Pearson Edexcel

Mark Scheme (Results)

Summer 2022

Pearson Edexcel GCSE

In Biology (1BI0) Paper 1F

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General Marking Guidance

1. All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
2. Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
3. Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
4. There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
5. 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.

1. Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
2. When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
3. Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Mark schemes have been developed so that the rubrics of each mark scheme reflects the characteristics of the skills within the AO being targeted and the requirements of the command word. So for example the command word 'Explain' requires an identification of a point and then reasoning/justification of the point.

Explain questions can be asked across all AOs. The distinction comes whether the identification is via a judgment made to reach a conclusion, or, making a point through application of knowledge to reason/justify the point made through application of understanding. It is the combination and linkage of the marking points that is needed to gain full marks.

When marking questions with a 'describe' or 'explain' command word, the detailed marking guidance below should be consulted to ensure consistency of marking.

Assessment Objective		**Command Word**	
Strand	**Element**	**Describe**	**Explain**
AO1		An answer that combines the marking points to provide a logical description	An explanation that links identification of a point with reasoning/justification(s) as required
AO2		An answer that combines the marking points to provide a logical description, showing application of knowledge and understanding	An explanation that links identification of a point (by applying knowledge) with reasoning/justification (application of understanding)
AO3	1a and 1b	An answer that combines points of interpretation/evaluation to provide a logical description	
AO3	2a and 2b		An explanation that combines identification via a judgment to reach a conclusion via justification/reasoning
AO3	3a	An answer that combines the marking points to provide a logical description of the plan/method/experiment	
AO3	3b		An explanation that combines identifying an improvement of the experimental procedure with a linked justification/reasoning

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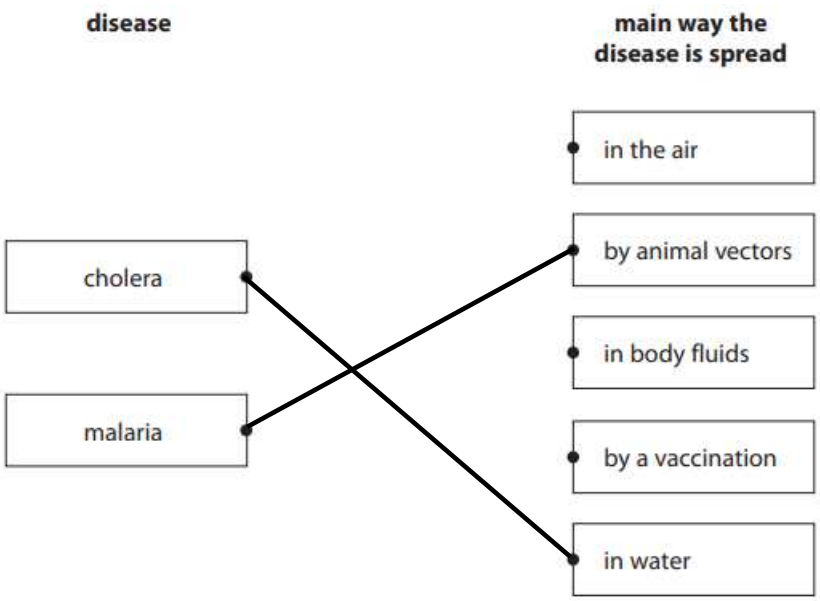
Question number	Answer	Mark
1(a)	A Pathogen **The only correct answer is A** ***B*** *is incorrect because a culture does not cause disease.* ***C*** *is incorrect because antibiotics do not cause disease.* ***D*** *is incorrect because platelets do not cause disease.*	**(1)** **AO1 1**

Question number	Answer	Mark
1(b)	 do not award mark if two lines are drawn from cholera box do not award mark if two lines are drawn from malaria box	**(2)** **AO1 1**

Question number	Answer	Additional guidance	Mark
1(c)(i)	all points plotted correctly ± one small square		**(1)** **AO2 2**

Question number	Answer	Additional guidance	Mark
1(c)(ii)	straight line of best fit going through all the plotted points ± two small squares.	ignore any extrapolation	**(1)** **AO2 2**

