



**General Certificate of Education  
June 2010**

**Biology**

**BIOL2**

**The variety of living organisms**

**Final**

***Mark Scheme***

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Question	Part	Sub Part	Marking Guidance	Mark	Comments
1	(a)		Helical /spiral/coiled; Compact / description e.g. 'tightly packed';  Insoluble; Prevents osmosis/uptake of water / does not affect water potential / (starch) does not leave cell;  Large molecule / long chain; Does not leave cell;	1 1  1 1  1 1	2 max Feature = one mark Explanation = one mark  These must be related for both marks but can be in reverse order.  Allow idea of compact/helical/spiral/coiled due to bonding for two marks.
1	(b)	(i)	$\beta$ /beta Glucose;	1	<b>Q</b> Reject alpha glucose
1	(b)	(ii)	Glycosidic;	1	
1	(c)		Long/straight/unbranched chains (of glucose);  (Joined by) hydrogen bonds;  Form (micro)fibrils/(macro)fibrils;  Provide rigidity/strength/support;	1  1  1  1	3 max  <b>Q</b> Ignore reference to alpha glucose  Allow suitable descriptions for last point e.g. 'prevents bursting';

Question	Part	Sub Part	Marking Guidance	Mark	Comments
2	(a)		Endothelium/epithelium;	1	Allow endothelial/epithelial  Reject - epidermis/endodermis
2	(b)		Measurement divided by 8;  Allow answer in range of 3-3.3 for two marks;	1  1	Correct answer gains 2 marks.
2	(c)	(i)	Stretches/'expands' under high pressure/when ventricle contracts / systole;  Recoils/'springs back' under low pressure/when ventricle relaxes / diastole;  Smooths blood flow / maintains blood pressure / reduces pressure surges;	1  1  1	2 max  <b>Q</b> References to aorta contracting or relaxing negates marks for stretch and recoil.  Stretch and recoil without reference to blood pressure etc. = one mark.  Stretch and recoil to smooth blood flow etc. = two marks  Ignore references to aorta withstanding blood pressure or not being damaged.
2	(c)	(ii)	(Muscle) contracts;  (Arteriole) constricts / narrows/alters size of lumen / reduces/regulates blood flow (to capillaries);	1  1	'It' in answer = muscle  Allow converse (muscle) relaxes and (arteriole) dilates etc / increase blood flow etc.  Ignore references to pressure

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2	(d)	(i)	Large/increase in (total) cross sectional area / friction / resistance;	1	
2	(d)	(ii)	(More) <u>time</u> for exchange of substances;	1	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
3	(a)		Introns;	1	
3	(b)		Ile Gly Val Ser;	1	
3	(c)	(i)	Has no effect / same amino acid (sequence) / same primary structure;  Glycine named as same amino acid;	1  1	<b>Q</b> Reject same amino acid formed or produced.  It still codes for glycine = two marks.
3	(c)	(ii)	Leu replaces Val / change in amino acid (sequence)/primary structure;  Change in hydrogen/ionic bonds;  Alters tertiary structure/active site;  Substrate cannot bind / no longer complementary / no enzyme-substrate complexes form;	1  1  1  1	3 max  <b>Q</b> Different amino acid formed or produced negates first marking point.  Active site changed must be clear for third marking point but does not need reference to shape.
3	(d)	(i)	Interphase/ S/synthesis (phase);	1	
3	(d)	(ii)	DNA/gene replication/synthesis occurs / longest stage;	1	Allow 'genetic information' = DNA.  Allow 'copied' or 'formed' = replication/synthesis

Question	Part	Sub Part	Marking Guidance	Mark	Comments
4	(a)		Light (intensity) / temperature / air movement / humidity;	1	
4	(b)		Prevent air entering / continuous water column;	1	Allow answer in context of shoot, xylem or potometer.
4	(c)		Distance and time;	1	Reject 'amount bubble moves'
			Radius/diameter/area (of capillary tube);	1	
4	(d)		(used to provide) turgidity/support/description of;	1	2 max
			(used in) photosynthesis / (produced in) respiration;	1	
			Apparatus not sealed/'leaks';	1	
4	(e)	(i)	Returns bubble (to start);	1	
4	(e)	(ii)	Increases reliability (of results) / anomalous result can be identified;	1	<b>Q</b> Ignore references to validity/precision/accuracy etc.

