1)	**Allow** glutamate is hydrophilic **Allow** is less able to dissolve in water **Allow** haemoglobin molecules are less able to associate with water	**2**

Question Number	Answer	Additional guidance	Mark
4(b)(i)	An answer that makes reference to two of the following: Similarities (**max 1**) 1. both have {S-shaped / sigmoidal} curve (1) 2. both have cooperative binding (1) Differences (**max 1**) 3. affected haemoglobin has a lower affinity for oxygen (1) 4. affected haemoglobin has {lower saturation of oxygen / never reaches 100 % saturation} (1) 5. there is a wider {variation / range / spread / variability} in affinity (for haemoglobin) from people with sickle cell anaemia (1)	**One similarity and one difference.** **Allow** converse for unaffected	**2**

Question Number	Answer	Additional guidance	Mark
4(b)(ii)	• there is a {wide / large} {variation / range} (1)		**1**

Question Number	Answer	Additional guidance	Mark
4(b)(iii)	An explanation that makes reference to three of the following: • (haemoglobin has a) low(er) **affinity** for oxygen (1) • haemoglobin never becomes fully saturated / less oxygen will {bind to / load on} haemoglobin (1) • so that less oxygen is available for **respiration** (in muscles) / less **aerobic respiration** / more **anaerobic respiration** (1) • so that less **ATP** is produced for **muscle contraction** / more **lactic acid** formation (in muscles) (1)	**Allow** sickle cell haemoglobin needs higher partial pressure of oxygen to saturate **Allow** sickle cell haemoglobin is less saturated with oxygen / carries less oxygen	**3**

(Total for Question 4 = 10 marks)

Question Number	Answer	Mark
5 (a)	The only correct answer is A *B is incorrect as auxin does not stimulate flowering* *C is incorrect as auxin does not stimulate flowering* *D is incorrect as auxin does not stimulate flowering*	**1**

Question Number	Answer	Additional guidance	Mark
5(b)(i)	Calculation of percentage difference (1)	Example of calculation 1.3-0.7 / 0.7=**86** **Allow** 86, 87, 88	**1**

Question Number	Answer	Additional guidance	Mark
5(b)(ii)	An answer that makes reference to four of the following: 1. increasing auxin concentration causes an {increase then decrease of root length / increase then decrease of biomass} (1) 2. (positive) **correlation** between root growth and biomass (1) 3. as (longer roots can) obtain more {minerals / water}/ root length limits {mineral / water} uptake (1) 4. nitrates for {amino acid synthesis / protein synthesis / nucleic acids / chlorophyll} / calcium for {calcium pectate / cell wall synthesis} / phosphate for {DNA / RNA / phospholipids / membranes} / magnesium for {for chlorophyll} (1) 5. correct reference to overlap of (error) bars (1)	**Allow** {longest root / highest biomass / optimal concentration} in the range of 10^{-4} and 10^{-1} **Allow** any number in this range **Allow** correct examples of minerals **Allow** shorter roots take up fewer minerals / water **Allow** other correct functions for named minerals e.g. may be no difference in root growth if bars overlap / difference if no overlap	**4**

(Total for Question 5 = 6 marks)

Question Number	Answer	Mark
6 (a) (i)	The only correct answer is C *A is incorrect as Mammalia is not a family* *B is incorrect as Mammalia is not a family* *D is incorrect as Mammalia is not an order*	**1**

Question Number	Answer	Additional guidance	Mark
6(a)(ii)	• gel electrophoresis / {DNA / base} sequencing / bioinformatics / protein sequencing / morphology / **molecular** phylogeny / anatomical features (1)	**Allow** amino acid sequences of proteins **Allow** DNA hybridisation **Allow** immunological comparison	**1**

Question Number	Answer	Additional guidance	Mark
6(b)(i)	An answer that makes reference to the following: • 34 (**3 marks**) **For one mark each, allow:** • 0.94 (**1 mark**) • 0.06 (**1 mark**)	**Allow** 33 (**3 marks**) **Allow two marks only** for 0.1128 / 11.28(%) / 0.113 / 11.3 (%) **Allow** 0.939(85) **Allow** 0.060(15) **Example of calculation** q^2 = 265 /300 = 0.883 q = 0.93985… p = 1- 0.9395 = 0.0601 2pq = 2 x 0.9395 x 0.0601 = 0.1129279 so, 0.1129279 x 300 = 33.87 **Correct answer with no working gains full marks.**	**3**

Question Number	Answer	Additional guidance	Mark
6(b)(ii)	An explanation that makes reference to the following: • resistant (rats) {survive / breed / produce offspring} (1) • (resistant rats) pass on the **allele** (to offspring) (1)	**Allow** non-resistant rats {die / do not breed / do not produce offspring}	**2**

