



Mark Scheme (Results)

Summer 2016

Pearson Edexcel GCE
in Biology (6BI01) Paper 01
Transport, Genes and Health

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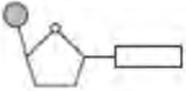
Publications Code 46640_MS*

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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)(i)	C 		(1)

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	B G-A-U-U-C-A-C-G-U		(1)

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	C 3 1 4 2		(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	8		(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	6		(1)

Question Number	Answer	Additional Guidance	Mark
1(c)	<ol style="list-style-type: none">1. DNA is {double stranded/ has a double helix} and RNA is {single stranded / does not have a double helix} ;2. DNA has {thymine / T } while RNA has { uracil / U } ;3. DNA has deoxyribose while RNA has ribose ;4. DNA is { larger / longer } than RNA / eq ;	<p>1. ACCEPT mixtures e.g. DNA double helix mRNA is single strand IGNORE hydrogen bonds</p> <p>2.NOT thiamine, thiamine</p>	<p>(3)</p>

Question Number	Answer	Additional Guidance	Mark
2(a)	<p>correct answer only gains both marks</p> <p>1. $32.2 - 7.6 = 24.6$;</p> <p>2. $(\div 32.2) \times 100 = 76.4 / 76.40$;</p>	<p>ACCEPT $7.6 \div 32.2$</p> <p>$100 - 23.6 = 76.4 / 76.40$</p>	(2)

Question Number	Answer	Additional Guidance	Mark
2(b)	<p>1. idea of producing liquid extract of cabbage;</p> <p>2. description of titration ;</p> <p>3. reference to use of DCPIP ;</p> <p>4. correct colour change described ;</p> <p>5. compare volumes with standard e.g. reference to use of calibration curve / eq ;</p> <p>6. description of appropriate standardisation of extract e.g. mass of cabbage, volume of liquid added to cabbage ;</p>	<p>2. e.g. set volume of extract and find the volume of DCPIP needed or converse</p> <p>4. e.g. it goes colourless when extract added, add DCPIP until it goes blue</p>	(4)

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	<ol style="list-style-type: none"> cell membranes {damaged / permeable / eq} ; vitamin C leaves the {cells / cabbage} (because it is water soluble) ; vitamin C is destroyed by {boiling / enzyme / ascorbic acid oxidase} ; 		(2)

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	the { enzyme / ascorbic acid oxidase } would have been denatured (quicker when added to the boiling water) ;	ACCEPT for cold water: enzyme is more active as water is heated up or vitamin C leaks out as it heats up	(1)

Question Number	Answer	Additional Guidance	Mark
2(d)	<ol style="list-style-type: none"> idea that stored sauerkraut still contains some vitamin C. cabbage would {rot / decompose / eq} ; 	ACCEPT sauerkraut does not rot	(1)

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	<ol style="list-style-type: none"> idea of it being frequently inherited in the family e.g. 1, 7 and 10 all have affected offspring, 9 of the family have the disorder ; individual { 1 / 3 / 7 / 10 } must be heterozygous / eq ; use of the pedigree diagram to explain mark point 2 ; appropriate use recessive allele argument e.g. if it were recessive then 2 would have to be { heterozygous / a carrier } ; idea that it is unlikely that the unrelated parents { 8 / 11 } would also be carriers of the affected allele ; 	<p>IGNORE 50% are affected</p> <p>1 ACCEPT 8 of 14 descendants of 1 and 2</p> <p>2 ACCEPT have one dominant allele</p>	(3)

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	<ol style="list-style-type: none"> parents gametes displayed correctly (e.g. M, m and m, m) ; correct genotypes of offspring shown ; probability matches genotypes shown e.g. 0.5 / ½ / 1 in 2 / 50% ; 	<p>1. ACCEPT gametes shown on a punnett square alone</p> <p>3. ACCEPT other probabilities if match genotypes shown</p>	(3)

Question Number	Answer	Additional Guidance	Mark
3(b)	<p>Any two pairs from:</p> <ol style="list-style-type: none"> 1. idea that there is a { thick wall / thick layers / thick tunica media / eq } ; 2. idea that it needs to { avoid rupture / withstand high pressure / allow expansion / eq } ; 3. collagen / elastic fibres ; 4. allow expansion / elastic recoil ; 5. muscle { layer / fibres / wall / eq } ; 6. control the flow of blood / maintain blood pressure / eq ; 7. smooth endothelial wall / eq ; 8. to reduce { friction / resistance / eq } ; 9. narrow lumen ; 10.(to maintain) high blood pressure / eq ; 	<p>3 and 4 . ACCEPT folded {endothelium / (inner) surface} allows expansion</p>	<p>(4)</p>

Question Number	Answer	Additional Guidance	Mark
4(a)(i)	B (are R and S) ;		(1)