Question number	Answer	Additional guidance	Mark
1(c)(iii)	A description including **two** from: • 10 °C is slower (than growth at 20 °C) (1) • 10 °C is linear /straight (1) • 10 °C does not level off (1) • supported by manipulated data (1)	accept 10 °C is below / less (than the 20 °C line) differences must be in 1000s accept reverse arguments for 20 °C	**(2)** **AO3** **1a 1b**

(Total marks for question 1 = 7 marks)

Question number	Answer	Additional guidance	Mark
2(a)(i)	A description including **two** from: • by hitting it (1) • with another stone / rock / flint / something hard (1) • to knock flakes /chips off (1)	not just another object accept knapped (2)	**(2)** **AO2 1**

Question number	Answer	Mark
2(a)(ii)	B tool Q is more pointed than tool P **The only correct answer is B** ***A*** *is incorrect because colour does not tell you how advanced the maker of the tool was.* ***C*** *is incorrect because colour does not tell you how advanced the maker of the tool was.* ***D*** *is incorrect because Q is more pointed than P.*	**(1)** **AO3 2a**

Question number	Answer	Mark
2(a)(iii)	• natural (1) • mutate (1) Must be in the correct order Reject migrate against either mark	**(2)** **AO1 1**

Question number	Answer	Additional guidance	Mark
2(b)	A description including **two** from: • compare with other tools / fossils (that have already been dated) (1) • from the (layer of) rock in which they are found / how deep down each was found (1) • radiometric dating / description of radiometric dating (1) • comparing to other finds (of known age) from the same layer (of rock) (1)	accept compare to other tools that are less well / better made	**(2)** **AO2 1**

(Total marks for question 2 = 7 marks)

Question number	Answer	Mark
3 (a)(i)	A Charles Darwin **The only correct answer is A** ***B*** *is incorrect because Robert Hooke did not write On the Origin of Species* ***C*** *is incorrect because Richard Leakey did not write On the Origin of Species* ***D*** *is incorrect because Gregor Mendel did not write On the Origin of Species*	**(1)** **AO1 1**

Question number	Answer	Mark
3 (a)(ii)	D new species evolve over many generations **The only correct answer is** D ***A*** *is incorrect because humans are related to other groups of animals* ***B*** *is incorrect because different species have different genes* ***C*** *is incorrect because dinosaurs did not evolve because of a meteor*	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
3 (b)(i)	the whale humerus is shorter / wider / stubbier	accept whale humerus is less likely to break / is stronger accept reverse arguments for humerus of human	**(1)** **AO2 1**

Question number	Answer	Additional guidance	Mark
3 (b)(ii)	the horse has fewer phalanges	the horse has 3 phalanges whereas the human has 14 phalanges accept humans have smaller phalanges / the horse phalanges are thicker / stronger accept reverse arguments for human	**(1)** **AO2 1**

Question number	Answer	Additional guidance	Mark
3 (c)	A description linking four from: • there was variation in beak shape / mutations occurred that changed the shape of the beak (in some finches) (1) • thinner beaks are more suited to catching / extracting {the food available for finch A /insects / finch A's environment} (1) • the birds with thinner beaks {outcompeted / were more successful than / more likely to survive / obtained **more** food } (those with thicker beaks) (1) • (more) birds with thinner beaks reproduced and passed on **alleles** for thinner beaks (1) • this occurs over many generations / a long period of time (1)	accept reverse arguments	**(4)** **AO2 1**

Total marks for question 3 = 8 marks

Question number	Answer	Mark
4(a)	A diffusion **The only correct answer is A** ***B*** *is incorrect because respiration is the release of energy from glucose.* ***C*** *is incorrect because osmosis is the movement of water, not alcohol.* ***D*** *is incorrect because protein synthesis is how proteins are made.*	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
4(b)(i)	readings from graph 3.0 / 3 (1) 1.8 (1) Evaluation 3.0 – 1.8 = 1.2 (units higher of developing cirrhosis of the liver) (1)	award full marks for correct answer with no working ecf for (3 – 1.7 or 3 - 1.9)	**(3)** **AO3** **1a 1b**

Question number	Answer	Additional guidance	Mark
4(b)(ii)	An answer including **two** of the following: • reduce alcohol intake / do not drink alcohol (1) • drink alcohol with meals / do not drink it on its own (1)	 accept data from graph / manipulated data from graph reflecting a reduction in drink	**(2)** **AO2 1**

