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# **Mark Scheme (Results)**

Summer 2017

Pearson Edexcel International Advanced Level  
In Biology (WBI01) Paper 01  
Lifestyle, Transport, Genes and Health

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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	Mark
<b>1(a)(i)</b>	<p><b>1(a)(i). The only correct answer is C</b></p> <p><i>A is not correct because adenine pairs with thymine</i></p> <p><i>B is not correct because adenine pairs with thymine</i></p> <p><i>D is not correct because uracil is not used in DNA</i></p>	<b>(1)</b>

Question Number	Answer	Mark
<b>1(a)(ii)</b>	<p><b>1(a)(ii). The only correct answer is C</b></p> <p><i>A is not correct because N labels a hydrogen bond which is not a covalent bond</i></p> <p><i>B is not correct, glycosidic bonds are formed between sugars and are not present in DNA</i></p> <p><i>D is not correct because N labels a hydrogen bond which is not the phosphodiester bond that joins nucleotides to form chains of polynucleotide</i></p>	<b>(1)</b>

Question Number	Answer	Mark
<b>1(a)(iii)</b>	<p><b>1(a)(iii). The only correct answer is C</b></p> <p><i>A is not correct because box P contains a base</i></p> <p><i>B is not correct because box Q contains a nucleoside (deoxyribose and base)</i></p> <p><i>D is not correct because box S contains a pair of complementary bases</i></p>	<b>(1)</b>

Question Number	Answer	Additional guidance	Mark
<b>1(b)</b>	deoxyribose ;	<b>IGNORE pentose/sugar</b>	<b>(1)</b>

Question Number	Answer	Additional guidance	Mark
<b>1(c)(i)</b>	1. both strands of original DNA (molecule) are copied/replicated/act as templates ;  2. idea that {daughter / new / eq} DNA molecules contain one original strand and one new strand ;	<b>ACCEPT MP1 and 2 from a correctly labelled diagram</b>	<b>(2)</b>

Question Number	Answer	Additional guidance	Mark
<b>1(c)(ii)</b>	Meselson and Stahl ;	<b>ACCEPT phonetic spellings</b>	<b>(1)</b>

**Total for Question 1 = 7 MARKS**

Question Number	Answer	Additional guidance	Mark
<b>2(a)</b>	<p>1. allele is an (alternative) form/version of a gene ;</p> <p>2. only expressed in individuals homozygous for the allele/eq ;</p>	<p>MP1 do not accept type of gene</p> <p>MP2 ACCEPT not expressed if dominant allele present/if heterozygous</p>	<b>(2)</b>

Question Number	Answer	Additional guidance	Mark
<b>2(b)</b>	<p>1. parents and offspring for each generation identified ;</p> <p>2. phenotype(s) identified ;</p> <p>3. for {HC /recessive condition} two normal/unaffected parents may have {one or more / some / eq} offspring that are affected ;</p>	<p>IGNORE Punnett squares/genetic crosses</p> <p>MP1 ALLOW family history/ancestry</p> <p>MP2 ALLOW identification of individuals with/without condition</p> <p>MP2 and 3-IGNORE ref to carriers as this refers to genotype</p>	<b>(3)</b>

Question Number	Answer	Additional guidance	Mark
2(c)	1. amniocentesis ; 2. amniotic fluid collected ; 3. between 14 and 20 weeks of pregnancy ; 4. cells are cultured (for 2-3 weeks) ; <b>or</b> 5. chorionic villus sampling/CVS ; 6. sample taken from placenta ; 7. between 8 and 12 weeks of pregnancy ; 8. DNA analysed (for recessive allele) ;	If method does not match description do not award first mark.  MP3 and 7 ACCEPT given time(s) within the stated range  MP6 IGNORE from chorionic villi	(4)

**Total for Question 2 = 9 MARKS**

Question Number	Answer	Mark
<b>3(a)(i)</b>	<p><b>3(a)(i). The only correct answer is B</b></p> <p><i>A is not correct because the correct sequence of events is atrial systole → ventricular systole → atrial diastole → ventricular diastole</i></p> <p><i>C is not correct because the correct sequence of events is atrial systole → ventricular systole → atrial diastole → ventricular diastole</i></p> <p><i>D is not correct because the correct sequence of events is atrial systole → ventricular systole → atrial diastole → ventricular diastole</i></p>	<b>(1)</b>

