

2806/01 Unifying Concepts in Biology

June 2003

Mark Scheme

ADVICE TO EXAMINERS ON THE ANNOTATION OF SCRIPTS

1. Please ensure that you use the **final** version of the Mark Scheme.
You are advised to destroy all draft versions.
2. Please mark all post-standardisation scripts in red ink. A tick (✓) should be used for each answer judged worthy of a mark. Ticks should be placed as close as possible to the point in the answer where the mark has been awarded. The number of ticks should be the same as the number of marks awarded. If two (or more) responses are required for one mark, use only one tick. Half marks ($\frac{1}{2}$) should never be used.
3. The following annotations may be used when marking. No comments should be written on scripts unless they relate directly to the mark scheme. Remember that scripts may be returned to Centres.

x = incorrect response (errors may also be underlined)
^ = omission mark
bod = benefit of the doubt (where professional judgement has been used)
ecf = error carried forward (in consequential marking)
con = contradiction (in cases where candidates contradict themselves in the same response)
sf = error in the number of significant figures
4. The marks awarded for each part question should be indicated in the margin provided on the right hand side of the page. The mark total for each question should be ringed at the end of the question, on the right hand side. These totals should be added up to give the final total on the front of the paper.
5. In cases where candidates are required to give a specific number of answers, (e.g. 'give three reasons'), mark the first answer(s) given up to the total number required. Strike through the remainder. In specific cases where this rule cannot be applied, the exact procedure to be used is given in the mark scheme.
6. Correct answers to calculations should gain full credit even if no working is shown, unless otherwise indicated in the mark scheme. (An instruction on the paper to 'Show your working' is to help candidates, who may then gain partial credit even if their final answer is not correct.)
7. Strike through all blank spaces and / or pages in order to give a clear indication that the whole of the script has been considered.
8. An element of professional judgement is required in the marking of any written paper, and candidates may not use the exact words that appear in the mark scheme. If the science is correct and answers the question, then the mark(s) should normally be credited. If you are in doubt about the validity of any answer, contact your Team Leader / Principal Examiner for guidance.

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Abbreviations, annotations and conventions used in the Mark Scheme	/ = alternative and acceptable answers for the same marking point ; = separates marking points NOT = answers which are not worthy of credit R = reject () = words which are not essential to gain credit <u> </u> = (underlining) key words which must be used to gain credit ecf = error carried forward AW = alternative wording A = accept ora = or reverse argument
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Question	Expected Answers	Marks
1 (a)	<p><i>look for these ideas</i></p> <p>glycogen is made from glucose; enzyme (active site) has a specific shape / lock and key idea; fructose and glucose / their polymers, have different shapes / structure; glucose and fructose, contain the same number and type of atoms / are isomers; but have a different arrangement of atoms; ref to aldose and ketose; ref to fructose having two carbon atoms outside the ring rather than one for glucose; compounds of fructose will not, fit / bind, to the active sites of enzymes that work on glucose polymers;</p>	3 max
(b) (i)	<p><i>look for comparative statements</i></p> <p>A peaks higher than B; ora A peaks, earlier / faster / steeper, than B; ora A returns to zero, B does not return to zero; A this idea implied</p>	2 max
(b) (ii)	<p>pressure provides force; for, (ultra) filtration / described;</p>	2
(c)	<p>must not be reabsorbed by the, nephrons / kidney tubules; non toxic / not dangerous / AW ; will not be, metabolised / react / hydrolysed / respired / broken down; A cannot be used ref to enzyme; little osmotic effect;</p>	2 max
[Total: 9]		

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Question	Expected Answers	Marks
2 (a)	<p>transect; line / tape / string, from road to field; positions of species touching line recorded; quadrats placed at selected intervals; abundance / frequency / presence / density / (percentage) cover (of species); soil samples taken along the transect; ref to water content / pH measurements / organic content / any named soil factor; replication / repeat of transects; AVP; e.g. ACFOR etc, height of vegetation, another abiotic factor (not soil) measurement of angle of slope</p> <p><i>if quadrats / point frames are used correctly to survey each zone of the transect but a transect is not mentioned or clearly implied, award 4 max</i></p>	5 max
(b)	<p>have, <u>nitrogen fixing bacteria</u> / <i>Rhizobium</i>; R if wrong bacterium named ref symbiosis / mutualism; in root nodules; not dependent on nitrogen compounds in soil; (decay) releasing, nitrogen compounds / ammonia; A nitrates into soil good source of protein for consumer / AW; making a named nitrogen compound;</p> <p>AVP; tolerates trampling AVP; not competitive so confined to short vegetation damp soil at bottom of slope light intensity, qualified pioneer species role in succession / AW</p>	2 max
(c)	<p>AVP;; e.g. pollution from, vehicles / road ref to interspecific competition ref agricultural activity needs good drainage difference in soil, depth / type cannot tolerate, grazing / mowing cannot tolerate disturbance different nutrient levels ref to slope and light levels</p>	2 max

[Total: 9]

