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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)	β/beta Glucose;	1	**Q** 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 **Q** 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 ***Q*** 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

2	(d)	(i)	Large/increase in (total) cross sectional area / friction / resistance;	1	
2	(d)	(ii)	(More) time 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	***Q*** 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 ***Q*** 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; Radius/diameter/area (of capillary tube);	1 1	Reject 'amount bubble moves'
4	(d)		(used to provide) turgidity/support/description of; (used in) photosynthesis / (produced in) respiration; Apparatus not sealed/'leaks';	1 1 1	2 max
4	(e)	(i)	Returns bubble (to start);	1	
4	(e)	(ii)	Increases reliability (of results) / anomalous result can be identified;	1	***Q*** 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 chromatids; Due to DNA replication; Joined by a centromere;	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)		Loading/uptake/association of oxygen at high p.O_2;	1	3 max
			In lungs (haemoglobin) is (almost) fully saturated / in lungs haemoglobin has a high affinity for oxygen;	1	Allow converse for second marking point in tissues i.e. haemoglobin has low affinity / releases most of its oxygen.
			Unloads/releases/dissociates oxygen at low p.O_2;	1	
			Unloading linked to higher carbon dioxide concentration;	1	Mark for haemoglobin having high affinity for oxygen must be 'in lungs'.
7	(b)	(i)	Larger the mammal the more to the left/steeper/'higher' is the curve / the higher the affinity for oxygen;	1	Allow converse. Ignore references to Bohr shift
7	(b)	(ii)	Smaller mammal has greater surface area to volume ratio;	1	4 max
			Smaller mammal/larger SA:Vol ratio more heat lost (per unit body mass);	1	Allow converse explanation for larger mammals or lower surface area to volume ratio.
			Smaller mammal/larger SA:Vol ratio has greater rate of respiration/metabolism;	1	Allow suitable named mammal as alternative to smaller or larger mammal.
			Oxygen required for respiration;	1	
			(Haemoglobin) releases more oxygen / oxygen released more readily / haemoglobin has lower affinity;	1	

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

8	(d)	(ii)	Age; Ethnicity; Lifestyle; Body mass; Health; Sex of person;	1 1 1 1 1 1	2 max Ignore references to same or different
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; 2. Mutation present (for antibiotic resistance); 3. Gene/allele for (antibiotic) resistance; 4. Bacteria with (antibiotic) resistance survive; 5. Vertical gene transmission; 6. Frequency of gene/allele (for resistance) increases;	1 1 1 1 1 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.

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</u> <u>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 (μm) / some less than 5.5 (μm) / / without pernicious anaemia none more than 9 (μm) / none less than 5.5 (μm); Pernicious anaemia (cells) peak/most frequent at 8.5 (μm) / peak/most frequent at higher diameter / / without pernicious anaemia peak/most frequent at 7 (μm) /peaks at lower diameter;	1 1 1	2 max There are several alternatives for marking points 2 and 3

9	(c)		1. Mark for general principle of - reduced variety/number of different alleles/DNA / reduced gene pool (in new population);	1	6 max The first marking point should not be awarded for 'fewer alleles' unless reduced variety or fewer different alleles is mentioned.
			2. Founder effect;	1	
			3. A few individuals from a population become isolated/form colonies:	1	
			4. (Genetic) bottlenecks;	1	
			5. (Significant) fall in size of population	1	
			6. Selective breeding / artificial selection;	1	
			7. Using organisms with particular alleles/traits/phenotypes/characteristics;	1	