Question	Part	Sub Part	Marking Guidance	Mark	Comments
5	(a)		(Different) form/type/version of a gene / different base sequence of a gene;	1	
5	(b)		Two/sister <u>chromatids</u> ; Due to <u>DNA</u> replication; Joined by a <u>centromere</u> ;	1 1 1	2 max
5	(c)	(i)	Crossing over; Exchange (of alleles) between chromatids/chromosomes;	1 1	Negate first marking point for answers which refer to independent segregation.  Chiasma/chiasmata = first marking point
5	(c)	(ii)	Is infrequent/rare;	1	References to it being 'random', 'occurs by chance' or 'doesn't always occur' should not be credited without a clear idea that it is rare or infrequent.
5	(d)	(i)	Three chromosomes shown; One from each homologous pair;	1 1	For first mark point allow drawings showing three chromosomes as single or double structures.
5	(d)	(ii)	8;	1	



Question	Part	Sub Part	Marking Guidance	Mark	Comments
6	(a)		Most closely (related) to chimpanzee / most recent common ancestor;  Least (related) to dogfish / least recent common ancestor;	1  1	Allow 'chicken is second' to chimpanzee as equivalent to second mark point.  Allow answers which compare similarity in DNA/genetic material.  Marks should not be awarded for answers which only compare amino acid sequences without any indication of relationships.  Allow 'monkey' for chimpanzee and 'fish' for dogfish
6	(b)		Is present in all eukaryotes;	1	
6	(c)		Reference to base triplet/triplet code / more bases than amino acids / longer base sequence than amino acid sequence;  Introns/non-coding DNA;  Same amino acid may be coded for / DNA code is degenerate;	1  1  1	2 max  Different (base) triplets code for same amino acid = 2 marks  Reject different amino acids are formed/produced.  Ignore reference to codon.

Question	Part	Sub Part	Marking Guidance	Mark	Comments
7	(a)		<p>Loading/uptake/association of oxygen at high <math>p.O_2</math>;</p> <p>In lungs (haemoglobin) is (almost) fully saturated / in lungs haemoglobin has a high affinity for oxygen;</p> <p>Unloads/releases/dissociates oxygen at low <math>p.O_2</math>;</p> <p>Unloading linked to higher carbon dioxide concentration;</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>3 max</p> <p>Allow converse for second marking point in tissues i.e. haemoglobin has low affinity / releases most of its oxygen.</p> <p>Mark for haemoglobin having high affinity for oxygen must be 'in lungs'.</p>
7	(b)	(i)	Larger the mammal the more to the left/steeper/'higher' is the curve / the higher the affinity for oxygen;	1	<p>Allow converse.</p> <p>Ignore references to Bohr shift</p>
7	(b)	(ii)	<p>Smaller mammal has greater surface area to volume ratio;</p> <p>Smaller mammal/larger SA:Vol ratio more heat lost (per unit body mass);</p> <p>Smaller mammal/larger SA:Vol ratio has greater rate of respiration/metabolism;</p> <p>Oxygen required for respiration;</p> <p>(Haemoglobin) releases more oxygen / oxygen released more readily / haemoglobin has lower affinity;</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>4 max</p> <p>Allow converse explanation for larger mammals or lower surface area to volume ratio.</p> <p>Allow suitable named mammal as alternative to smaller or larger mammal.</p>