Question Number	Answer	Mark
<b>3(a)(ii)</b>	<p><b>3(a)(ii). The only correct answer is D</b></p> <p><i>A is not correct because at 0.5 seconds the ventricle is filling so atrioventricular valves are open and the semilunar valves closed</i></p> <p><i>B is not correct because at 0.5 seconds the ventricle is filling so atrioventricular valves are open and the semilunar valves closed</i></p> <p><i>D is not correct because at 0.5 seconds the ventricle is filling so atrioventricular valves are open and the semilunar valves closed</i></p>	<b>(1)</b>

Question Number	Answer	Mark
<b>3(a)(iii)</b>	<p><b>3(a)(iii). The only correct answer is D</b></p> <p><i>A is not correct because at 0.22 seconds the atria is in diastole</i></p> <p><i>B is not correct because at 0.52 seconds the atria is in diastole</i></p> <p><i>C is not correct because at 0.72 seconds the atria is in diastole</i></p>	<b>(1)</b>

Question Number	Answer	Additional guidance	Mark
<b>3(a)(iv)</b>	<p>1. 0.8 (seconds) ;</p> <p>2. 75 (beats per minute) ;</p>	<p>MP1 ACCEPT: 0.79 (seconds)</p> <p>MP 2: ACCEPT 76</p> <p>Correct answer with no working shown gains both marks</p>	<b>(2)</b>

Question Number	Answer	Additional guidance	Mark
<b>3(b)(i)</b>	<p>1. (training) reduces/lowers the heart rate ;</p> <p>2. In a trained person heart rate does not increase as much during exercise ;</p> <p>3. idea that during exercise heart rate plateaus/levels off (in a trained person) ;</p>	<p>ACCEPT converses for MPs 1, 2 and 3</p> <p>MP2 IGNORE: rate of increase</p>	<b>(3)</b>

Question Number	Answer	Additional guidance	Mark
<b>3(b)(ii)</b>	1. low blood pressure ; 2. low heart rate ; 3. {heart/cardiac muscle} is stronger ; 4. not overweight ; 5. changes LDL/HDL ratio/lowers cholesterol ;	MP4 ALLOW lower BMI/less body fat	<b>(2)</b>

**Total for Question 3 = 10 MARKS**

Question Number	Answer	Additional guidance	Mark
<b>4(a)(i)</b>	<ol style="list-style-type: none"> <li>1. glucose and fructose ;</li> <li>2. joined by condensation reaction / water produced ;</li> <li>3. forming a glycosidic {bond/link} ;</li> </ol>	<p>ACCEPT a correctly annotated diagram. MP1 IGNORE: references to alpha and beta</p> <p>MP3 IGNORE: numbered bonds</p>	<b>(3)</b>

Question Number	Answer	Additional guidance	Mark
<b>4(a)(ii)</b>	<ol style="list-style-type: none"> <li>1. (many) glucose molecules joined by glycosidic {bonds /links} ;</li> <li>2. amylose and amylopectin ;</li> <li>3. amylose {is linear / is unbranched / is helical / has 1,4 bonds} ;</li> <li>4. amylopectin {is branched / has 1,4 and 1,6 bonds} ;</li> </ol>	<p>MP4 ACCEPT: has many terminal ends</p>	<b>(3)</b>

Question Number	Answer	Additional guidance	Mark
<b>4(b)(i)</b>	<ol style="list-style-type: none"> <li>1. as the percentage of added sugar increases the (LDL:HDL) ratio increases ;</li> <li>2. (resulting in) high level of LDLs in the blood ;</li> <li>3. high {ratio/ level of LDLs} is a risk factor for {CVD/atherosclerosis} ;</li> </ol>	<p>MP1 ACCEPT: there is a positive correlation between added sugar and ratio</p>	<b>(3)</b>

Question Number	Answer	Additional guidance	Mark
<b>4(b)(ii)</b>	1. CVD takes a long time to develop ; 2. Added sugar has no { obvious / immediate / eq } adverse effect; 3. not knowing about the risks of added sugar / eq ;		<b>(2)</b>

Question Number	Answer	Additional guidance	Mark
<b>4(b)(iii)</b>	1. statins lower (LDL) cholesterol ; 2. (statins) reduce the ratio of LDL to HDL ; 3. effects of sugar intake might be counteracted by effect of statins ; 4. if they were included the study would not be not valid ;	MP 4 IGNORE reliability /accuracy	<b>(2)</b>