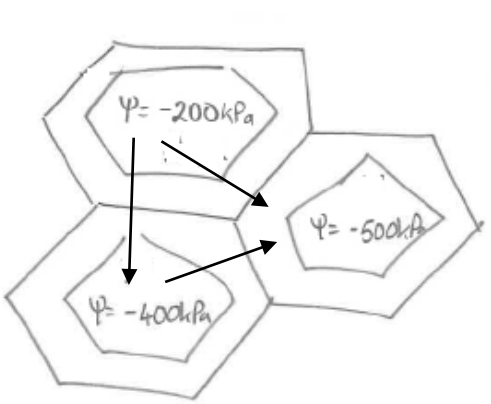
Question Number	Answer	Additional guidance	Mark
6(b)(iii)	An explanation that makes reference to two of the following: • {heterozygotes / W^RW^N} survive (better) / {heterozygotes / W^RW^N} have advantage (1) • as W^RW^N do not need extra vitamin K / W^RW^R die as need more vitamin K (1) • {heterozygotes / W^RW^N} pass on W^N allele / {heterozygotes / W^RW^N} produce W^NW^N offspring (1)	**Allow** carriers **Allow** W^RW^R rats need more vitamin K **Allow** carriers	**2**

(Total for Question 6 = 9 marks)

Question Number	Answer	Mark
7 (a) (i)	The only correct answer is D *A is incorrect as lactose does not contain fructose* *B is incorrect as lactose does not contain fructose* *C is incorrect as maltose does not contain fructose*	**1**

Question Number	Answer	Mark
7 (a) (ii)	The only correct answer is B *A is incorrect as ester bonds are found in lipids* *C is incorrect as hydrogen bonds do not join monosaccharides* *D is incorrect as peptide bonds do not join monosaccharides*	**1**

Question Number	Answer	Mark
7 (a) (iii)	The only correct answer is A *B is incorrect as there should be 21 oxygens* *C is incorrect as there should be 42 hydrogen* *D is incorrect as there are 21 oxygen*	**1**

Question Number	Answer	Additional guidance	Mark
7 (b)(i)	three arrows going in correct directions (1)	□ 	**1**

Question Number	Answer	Additional guidance	Mark
7 (b)(ii)	An explanation that makes reference to two of the following. • in **dry** weather {inulin / it} is more soluble / more able to dissolve (1) • so (in dry weather / with less fructose) **water potential** becomes {lower / more negative} (1) • so {in dry weather / with fewer fructose} water moves into {cells / root / plant} / {in dry weather / with fewer fructose} water {is not lost / is retained / stored / is absorbed} (1)	**Allow** insulin **Allow** in **wet** weather {inulin / it} is less soluble / less able to dissolve (1) **Allow** so (in wet weather / with more fructose) **water potential** becomes {higher / less negative} (1) **Allow** {in wet weather / with more fructose} less water {taken in / absorbed} (1)	**2**

Question Number	Answer	Additional guidance	Mark
7 (c)(i)	• correct answer for rate within given range and to two decimal places (1) • mg dm^{-3} min^{-1} / mg dm^{-3} s^{-1} (1)	Example of calculation **Allow** range between (-)7.50 to (-)8.99 (must be two d.p.) **Allow** range between (-)0.12 to (-)0.15 (must be two d.p.) (if in seconds) **Allow** mg dm^{-3} per minute **Allow** mg / dm^3 / min **Allow** mg dm^{-3} / min **Allow** mg dm^{-3} per second **Allow** mg / dm^3 / s **Allow** mg dm^{-3} / s **Allow** any other correct answer using different appropriate units **Correct answer with no working gains full marks.**	**2**

Question Number	Answer	Additional guidance	Mark
7(c)(ii)	An explanation that makes reference to two of the following: 1. ultrafiltration occurs (1) 2. (inulin passes from) glomerulus into Bowman's capsule (1) 3. because inulin is small enough to pass through {basement membrane / pores / fenestrations} (1)	 **Allow** (high) hydrostatic pressure moves inulin **Allow** through **gaps** between podocytes **Allow** insulin for inulin	**2**

Question Number	Answer	Additional guidance	Mark
7(c)(iii)	An explanation that makes reference to two of the following: • inulin has no function in humans (1) • inulin is not **reabsorb**ed (1) • because there are no inulin {channels / carriers / pumps} in {proximal convoluted tubule / PCT} (1)	**Allow** insulin for inulin **Allow** inulin is a waste product / is not needed **Allow** absorbed back **into blood** **Allow** first convoluted tubule	**2**

(Total for Question 7 = 12 marks)

Question Number	Answer	Mark
8 (a)	The only correct answer is A *B is incorrect as R should not be added* *C is incorrect as photosynthesis is not added* *D is incorrect as photosynthesis is not subtracted*	**1**