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	C (is P only) ;		(1)

Question Number	Answer	Additional Guidance	Mark
4(b)	1. glycerol plus three fatty acids as reactants ; 2. ester bond labelled ; 3. water shown ;	2 ACCEPT an ester bond drawn out correctly even if not labelled	(3)

Question Number	Answer	Additional Guidance	Mark
4(c)(i)	condensation / polymerisation ;	ACCEPT polymerization	(1)

Question Number	Answer	Additional Guidance	Mark
4(c)(ii)	glycosidic / 1,4 glycosidic ;	ACCEPT glycoside ACCEPT missing commas and commas replaced with dashes NOT 1,6 glycosidic IGNORE link or bond	(1)

Question Number	Answer	Additional Guidance	Mark
4(c)(iii)	Amylose is { coiled / unbranched / eq } / amylose has only 1,4 (glycosidic) bonds / eq ;	ACCEPT glycogen is not coiled / branched / has 1,4 and 1,6 glycosidic bonds	(1)

Question Number	Answer	Additional Guidance	Mark
4(c)(iv)	<ol style="list-style-type: none"> 1. contain glucose / eq ; 2. idea that they are compact so large { numbers of glucose / amylose / glycogen } molecules can fit into a small volume ; 3. insoluble therefore { does not affect osmosis / eq } ; 4. large molecules therefore { remains in cells / too big to diffuse / eq } ; 	<p>ACCEPT if each described separately but allow each Mp once only</p> <ol style="list-style-type: none"> 1. ACCEPT can be hydrolysed / broken down to release glucose 2. ACCEPT large amounts of energy in a small volume 3. IGNORE insoluble so will not dissolve 	(2)

Question Number	Answer	Additional Guidance	Mark
5(a)	1. platelets ; 2. prothrombin ; 3. fibrin ;	NB any sign of an arrow then item to go to review. 1. ACCEPT plattelets, platellets 2. ACCEPT prothrombrin	(3)

Question Number	Answer	Additional Guidance	Mark
5(b)	1. prevents oxygen reaching the heart { muscle / cells / tissue / eq } ; 2. prevents (aerobic) respiration ; 3. (cardiac) muscle { unable to contract / dies / eq } ;	1. ACCEPT heart muscle ischaemic 2. ACCEPT reference to anaerobic respiration / lactic acid production ACCEPT { no / less } ATP is produced 3. ACCEPT produces interference in the electrical impulses across the heart / eq ACCEPT cells of the heart die	(3)

Question Number	Answer	Additional Guidance	Mark
5(c)(i)	1. description of the trend e.g. increasing ratio decreases death rate, negative correlation / eq ; 2. highest death rate in countries with lowest ratio of unsaturated to saturated fatty acids / eq ; 3. correct manipulation of figures to illustrate relationship ;	2. ACCEPT converse 3. e. g. Finland and Italy 2x ratio / deaths down by 268 Finland and USA ratio up by 0.1 / deaths down by 95	(3)

Question Number	Answer	Additional Guidance	Mark
5(c)(ii)	<p>1. increase the ratio of unsaturated to saturated in their diet / eq ;</p> <p>2. because in countries with a low ratio of unsaturated to saturated the death rate by CVD is high / eq ;</p> <p>3. replace animal fats with plant oils / reduce animal fats / increase plant oils ;</p> <p>4. because { animal fats / beef / butter } have a high % of { saturated fatty / palmitic / stearic } acids /</p> <p>OR</p> <p>{ plant oils / olive and corn oil } have a high % of {unsaturated fatty / linoleic / oleic } acids</p> <p>OR</p> <p>{ saturated fatty / palmitic / stearic } acids raise blood cholesterol /</p> <p>OR</p> <p>{ unsaturated fatty / linoleic / oleic } acids {reduce / do not raise } blood cholesterol (to reduce chance of death)</p> <p>;</p>	<p>1.ACCEPT eat more unsaturated and less saturated</p> <p>3. ACCEPT suitable reference to beef, butter, olive oil and corn oil</p>	(3)

Question Number	Answer	Additional Guidance	Mark
5(d)	<ol style="list-style-type: none"> 1. other { variables / uncontrolled variables / eq } affect CVD ; 2. genetic differences (between national populations) / eq ; 3. (countries have) { environmental / life style } differences / eq ; 4. idea that data does not provide a causal { link / mechanism} ; 	<ol style="list-style-type: none"> 2. ACCEPT gender 3. ACCEPT differences in levels of activity, smoking, other dietary factors e.g. salt, alcohol consumption ACCEPT age profiles of countries may differ 	(2)

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	D – passive transport		(1)

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	C - ions move down a concentration gradient		(1)

