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AQA

General Certificate of Education
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Biology BIOL2

The variety of living organisms

Final

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

Question	Part	Sub Part	Marking Guidance	Mark	Comments
1	(a)		Helical /spiral/coiled;	1	2 max
			Compact / description e.g. 'tightly packed';	1	Feature = one mark
					Explanation = one mark
			Insoluble;		
			Prevents osmosis/uptake of water / does not affect water	1	These must be related for both
			potential / (starch) does not leave cell;	1	marks but can be in reverse
					order.
			Large molecule / long chain;	1	
			Does not leave cell;	1	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);	1	3 max
			(Joined by) hydrogen bonds;	1	**Q** Ignore reference to alpha glucose
			Form (micro)fibrils/(macro)fibrils;	1	
			Provide rigidity/strength/support;	1	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;	1	Correct answer gains 2 marks.
			Allow answer in range of 3-3.3 for two marks;	1	
2	(c)	(i)	Stretches/'expands' under high pressure/when ventricle contracts / systole;	1	2 max
			Recoils/'springs back' under low pressure/when ventricle relaxes / diastole;	1	*Q* References to aorta contracting or relaxing negates marks for stretch and recoil.
			Smooths blood flow / maintains blood pressure / reduces pressure surges;	1	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;	1	'It' in answer = muscle
			(Arteriole) constricts / narrows/alters size of lumen / reduces/regulates blood flow (to capillaries);	1	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) <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;	1	*Q* Reject same amino acid formed or produced.
			Glycine named as same amino acid;	1	It still codes for glycine = two marks.
3	(c)	(ii)	Leu replaces Val / change in amino acid (sequence)/primary structure;	1	3 max
					Q Different amino acid formed or produced negates first marking point.
			Change in hydrogen/ionic bonds;	1	
			Alters tertiary structure/active site;	1	
			Substrate cannot bind / no longer complementary / no enzyme-substrate complexes form;	1	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	*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 <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;	1	Allow 'chicken is second' to chimpanzee as equivalent to second mark point.
			Least (related) to dogfish / least recent common ancestor;	1	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;	1	2 max
			Introns/non-coding DNA;	1	Different (base) triplets code for same amino acid = 2 marks
			Same amino acid may be coded for / DNA code is degenerate;	1	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';	1	2 max
			Screening/testing (of patients/doctors etc);	1	Do not allow improve 'hygiene' or 'cleanliness' without named example such as 'washing hands' use of gloves etc.
			Sterilisation of wards/equipment / method to improve hygiene;	1	
8	(b)		May not all be absorbed;	1	2 max
			May be broken down /metabolised/excreted quickly;	1	Reference to becoming 'immune' negates last marking point.
			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
			Ethnicity;	1	Ignore references to same or different
			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
			2. Mutation present (for antibiotic resistance);	1	Reference to horizontal gene transmission = neutral
			3. Gene/allele for (antibiotic) resistance;	1	Reject mark for mutation if context suggests presence of antibiotic causes bacteria to mutate.
			4. Bacteria with (antibiotic) resistance survive;	1	
			5. Vertical gene transmission;	1	
			6. Frequency of gene/allele (for resistance) increases;	1	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 water potential; 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
			2. Founder effect;	1	The first marking point should not be awarded for 'fewer alleles' unless reduced variety or fewer different alleles is mentioned.
			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	