Question Number	Answer	Additional guidance	Mark
8(b)(i)	<table><tr><th>Age of heather plant</th><th>Rank age of heather plant</th><th>Leaf area : woody stem area</th><th>Rank leaf area : woody stem area</th><th>d</th><th>d^2</th></tr><tr><td>16</td><td>4</td><td>0.7</td><td>4.5</td><td>-0.5</td><td>0.25</td></tr><tr><td>15</td><td>5</td><td>0.5</td><td>8</td><td>-3</td><td>9</td></tr><tr><td>12</td><td>6</td><td>0.6</td><td>6</td><td>0</td><td>0</td></tr><tr><td>4</td><td>9</td><td>2</td><td>1</td><td>8</td><td>64</td></tr><tr><td>7</td><td>8</td><td>1.1</td><td>**2.5**</td><td>5.5</td><td>30.25</td></tr><tr><td>22</td><td>1</td><td>0.2</td><td>10</td><td>-9</td><td>81</td></tr><tr><td>20</td><td>2</td><td>0.3</td><td>9</td><td>-7</td><td>49</td></tr><tr><td>3</td><td>10</td><td>1.1</td><td>**2.5**</td><td>7.5</td><td>56.25</td></tr><tr><td>17</td><td>3</td><td>0.5</td><td>7</td><td>-4</td><td>16</td></tr><tr><td>11</td><td>7</td><td>0.7</td><td>4.5</td><td>2.5</td><td>6.25</td></tr></table> **one mark** for correct ranks (2.5 and 2.5) (1) **one mark** for correct d and d^2 (7.5 and 56.25) (1)		**2**

Question Number	Answer	Additional guidance	Mark
8(b)(ii)	• calculation of 6 $\sum d^2$ (**1872**) (1) • calculation of $n(n^2-1)$ (**990**) (1) • calculation of r_s value	**Allow ecf** from (i) **-**0.89(1) = **three marks** (note must be negative) **Allow** 1.89 for **two marks only** **Allow** 0.89(1) (with no minus) for **two marks only** **Allow** 1872 for **one mark** **Allow** 990 for **one mark** **Correct answer with no working gains full marks.**	**3**

Question Number	Answer	Additional guidance	Mark
8(b)(iii)	An answer that makes reference to the following: 1. there is a **significant** (negative) **correlation** (1) **and two from** 2. (because) the calculated value is **greater** than the critical value (1) 3. critical value is 0648 / 0.794 (1) 4. there is a less than 0.05 / 0.01 **probability** that the correlation is due to **chance** (1)	**Allow ECF from (ii)** **Allow as** age of heather increases, ratio of leaf area : woody stem area **significantly** decreases **Allow** correlation at the (5% / 1%) **significance** level **Do not accept** positive correlation **Ignore** significant relationship / significant difference **Allow** 5% / 1% **Allow** {0.95 / 0.99 / 99% / 95%} probability that the correlation is not due to chance	**3**

Question Number	Indicative content	Mark
8 *(c)	Answers will be credited according to candidate's deployment of knowledge and understanding of 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. **Productivity / effects of age of heather (P)** • old heather is less productive / has low NPP / young heather is more productive / has high NPP • old heather has low leaf area ratio / young heather has high leaf area ratio • old heather fixes less carbon / young heather fixes more carbon • old heather has low photosynthesis (compared with respiration) / young heather has high photosynthesis (compared with respiration) • with low NPP less energy for food chains / with high NPP more energy for food chains **Rewilding (R)** advantages • allows (secondary) **succession** (to return to original ecosystems) • increases biodiversity initially • which would allow natural species to return • peat locks up carbon in peat / peat decomposes slowly so slow release of carbon • reducing global warming / climate change disadvantages • older heather shades other plants / blocks light from small plants • as most species that would colonise area are extinct there are few grazing animals / few predators • some species could dominate (and outcompete others) • loss of income for farmers / farmers suffer unemployment • reduces carbon fixation / energy fixation (from old heather) **Burning (B)** advantages • removes old (unproductive) heather / allows young heather to grow • stimulates (seeds of) heather to germinate (for new plants) • stops ground being shaded so more light for other plant species / young heather • more grouse / food for birds of prey / increase bird of prey populations • more income for farmers (from grouse / sheep farming) • increases carbon fixation / energy fixation (from old heather) disadvantages • it is not a natural ecosystem / grouse moors are not natural • leads to loss of peat / less peat formed • kills other species as well as heather / not selective • reduces locked up carbon / releases carbon dioxide • leads to pollution / global warming / climate change • makes farmers **dependent** on grouse farming • unsightly when burning / causes health issues from smoke / can cause fires that get out of control	6