Question Number	Answer	Additional Guidance	Mark
6(a)(iii)	B - involves the production of a vacuole or vesicle		(1)

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	<ol style="list-style-type: none"> idea that the rate of uptake { is constant for first 5 minutes / reduces after 5 minutes } ; idea that { concentration of W reaches a maximum / no more uptake / stays at 0.6 mol dm^{-3} } from 10 minutes ; suitable manipulation of figures e.g. rate of uptake in first 5 minutes is 0.1 mol dm^{-3} per minute ; 	<p>1. ACCEPT idea of linear increase in first 5 minutes</p>	(3)

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	<ol style="list-style-type: none"> 1. uptake { slows down / is less / stops } / eq ; 2. because of smaller { concentration / diffusion } gradient / eq ; 3. credit argument for why it is not another process e.g. not osmosis as the solute concentration rises from 0, not active transport as it will continue to rise and not reach a maximum ; 	<p>2 ACCEPT converse</p>	<p>(2)</p>

Question Number	Answer	Additional Guidance	Mark
6(c)	<ol style="list-style-type: none"> 1. idea that water has moved into the cell ; 2. by osmosis ; 3. idea of a solute concentration gradient ; 4. cell membrane ruptures / eq ; 	<p>3. ACCEPT water { potential / concentration } gradient</p>	<p>(3)</p>

Question Number	Answer	Additional Guidance	Mark
7(a)(i)	Blood vessel at bottom of diagram with blood flowing away from the capillaries clearly labelled {P / pulmonary vein};		(1)

Question Number	Answer	Additional Guidance	Mark
7(a)(ii)	Any one difference described e.g. 1. capillary wall is one cell thick while vein wall is thicker / eq 2. capillary has no {collagen/ muscle} 3. capillaries do not have valves 4. smaller lumen in capillaries than veins ;	1. ACCEPT capillary wall is only one cell thick NOT cell wall 2 ACCEPT converse 3 ACCEPT converse	(1)

Question Number	Answer	Additional Guidance	Mark
7(b)	1. O ₂ diffuses more quickly than CO ₂ ; 2. different concentration gradients / eq ; 3. molecules are different sizes / eq ;	2. ACCEPT higher concentration gradient for O ₂ . ACCEPT gradients are 7 for oxygen and 2 for carbon dioxide	(2)

Question Number	Answer	Additional Guidance	Mark
7(c)	<p>(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> 1. idea that large surface area provided by alveoli ; 2. idea that large surface area provided by capillary network ; 3. idea that concentration gradient maintained by { ventilation of / air flow in / eq } the lungs ; 4. idea that concentration gradient maintained by { circulation / mass flow / eq } of blood ; 5. idea that diffusion pathway is small because alveoli have a thin wall ; 6. idea that diffusion pathway is small because capillaries { have a thin wall / are in contact with alveoli / are only one cell thick / eq } ; 7. idea that air is warmed because lungs are in core of body ; 8. warmer air enables faster { movement / diffusion / eq } of gases / eq ; 9. reference to { respiratory pigment / haemoglobin / red blood cells / eq } to carry oxygen ; 	<p>QWC emphasis is on clarity of expression</p> <p>1&2. IGNORE large surface area to volume ratio unless in context of whole body</p> <p>5.& 6. NOT cell wall</p>	<p>(5)</p>

Question Number	Answer	Additional Guidance	Mark
8(a)(i)	1. life expectancy is likely to be lower than {Aa / heterozygote} ; 2. because of higher chance of (developing) malaria / eq ; OR 3. life expectancy may be {higher / same } than {aa / homozygous recessive} ; 4. because of {less / similar} severity of anaemia ;		(2)

Question Number	Answer	Additional Guidance	Mark
8(a)(ii)	1. idea they (heterozygotes) are less likely to have { malaria / anaemia } ; 2. idea that { <i>Plasmodium</i> / parasite / eq } unable to reproduce (and cause wider infection) OR lower (functional) red blood cell count / blocking of blood vessels causes {pain / cell death / eq} ;	2 ACCEPT parasite will die	(2)

Question Number	Answer	Additional Guidance	Mark
8(b)	<p>(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> 1. reference to change in primary structure ; 2. reference to different R group ; 3. leading to different named bond e.g. ionic, hydrogen, disulfide ; 4. different { folding / secondary / tertiary / 3D structure / globular } ; 5. suggested change in properties of the haemoglobin e.g. change in solubility, flexibility, affinity for oxygen / eq ; 	<p>QWC emphasis is on logical sequence Maximum of 3 from Mps 1 to 4</p> <ol style="list-style-type: none"> 1. IGNORE sequence of amino acids 3. ACCEPT type or position of bonds IGNORE peptide 5. ACCEPT {less/no} oxygen will bind to haemoglobin 	(4)