Question number	Answer	Additional guidance	Mark
4(c)(i)	in the nucleus / on a chromosome	accept on DNA / it is part of DNA accept in mitochondria	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
4(c)(ii)	An explanation including: • person B must have an F allele because she does not have cystic fibrosis (1) • person B must have an f allele because person E must have inherited an f allele from her (1)	 accept because person E is ff / homozygous recessive	**(2)** **AO2 2**

Question number	Answer	Additional guidance	Mark
4(c)(iii)	ff both letters must be lower case	accept: homozygous recessive accept: double recessive accept: 'two small fs'	**(1)** **AO2 1**

(Total marks for question 4 = 10)

Question number	Answer	Mark
5(a)	lack of need to find a {mate / partner} / rapid reproductive cycle / plantlet has the same characteristics as the parent plant (so should be able to survive in that environment) / can quickly colonise an area.	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
5(b)(i)	A description including **two** from: • plantlets are not produced at 5^0C / 10^0C / 30^oC (1) • the number of plantlets then increases up to 20^0C (1) • the number of plantlets decreases above 20^0C (1)	accept plantlets are produced between 15^0C and 25^0C accept 20^0C is the best temperature (for producing plantlets)	**(2)** **AO3** **1a 1b**

Question number	Answer	Mark
5(b)(ii)	D grow five of these plants at each temperature **The only correct answer is D** ***A*** *is incorrect because a plant would not grow at 0^o C* ***B*** *is incorrect because growing the plants in different soils would introduce a second variable* ***C*** *is incorrect because growing a different species of plant would introduce a second variable*	**(1)** **AO3 3b**

Question number	Answer	Additional guidance	Mark
5(c)	An explanation including **two** of: • inherit different alleles (1) • (which gives greater) variation in (species) / structures / characteristics / example of a characteristic (1) • (so) will be able to exploit / survive / grow in different {conditions / environments} (1)	accept gets DNA from different plants	**(2)** **AO1 1**

Question number	Answer	Additional guidance	Mark
5(d)	An explanation including **three** from: • select plants L **and** M (1) • because these have the desired alleles / the offspring will inherit the desired alleles (1) • L because of large white flowers **and** large leaves (1) • M because of striped leaves (1)		**(3)** **AO3** **2a 2b**

(Total marks for question 5 = 9)

Question number	Answer	Mark
6(a)(i)	C 50^{th} to 75^{th} **The only correct answer is C** ***A*** *is incorrect because his height percentile is 50 – 75* ***B*** *is incorrect because his height percentile is 50 – 75* ***D*** *is incorrect because his height percentile is 50 – 75*	**(1)** **AO3 1a**

Question number	Answer	Mark
6(a)(ii)	Any **one** from: • to monitor height / growth (over time) (1) • to compare the growth of an individual against the standard growth pattern (1)	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
6(b)(i)	A description including any **two** from: • tail / flagellum (1) • acrosome / sac with enzymes (1) • (many) mitochondria (1) • streamlined (1) • haploid / has 23 chromosomes (1)	accept has enzymes to digest the membrane around the egg	**(2)** **AO1 1**

<table>
<tr><th>Question number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>6(b)(ii)</td><td>Award one mark for each correct square in the table.

<table><tr><th></th><th>mitosis</th><th>meiosis</th></tr><tr><td>number of daughter cells produced</td><td>2</td><td>4</td></tr><tr><td>number of chromosomes in each daughter cell</td><td>46 / <u>23 pairs</u></td><td>23</td></tr></table>For mitosis (number of chromosomes) ignore 23 on its own, must be qualified as 23 pairs</td><td>(4)
AO1 1</td></tr>
</table>

Question number	Answer	Mark
6(c)(i)	A meristem **The only correct answer is A** ***B*** *is incorrect because root hair cells are not the area of the root where many cells are dividing by mitosis.* ***C*** *is incorrect because xylem is not the area of the root where many cells are dividing by mitosis.* ***D*** *is incorrect because phloem is not the area of the root where many cells are dividing by mitosis.*	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
6(c)(ii)	An answer including **three** of the following • add {enzyme (solution) / plant root cells} to glucose (solution) (1) • test for presence of starch (1) • test {each minute / at set **time** intervals} / **time** until a positive result for starch (1) • repeat at more than one pH / (in buffers) of different pH values (1) • reference to controlling one variable, e.g. same volume of solutions / same temperature (1)	accept use iodine	**(3)** **AO3 3a**