	Level 1: **1 mark**: any **one** comment **2 marks**: any **two** comments **Level 2:** **3 marks:** any **three** comments from at least two of **P, B, or R** **4 marks:** any **four** comments from at least two of **P, B, or R** **Level 3:** **5 marks:** any **four** comments must come from all three of **P, B, and R** **6 marks:** any **five** comments must come from all three of **P, B, and R**	

Level 0	Marks	No awardable content evaluate
Level 1	1-2 (1-3)	Limited scientific judgement made with a focus on mainly just one method, with a few strengths/weaknesses identified. A conclusion may be attempted, demonstrating isolated elements of biological knowledge and understanding but with limited evidence to support the judgement being made.
Level 2	3-4 (4-6)	A scientific judgement is made through the application of relevant evidence, with strengths and weaknesses of each method identified. A conclusion is made, demonstrating linkages to elements of biological knowledge and understanding, with occasional evidence to support the judgement being made.
Level 3	5-6 (7-9)	A scientific judgement is made which is supported throughout by sustained application of relevant evidence from the analysis and interpretation of the scientific information. A conclusion is made, demonstrating sustained linkages to biological knowledge and understanding with evidence to support the judgement being made.

(Total for Question 8 = 15 marks)

Question Number	Answer	Additional guidance	Mark
9(a)(i)	Arrow from bottom to top (1)		**1**

Question Number	Answer	Additional guidance	Mark
9(a)(ii)	A description that makes reference to three of the following: 1. rhodopsin is converted into (trans) retinal **and** opsin (1) 2. (opsin causes) sodium channels to close (1) 3. sodium ions accumulate outside / sodium ions do not enter cell (1) 4. sodium potassium exchange pump continues (1) 5. {less / no} {neurotransmitter / glutamate} is released (1)	 **Allow** prevents sodium channels opening **Allow** depolarisation stops / dark current stops **Allow** sodium continue to be **pumped** out **Allow** membrane becomes hyperpolarised	**3**

Question Number	Indicative content	Mark
***9(b)**	Answers will be credited according to candidate's deployment of knowledge and understanding of 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. **Descriptions about cat v human retina (C)** • cat cones have spatial summation in cats (unlike humans) / have three / several cones per bipolar neurone • in cats rods and cones have same resolution / sensitivity (due to summation) • cat has more rods that humans (all over retina) • cat has fewer cones than human • cat has more rods in periphery of retina • cat have better peripheral vision • cat has a reflective tapetum to help see in dark **Descriptions about data for other mammals (M)** • nocturnal animals have more rod cells (than cones) • rat has fewer rods than night monkey • animals active in day have more cone cells (than nocturnal animals) • night monkey, rat and saimiri monkey have more rods than cones • marmoset monkey has more cones than rods / most animals have more rod cells than cone cells • saimiri monkey is different from others (in terms of activity and rod / cone number) • saimiri monkey may live in shaded areas **Conclusions and General points (G)** • *animals active in day / humans can **see detail** / have **better acuity** / can **see colour**** • *animals / cats active at night are sensitive to **low light** intensity / **dim light*** **(ignore dark(er) light)*** • rhodopsin is more sensitive than iodopsin • rods are more sensitive to lower light intensity than cones • rods are more sensitive as they have spatial summation / description of many rods joining to one bipolar neurone / cones usually have one bipolar neurone • cones have high acuity / rods have low acuity • rods are only black and white vision / cones are colour vision • only a limited survey / only a few animals investigated • rat is different as less related to the three monkeys **Level 1:** **1 mark:** any 1 point **2 mark:** any 2 points **Level 2:** **3 marks:** any 3 points from at **least two of** C, M, **or** G **4 marks:** any 4 points from at **least two of** C, M, **or** G **Level 3:** **5 marks:** any 5 points with at **least one from each of** C, M, **and** G **6 marks:** any 6 points with at **least one from each of** C, M, **and** G at **least one must be italics***	6

	Marks	AO2 discuss
0	0	No awardable content
1	1-2 (1-3)	Demonstrates isolated elements of biological knowledge and understanding to the given context with generalised comments made. Vague statements related to consequences are made with limited linkage to a range of scientific ideas, processes, techniques and procedures. The discussion will contain basic information with some attempt made to link knowledge and understanding to the given context.
2	3-4 (4-6)	Demonstrates adequate knowledge and understanding by selecting and applying some relevant biological facts/concepts. Consequences are discussed which are occasionally supported through linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows some linkages and lines of scientific reasoning with some structure.
3	5-6 (7-9)	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant knowledge of biological facts/concepts. Consequences are discussed which are supported throughout by sustained linkage to a range of scientific ideas, processes, techniques or procedures. The discussion shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.

(Total for Question 9 = 10 marks)

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