**Total for Question 4 = 13 MARKS**

Question Number	Answer	Additional guidance	Mark
<b>5(a)(i)</b>	1. measurement of 13 (mm) / ÷ by 12 ; 2. 1.1 (mm) ;	ALLOW: 1.3 (cm) ALLOW: 1.08 (mm) IGNORE: answers to more than 2 decimal places Correct answer with no working gains full marks	<b>(2)</b>

Question Number	Answer	Additional guidance	Mark
<b>5(a)(ii)</b>	1. (vein) walls {are thinner / have less collagen} because blood pressure is lower ; 2. (veins) have {less / no} elastic fibres as they do not need to {stretch/ recoil}; 3. (veins) have valves to prevent the back flow of blood ; 4. (veins) have a large lumen to reduce resistance to blood flow/eq ;	ACCEPT converse explanations for arteries only with a clear comparison MP2 ACCEPT: arteries have elastic fibres which smooth out blood flow	<b>(2)</b>

Question Number	Answer	Additional guidance	Mark
<b>5(b)(i)</b>	<ol style="list-style-type: none"> <li>1. Idea of slow blood flow in (large) veins ;</li> <li>2. initiates clotting cascade ;</li> <li>3. prothrombin converted to thrombin ;</li> <li>4. leading to conversion of fibrinogen to fibrin ;</li> <li>5. fibrin is insoluble ;</li> <li>6. trapping {red blood cells / platelets} (to form a clot) ;</li> </ol>	MP2 ACCEPT: release of thromboplastin, thrombokinase or platelet activation	<b>(4)</b>

Question Number	Answer	Additional guidance	Mark
<b>5(b)(ii)</b>	<ol style="list-style-type: none"> <li>1. clots formed in veins move to the lungs / eq ;</li> <li>2. clots block blood vessels ;</li> <li>3. reduced blood flow (through lungs) ;</li> <li>4. reduced {gas exchange /uptake of oxygen} in the lungs ;</li> <li>5. idea that oxygen is still being removed from the blood elsewhere in the body ;</li> </ol>	MP2 ACCEPT named blood vessels, but IGNORE lumen.	<b>(3)</b>

Question Number	Answer	Additional guidance	Mark
<b>5(b)(iii)</b>	<ol style="list-style-type: none"> <li data-bbox="360 323 1305 395">1. changes in {breathing rate / oxygen concentration} could be due to another cause ;</li> <li data-bbox="360 427 1305 499">2. fibrin fragments can be found in both VTE and non-VTE patients ;</li> <li data-bbox="360 531 1305 603">3. idea that using all three criteria increases diagnostic accuracy ;</li> </ol>		<b>(2)</b>

**Total for Question 5 = 13 MARKS**

Question Number	Answer	Additional guidance	Mark
<b>6(a)(i)</b>	phospholipid ;	DO NOT ACCEPT: phospholipid bilayer/layer	<b>(1)</b>

Question Number	Answer	Additional guidance	Mark
<b>6(a)(ii)</b>	<ol style="list-style-type: none"> <li>1. (phospholipids) form a bilayer as they have a polar head and non-polar tails ;</li> <li>2. proteins are located between the phospholipids ;</li> <li>3. (because of) interactions between R groups of proteins and phospholipids ;</li> <li>4. phospholipids are free to move which makes the membrane fluid;</li> </ol>	<p>MP1 ACCEPT: hydrophilic and hydrophobic.</p> <p>MP2 ALLOW: embedded in bilayer</p>	<b>(3)</b>

Question Number	Answer	Additional guidance	Mark
<b>6(b)(i)</b>	<ol style="list-style-type: none"> <li>1. as the pH increases from pH2 to pH4 the permeability decreases ;</li> <li>2. between pH4 and pH6 the permeability is {low / constant} ;</li> <li>3. as the pH increases from pH6 (to pH12) the permeability increases ;</li> </ol>	<p><b>IGNORE: any reference to absorbance</b></p> <p><b>MP1 ACCEPT:</b> pH 2 has the highest permeability ;</p>	<b>(2)</b>