(Total marks for question 6 = 12)

Question number	Answer	Mark
7(a)(i)	C structure S **The only correct answer is C** ***A*** *is incorrect because cataracts do not develop in the retina.* ***B*** *is incorrect because cataracts do not develop in the sclerotic.* ***D*** *is incorrect because cataracts do not develop in the cornea.*	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
7(a)(ii)	A description including **two** of: • cut into the eye / use a laser (to open the eye) (1) • replace (old / opaque) **lens** (1) • with a new clear artificial / plastic / glass lens (1)		**(2)** **AO1 1**

Question number	Answer	Additional guidance	Mark
7(b)(i)	An explanation linking: • the pupil gets smaller (1) • (the) iris (1) • gets bigger (1)	accept (circular) muscles contract (1) accept radial muscles relax (1)	**(3)** **AO1 1**

Question number	Indicative content	Mark
7 (b)(ii)	**AO2** **why distant objects cannot be seen clearly** • person is near-sighted / short-sighted / has myopia • light is not focused on retina • light is focused in front of the retina • the eyeball is **too** long • the cornea is **too** curved / convex /converging • the lens cannot be made thin enough • so the light is refracted too much **how the problem can be corrected** • go to the opticians • go to have your eyesight tested • have glasses / contact lenses prescribed • glasses / contact lenses need to be concave / diverging • have laser treatment (of cornea) • cornea needs to be less convex • so light is refracted less before it enters the eye • so light is focused on the retina	**(6)** **AO2 1**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates elements of biological understanding, some of which is accurate. Understanding of scientific, enquiry, techniques and procedures lacks detail. • Presents a description which is not logically ordered and with significant gaps.
Level 2	3–4	• Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas, enquiry, techniques and procedures is not fully detailed and/or developed. • Presents a description of the procedure that has a structure which is mostly clear, coherent and logical with minor steps missing.
Level 3	5–6	• Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas, enquiry, techniques and procedures is detailed and fully developed. • Presents a description that has a well-developed structure which is clear, coherent and logical.

Level	Mark	Additional Guidance	General additional guidance The level is determined by the areas of indicative content covered within the response. The mark within the level is determined by the detail within each description.
	0	No rewardable material	
Level 1	1–2	• Makes a simple reference to the eye problem or how it can be corrected.	<u>Possible candidate responses</u> • Wear glasses (bottom of level 1) • The light comes together in front of the retina (good level 1)
Level 2	3–4	• Refers to both areas of indicative content OR • Gives an explanation of the eye problem OR how to correct the eye problem.	<u>Possible candidate responses</u> • The light is bent too much at the front of the eye so you need to wear glasses (bottom of level 2 – both areas referred to) • Light is bent too much at the cornea so it focuses in front of the retina (good level 2 – an explanation of one area)
Level 3	5-6	• Refers to both areas of indicative content and gives a detailed explanation of one area OR • Gives a detailed explanation of both areas of indicative content	<u>Possible candidate responses</u> • The person is short-sighted. The cornea is too curved so the light is bent so that it is focused in front of the retina. Glasses need to be worn to correct the problem (bottom of level 3 – both areas and one in detail) • The person is short-sighted because the cornea is too convex, so light is focused in front of the retina. To correct the problem you need glasses to make light meet on the retina (good level 3 – both areas explained)

(Total marks for question 7 = 12)

Question number	Answer	Additional guidance	Mark
8(a)	A description linking **two** from: weak (1) hydrogen bonds (1) complementary bases (1) A – T / C – G (1)	 accept H bonds reject hydro bonds accept the names of the base pair	**(2)** **AO1 2**