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Question	Expected Answers	Marks
3 (a)	ribosome;	1
(b)	(shape / structure) linked with specificity / complementary idea; active site of enzyme fits substrate; antibody, fits / recognises, antigen / AW; ref variable region; ref to pore / passage, in transport protein; allows, binding / passing through of, molecules / ions / named example; ref to prosthetic group / hydrophobic region or pocket, of named transport protein in blood; allows (easily) reversible, attachment / binding; further detail of any of the above; AVP; e.g. less soluble	5 max
(c) (i)	hydrolysis / described; of peptide bonds; to produce, smaller peptides / amino acids; by, enzymes / proteases / peptidases; ref to lysosomes / lysosomal enzymes;	2 max
(ii)	<i>incorrectly folded proteins may</i> be very tightly folded; insoluble; not fit, protease / enzyme active site; A 'bind' the sites / specific amino acids, in the peptide chains to which, proteases / enzymes, bind may not be exposed; associate in large groups; AVP; folding exposes different, side chains / R groups	2 max
(d)	hydrogen; disulphide; ionic / salt / between acid and basic groups; hydrophobic attraction / Van der Waals force;	1 max
(e)	protein molecules are large; especially if attached to chaperones; move to specific locations / diffusion is non-directional; e.g. to the Golgi / nucleus / cell surface / other valid organelle; would be slow over larger distances; cannot pass through membranes; AVP;	2 max
[Total:		13]

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Question	Expected Answers	Marks
4 (a)	diffusion; facilitated diffusion; active transport / by protein pumps; R 'pumps' unqualified co-transport;	2 max
(b)	<i>first mark for possible mechanism and second mark for explanation or further detail or A a second mechanism</i> interfere with osmotic balance; accumulation of ions lowers water potential; water moves by osmosis towards concentrations of ions; ions may promote the activity of enzymes; act as cofactors; ions may act as inhibitors; slow down enzyme controlled reactions; change protein structure; by binding to R groups; act as metabolites; example; AVP; e.g. alters electrical potential AVP;	2 max
(c)	positively correlated / positive correlation / described;	1 max
(d) (i)	pumping / active transport, requires, energy / ATP; which could be used for named function; R growth respiration required / not enough ATP available; influx of sodium ions / ref to gradient; AVP; e.g. ref to interference with uptake of other ions	2 max
(ii)	maintain turgor; ref osmotic / water potential, gradient; increase cell volume; store water; store (waste) products of metabolism; AVP; e.g. ref symplast pathway	1 max
(iii)	vacuole has, few / no, (metabolic) reactions; cytoplasm / cytosol, has organelles, vacuole has not; no / few, enzymes in vacuole; AVP; e.g. tonoplast isolates ions (from rest of cell) AVP;	2 max
	[Total: 10]	

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Question	Expected Answers	Marks
5 (a)	allow air movement to occur more easily; decrease in resistance to air movement; (tidal) flow of air extends deeper into the lungs / idea; A oxygen more gas exchange;	1 max
(b)	constriction (of bronchi) / contraction of (smooth) muscle; R 'constriction of muscle' <i>and</i> 'contraction of bronchi' increased secretion of mucus; walls swell / oedema of walls;	2
(c)	1 <u>smooth muscle</u> in (walls of) vessels relaxes; ora in context 2 vessels, in / to / from, muscles dilate; ora in context 3 there is less resistance; ora in context 4 so more blood passes through; ora in context 5 ref to two exchanges / transfers between blood and tissues;; 6 7 vessels / arteries / arterioles, in the gut / skin, constrict; 8 allowing blood to be diverted; 9 skin arterioles dilate; 10 ref to heat loss; 11 precapillary sphincters; A described as 'ring of smooth muscle' 12 shunt vessels; 13 adrenaline affects blood vessel diameter; 14 lactate / lactic acid, stimulates vasodilation; 15 contraction of (skeletal) muscle, compresses / squeezes, veins; 16 allowing, faster / more, return (of venous blood) to heart; 17 capillary density increases in muscles as a result of training; 18 AVP; e.g. ref to blood pressure, initial vasoconstriction in skin 19 AVP;	6 max
	QWC – legible text with accurate spelling punctuation and grammar;	1

[Total: 10]

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Question	Expected Answers	Marks
6 (a)	<p><i>assume answer is about L unless stated otherwise</i></p> <p>no leaflets; R fewer leaflets smaller area; allowing less photosynthesis / has less chlorophyll / has fewer chloroplasts; products of photosynthesis provide, energy / materials, for growth; A for pea production</p>	3 max
(b)	<p><i>if more than one genotype given all must be correct to award the mark</i></p> <p>N = AABB / AaBb / AABb / AaBB; T = aaBB / aaBb; L = AAbb / Aabb; D = aabb;</p> <p><i>A different symbols if candidate defines them</i></p>	4
(c)	<p>dwarf plants do not need support; A ref to tall plants e.g. wind damage tendrils allow the plants to support each other; fewer leafy parts / no leaves, to be harvested;</p>	2 max
		[Total: 9]