Question Number	Answer	Additional guidance	Mark
<b>6(b)(ii)</b>	1. idea that when the pH is {high / low} the proteins are {denatured /damaged} ; 2. therefore holes are created in the membrane ;	MP1 ACCEPT extremes of pH  ALLOW damage/disruption to membrane	<b>(2)</b>

**Total for Question 6 = 8 MARKS**

Question Number	Answer	Mark
<b>7(a)</b>	<p><b>7(a). The only correct answer is C</b></p> <p><i>A is not correct because the bond between amino acids is a peptide bond the ester bond joins fatty acids and glycerol molecules</i></p> <p><i>B is not correct because the bond between amino acids is a peptide bond the glycosidic bond joins sugar molecules in polysaccharides</i></p> <p><i>D is not correct because the bond between amino acids is a peptide bond the phosphodiester bond joins fatty nucleic acids together in a polynucleotide</i></p>	<b>(1)</b>

Question Number	Answer	Additional guidance	Mark
<b>*7(b)(i)</b>	<p><b>(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</b></p> <ol style="list-style-type: none"> <li>1. (transcription of the prolidase gene) occurs in the nucleus ;</li> <li>2. DNA unwinds ;</li> <li>3. (RNA) nucleotides bind to DNA ;</li> <li>4. to the {template / antisense} strand of DNA ;</li> <li>5. by complementary base pairing ;</li> <li>6. RNA polymerase joins the (RNA) mononucleotides together ;</li> <li>7. by the formation of phosphodiester bonds ;</li> </ol>	<p><b>QWC emphasis is logical sequence [penalise once only]</b></p> <p>MP2 ACCEPT DNA strands separate or unzip</p> <p>MP3 ACCEPT forming H bonds for binding, must give some idea of attachment, not just pairing</p> <p>MP5 ACCEPT examples of complementary base pairing</p> <p>QWC marks: identify all marks scored, and if a QWC deduction applies subtract one mark</p>	<b>(5)</b>

Question Number	Answer	Additional guidance	Mark
<b>7(b)(ii)</b>	1. idea that a mutation is a change in {base / nucleotide} sequence (of the prolidase gene) ; 2. change in the primary structure (of prolidase) ; 3. change in the bonds (that are involved in the folding) ; 4. change in the shape of {prolidase / enzyme / active site} ; 5. idea that no enzyme-substrate complexes formed ;	<b>MP2 ACCEPT:</b> change in sequence of amino acids or R groups  <b>MP3 ACCEPT:</b> any correct type of bond  <b>MP4 ACCEPT:</b> 3D or tertiary structure	<b>(4)</b>

**Total for Question 7 = 10 MARKS**

Question Number	Answer	Additional guidance	Mark
<b>8(a)(i)</b>	1. 135.0 2. 60 (%) <b>Or</b> 3. 135.0 4. 150 (%)	This can be calculated in two different ways.  Either correct answer with no working gains 2 marks.	<b>(2)</b>

Question Number	Answer	Additional guidance	Mark
<b>8(a)(ii)</b>	1. it is long and thin ; 2. it has a large surface area to volume ratio ; 3. oxygen enters the body by diffusion ; 4. idea of outer surface of <i>T. tubifex</i> is permeable to gases ;		<b>(3)</b>

Question Number	Answer	Additional guidance	Mark
<b>*8(b)</b>	<p><b>(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</b></p> <ol style="list-style-type: none"> <li>1. walls of <i>alveoli</i> are thin ;</li> <li>2. walls of <i>capillaries</i> are thin ;</li> <li>3. idea of short <i>diffusion</i> distance ;</li> <li>4. idea that <i>alveoli</i> are covered with <i>capillaries</i> ;</li> <li>5. idea that the large number of {<i>alveoli</i> / <i>capillaries</i>} provide a large <i>surface</i> area ;</li> <li>6. idea that <i>concentration</i> gradient maintained by {<i>ventilation</i> / <i>breathing</i> / <i>eq</i> } ;</li> <li>7. idea that <i>concentration</i> gradient maintained by blood flow ;</li> </ol>	<p><b>QWC emphasis is spelling of technical terms [penalise once only]</b></p> <p><b>MP1 and 2 ACCEPT</b> that walls are made of one layer of flattened cell</p> <p><b>MP5 do not ACCEPT:</b> large surface to volume area</p>	<p><b>( 5 )</b></p>

**Total for Question 8 = 10 MARKS**

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**TOTAL FOR PAPER = 80 MARKS**

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