Question number	Answer	Additional guidance	Mark
8(b)(i)	<table><tr><td>**T**</td><td>**T**</td><td>**G**</td><td>**A**</td><td>**T**</td><td>**T**</td><td>**G**</td><td>**C**</td><td>**G**</td><td>**T**</td><td>**A**</td><td>**A**</td></tr><tr><td>**A**</td><td>**A**</td><td>**C**</td><td>**T**</td><td>**A**</td><td>**A**</td><td>**C**</td><td>**G**</td><td>**C**</td><td>**A**</td><td>**T**</td><td>**T**</td></tr></table> award 1 mark for all the As and Ts in the top line correctly paired (1) award 1 mark for all the Cs and Gs in the top line correctly paired (1)	accept lower case letters	**(2)** **AO2 1**

Question number	Answer	Mark
8(b)(ii)	B 4 **The only correct answer is B** ***A*** *is incorrect because 3 amino acids would need 9 bases to be present* ***C*** *is incorrect because 6 amino acids would need 18 bases* ***D*** *is incorrect because 12 amino acids would need 36 bases*	**(1)** **AO2 1**

Question number	Answer	Mark
8 (b)(iii)	D double helix **The only correct answer is D** ***A*** *is incorrect because a DNA molecule is not three separate strands* ***B*** *is incorrect because the DNA molecule consists of two strands* ***C*** *is incorrect because a DNA molecule is a double helix not a single helix*	**(1)** **AO1 2**

Question number	Answer	Additional guidance	Mark
8 (c)(i)	An explanation linking **two** from: • (protease) breaks down proteins (1) • in the {cell/nuclear} membrane (1) • destroys enzymes that may break down the DNA (1)	 accept break down {the cell / nucleus/ cell wall}	**(2)** **AO1 2**

Question number	Answer	Additional guidance	Mark
8 (c)(ii)	to precipitate the DNA / because DNA is insoluble in ethanol	accept to see the DNA	**(1)** **AO1 2**

Question number	Answer	Additional guidance	Mark
8(c)(iii)	Any **two** from: • mass of peas and beans (1) • method of crushing (1) • volume of {washing up liquid / detergent} / water (1) • volume of protease (1) • temperature if qualified (1) • volume of ethanol (1) • time if qualified (1)	accept weight accept keep the temperature of the mixture the same accept time the mixture was heated / time exposed to ethanol	**(2)** **AO3** **3a 3b**

(Total for question 8 = 11 marks)

Question number	Answer	Mark
9(a)(i)	Gonorrhoea accept phonetic spellings	(1) A03 1a

Question number	Answer	Additional guidance	Mark
9(a)(ii)	66 000 000 ÷ 1000 = 66 000 (1) (66 000) x 3.7 =244 200 (people) or 3.7 ÷ 1000 / 0.0037 (1) (0.0037) x 66 000 000= 244 200 (people) or (66 000 000 x 3.7) = 244 200 000 (1) (244 200 000 ÷ 1000) = 244 200 (people)	award full marks for correct answer no working accept answers in standard form accept 244 200 to any incorrect magnitude for one mark	(2) AO2 1

Question number	Answer	Additional guidance	Mark
9(a)(iii)	Any one from: • it is {**passed/spread**} from **person to person (1)** • caused by bacteria (1)	 accept it is spread by {sexual contact / body fluids} accept pathogen ignore caused by a virus	(1) AO1 1

Question number	Answer	Additional guidance	Mark
9(a)(iv)	Any **one** from: • avoid sexual contact (1) • use a {condom / femidom} (1) • screen people for an infection (1) • treat the infection / give antibiotics (1)	accept use a barrier form of contraception ignore protection / contraception	**(1)** **AO2 1**

Question number	Answer	Additional guidance	Mark
9(a)(v)	An explanation including the following: • it is {killed / inhibited} by antibiotics (1) • because chlamydia is caused by bacteria (1)	accept disrupt cell processes (in bacteria) / prevent (bacteria) reproducing accept antibiotics are used to kill bacteria for 2 marks	**(2)** **AO2 1**