Question	Part	Sub Part	Marking Guidance	Mark	Comments
8	(a)		Isolation / quarantine / 'kept separate';	1	2 max  Do not allow improve 'hygiene' or 'cleanliness' without named example such as 'washing hands' use of gloves etc.
			Screening/testing (of patients/doctors etc);	1	
			Sterilisation of wards/equipment / method to improve hygiene;	1	
8	(b)		May not all be absorbed;	1	2 max  Reference to becoming 'immune' negates last marking point.
			May be broken down /metabolised/excreted quickly;	1	
			To kill the microorganisms/bacteria;	1	
			Reference to antibiotic resistance;	1	
8	(c)	(i)	P;	1	
8	(c)	(ii)	S;	1	
8	(d)	(i)	Prevents bias;	1	
			Vested interest (of scientists);	1	
			Prevents 'placebo'/positive/negative/psychological effects/'demand characteristics' (in volunteers);	1	

8	(d)	(ii)	Age;	1	2 max  Ignore references to same or different
			Ethnicity;	1	
			Lifestyle;	1	
			Body mass;	1	
			Health;	1	
			Sex of person;	1	
8	(e)	(i)	Gradual/slight increase followed by rapid/greater increase;	1	Allow more detailed descriptions which describe similar trend of gradual increase followed by rapid increase.
8	(e)	(ii)	1. No/little resistance shown to drug X;	1	max 4  Reference to horizontal gene transmission = neutral  Reject mark for mutation if context suggests presence of antibiotic causes bacteria to mutate.  Resistance is passed on by vertical gene transmission = two marks i.e. points 3 and 5.
			2. Mutation present (for antibiotic resistance);	1	
			3. Gene/allele for (antibiotic) resistance;	1	
			4. Bacteria with (antibiotic) resistance survive;	1	
			5. Vertical gene transmission;	1	
			6. Frequency of gene/allele (for resistance) increases;	1	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
9	(a)	(i)	Faster/greater/more effective response in children;	1	Do not accept children have more haemoglobin
9	(a)	(ii)	Use line of best fit; Extrapolate/extend line (and read from graph);	1 1	Allow calculation using rate of increase per day = one mark. However for both marks this must be linked to line of best fit.
9	(a)	(iii)	More than one polypeptide chain;	1	Allow many polypeptide chains.  'Haemoglobin has four polypeptide chains' must be in correct context to gain mark.
9	(b)	(i)	Has same <u>water potential</u> ;  No (net) water movement / osmosis;  Cells will not swell/burst/change size;	1 1 1	Allow converse for effect of using distilled water or a concentrated solution.  No osmotic lysis = two marks
9	(b)	(ii)	Pernicious anaemia (cells) greater range/spread/variation of diameters/widths;  Some pernicious anaemia (cells) wider than 9 ( $\mu\text{m}$ ) / some less than 5.5 ( $\mu\text{m}$ ) / / without pernicious anaemia none more than 9 ( $\mu\text{m}$ ) / none less than 5.5 ( $\mu\text{m}$ );  Pernicious anaemia (cells) peak/most frequent at 8.5 ( $\mu\text{m}$ ) / peak/most frequent at higher diameter / / without pernicious anaemia peak/most frequent at 7 ( $\mu\text{m}$ ) /peaks at lower diameter;	1  1  1	2 max  There are several alternatives for marking points 2 and 3

9	(c)		<ol style="list-style-type: none"> <li>1. Mark for general principle of - reduced variety/number of different alleles/DNA / reduced gene pool (in new population);</li> <li>2. Founder effect;</li> <li>3. A few individuals from a population become isolated/form colonies:</li> <li>4. (Genetic) bottlenecks;</li> <li>5. (Significant) fall in size of population</li> <li>6. Selective breeding / artificial selection;</li> <li>7. Using organisms with particular alleles/traits/phenotypes/characteristics;</li> </ol>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>6 max</p> <p>The first marking point should not be awarded for 'fewer alleles' unless reduced variety or fewer different alleles is mentioned.</p>
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