Question number	Indicative content	Mark
9(b)	**AO2** Area A • antigens are on the bacteria • which are detected by WBCs / phagocytes • white blood / phagocytes engulf bacteria (phagocytosis) • swelling / inflammation of tissues / fever Area B • number of white blood cells increases • antibodies are produced • by lymphocytes / white blood cells • antibodies surround / cover / inactivate the antigens / pathogens Area C • memory lymphocytes / cells are produced • which remain in the blood • then if a secondary infection occurs • memory lymphocytes produce antibodies faster / in greater numbers • so the bacteria / pathogens are destroyed faster	**(6)** **AO1 1**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates elements of biological understanding, some of which is accurate. Understanding of scientific, enquiry, techniques and procedures lacks detail. • Presents a description which is not logically ordered and with significant gaps.
Level 2	3–4	• Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas, enquiry, techniques and procedures is not fully detailed and/or developed. • Presents a description of the procedure that has a structure which is mostly clear, coherent and logical with minor steps missing.
Level 3	5–6	• Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas, enquiry, techniques and procedures is detailed and fully developed. • Presents a description that has a well-developed structure which is clear, coherent and logical.

Level	Mark	Additional Guidance	General additional guidance The level is determined by the areas of indicative content covered within the response. The mark within the level is determined by the detail and /or use of biological terms within each description.
	0	No rewardable material	
Level 1	1–2	Makes a simple reference to a feature of the immune response	<u>Possible candidate responses</u> • White blood cells are involved • White blood cells engulf bacteria
Level 2	3–4	Refers to two areas of indicative content OR Gives an explanation of one area of indicative content	<u>Possible candidate responses</u> • Bacteria have antigens on them and white blood cells make antibodies • Infection by bacteria causes more white blood cells to be produced. Lymphocytes make antibodies which inactivate antigens on the pathogens
Level 3	5-6	Refers to three areas of indicative content OR Gives an explanation of two areas of indicative content	<u>Possible candidate responses</u> • There are antigens on bacteria which are detected by white blood cells. Lymphocytes make antibodies and then memory lymphocytes are produced for a faster secondary response • Phagocytes detect antigens on the bacteria and engulf them. This is called phagocytosis. People might also develop a fever. Memory lymphocytes are produced and these stay in the blood to produce specific antibodies very quickly if there is a secondary infection by the same bacteria

(**Total for question 9 = 13 marks)**

Question number	Answer	Mark
10(a)(i)	D retina **The only correct answer is D** ***A*** *is incorrect because the cornea does not contain light receptor cells* ***B*** *is incorrect because the iris does not contain light receptor cells* ***C*** *is incorrect because the lens does not contain light receptor cells*	**(1)** **AO2 1**

Question number	Answer	Mark
10(a)(ii)	mitochondria / mitochondrion accept phonetic spellings	**(1)** **AO2 1**

Question number	Answer	Mark
10(a)(iii)	nucleus / nuclei accept phonetic spellings	**(1)** **AO2 1**

Question number	Answer	Additional guidance	Mark
10(a)(iv)	rods / rod cells	reject cones	**(1)** **AO2 1**

Question number	Answer	Additional guidance	Mark
10(a)(v)	A description including **two** of the following: • cell B is a cone cell (1) • involved in colour vision (1)	accept responds to bright light / high light intensities accept responds to different wavelengths frequencies of light (1)	**(2)** **AO2 1**

Question number	Answer	Additional guidance	Mark
10(b)(i)	Change the subject of the equation time = distance ÷ speed (1) Conversion of mm to m 47 ÷ 1000 = 0.047(m) (1) Substitution 0.047 ÷ 75 = 0.0006267 (seconds) OR Change the subject of the equation time = distance ÷ speed (1) Conversion of m to mm 75 x 1000 = 75000 (mm) (1) Substitution 47 ÷ 75000 = 0.0006267 (seconds)	award full marks for correct answer no working accept any correct rounding - 0.00063 / 0.000626(recurring) / 0.0006 accept answers in standard form accept any correct rounding - 0.00063 / 0.000626(recurring) / 0.0006 accept answers in standard form	**(3)** **AO2 1**

Question number	Answer	Mark
10(b)(ii)	A cerebral hemispheres **The only correct answer is A** ***B*** *is incorrect because the occipital lobe is not located in the medulla oblongata* ***C*** *is incorrect because the occipital lobe is not located in the cerebellum* ***D*** *is incorrect because the occipital lobe is not located in the hypothalamus*	**(1)** **AO1 1**

Question number	Answer	Mark
10(b)(iii)	(eye)sight / vison / seeing / being able to see	**(1)** **AO2 1**

(Total for question 10 = 11 marks)