



Subject: Biology Foundation

Code: 2801

Session: June

Year: 2001

Mark Scheme

MAXIMUM MARK

90

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 or 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 () = words which are not essential to gain credit _____ = (underlining) key words which must be used to gain credit ecf = error carried forward AW = alternative wording ora = or reverse argument
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Question	Expected Answers	Marks
1 (a)	presence of , nucleus / nuclear envelope ; presence of , organelles / named organelle ; ; (<i>two marks</i>) presence of chloroplast ; presence of , permanent vacuole / large vacuole / tonoplast ; ref. size ; presence of cellulose cell wall ; <i>Allow ref. to ribosomes if larger / 80S / 22 nm</i> <i>Allow 1 suitable ref. to DNA</i>	max 2
(b) (i)	photosynthesis / AW ;	1
(ii)	allows / controls , entry / exit ; cell to cell recognition ; receptors ;	max 1
(c)	<i>correct answer = 2 ticks = 2 marks</i> a figure between 6600 and 6700 ; ; <i>Max 1 if magnification has units.</i> <i>If answer incorrect look to award 1 mark for method.</i> a figure between 66 and 67 mm / ₁₀ or between 66000 and 67000 / ₁₀ ;	2
(d)	<i>Assume referring to animal cell unless stated otherwise (allow converse)</i> no , cell wall / cellulose ; no , large vacuole / permanent vacuole / tonoplast ; no chloroplast ; glycogen (stored) / no starch / no plastids ; centrioles ; smaller ; 1 Golgi structure ; lysosomes ;	max 1

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Question	Expected Answers	Marks
2 (a) (i)	habitat ;	1
(ii)	community ;	1
(iii)	population ;	1
(iv)	niche ;	1
(v)	producer / autotroph ; <i>Allow (green) plant</i>	1
(vi)	ecosystem ;	1
(b) (i)	<p><i>Allow 1 mark for ammonium to nitrate instead of the two stages.</i></p> <p><i>Allow 1 mark for mentioning both species of bacteria provided they are not incorrectly linked to a reaction.</i></p> <p><i>Allow ammonia throughout.</i></p> <p>1 plant can take up ammonium ;</p> <p>2 decomposers can convert , them / protein / urea / nitrogen-containing compounds , into ammonium ;</p> <p>3 nitrification ;</p> <p>4 nitrifying bacteria ;</p> <p>5 oxidation ;</p> <p>6 chemosynthesis / chemoautotrophs ;</p> <p>7 ammonium to , nitrite / nitrate III ;</p> <p>8 by Nitrosomonas ;</p> <p>9 nitrite / nitrate III , to , nitrate / nitrate VI ;</p> <p>10 by Nitrobacter ;</p> <p>11 plant can , take up / use , nitrate ;</p>	<p>max 4</p>
(ii)	<p>smell ;</p> <p>disease ;</p> <p>heavy metals ;</p> <p>too much applied ;</p> <p>applied at wrong time ;</p> <p>drainage / leaching ;</p> <p>eutrophication ;</p> <p>AVP ; (e.g. toxic chemicals)</p>	<p>max 1</p>

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Question	Expected Answers	Marks
3 (a) (i)	bone / teeth (formation / strengthening) ; enamel / shell (formation / strengthening) ; muscle / nerve , function ; blood clotting ; middle lamella ; AVP ;	max 1
(ii)	part of chlorophyll ; cofactor for enzymes ; bone ; AVP ;	max 1
(iii)	nucleotide / nucleic acid / ATP (synthesis) ; bone / enamel (formation) ; phospholipids (for membranes) ; creatine phosphate ; AVP ;	max 1
(iv)	membrane , function / pumps ; nerve / muscle , function ; ref. osmotic balance / AW ; AVP ; transport of carbon dioxide function of loop of Henle	max 1
(v)	solvent ; transport medium / AW ; NOT “blood” alone reaction medium ; coolant ; reactant / reagent (in hydrolysis reactions / photosynthesis) ; support / hydrostatic skeleton ; NOT buoyancy turgor ; AVP ;	max 1

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Question	Expected Answers	Marks
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- (b) (sucrose is a) non-reducing sugar ;
hydrolyse / description of ;
- either* add (dil) acid and , boil / heat ;
neutralise (with NaHCO₃) ;
- or* invertase / sucrose / enzyme ;
warm ;
- then , boil / heat , with , Benedict's solution / Fehlings A & B solutions /
sodium citrate & sodium carbonate & copper sulphate solutions ;
Allow "then do the Benedict's test / then do the test for reducing sugar"
- either* use filtrate from original test ;
(if sucrose also present then) red (precipitate) / blue to red ;
- or* take fresh sample ;
(if sucrose also present then) heavier precipitate / more precipitate /
red precipitate rather than green-yellow colour before /
suitable ref. to light absorbance ;
- Allow orange as an alternative to red.* **max 4**

- (c) *Quality of written communication assessed in this answer.*
Allow marks from labelled diagrams.
If amylose and amylopectin confused, then do not award marking points 10 & 12.
- 1 polymer / polysaccharide / AW ;
 - 2 α ;
 - 3 glucose ;
 - 4 detail of structure on C atom 1 ; (OH down)
 - 5 condensation ;
 - 6 glycosidic bond ;
 - 7 detail ;
 - 8 joined by 1,4 linkages ;
 - 9 compact ;
 - 10 amylose = non-branching / "straight" / AW ;
 - 11 (chain) coils / is a helix ;
 - 12 amylopectin = branching form ;
 - 13 1,6 links ;
 - 14 more / up to twice the number , glucose (residues) ;
 - 15 AVP ; amylopectin shorter / further structural detail
 - 16 AVP ; **max 7**
- Q ~ clear, well organised using specialist terms ;** **1**

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Question	Expected Answers	Marks
4 (a)	ammonia / product , is alkaline ;	1
(b) (i)	in the range 15 - 45°C ; NOT single figure (probably near) 35°C ;	max 1
(ii)	reaction / enzyme works , slower at 15°C ; ora energy / movement , is less (at 15°C) ; ora ESC less likely to be formed / fewer collisions / AW (at 15°C) ; ora product made slowly (at 15°C) ; ora reaction slower at 55°C ; ora high temperature denatures enzyme ; ora shape of active site altered ; ora substrate can't fit / substrate unable to be converted into product ; ora	max 4
(c)	<u>control</u> ; ensures that neither were solely responsible for colour change / AW ;	2
(d) (i)	initial (linear) increase (from origin) ; plateau ;	2
(ii)	linear increase ;	1
(e) (i)	active site correctly labelled ;	1
(ii)	<i>If competitive described as well, award max 2 for non-competitive.</i> inhibitor fits (into its site) ; NOT active site enzyme changes shape ; active site changes shape ; substrate no longer , fits / binds ; ref. substrate and active site complementary (shape) ; slows / no , reaction ;	max 3

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Question	Expected Answers	Marks
5 (a)	<i>Ignore ref. to faster / easier diffusion</i>	
(i)	large surface area ;	1
(ii)	short distance / ref. resistance (for diffusion) ;	1
(iii)	large volume of blood ; large surface area (for gases) to , enter / leave , (internal) transport system / blood ; AW large quantity (of gas) can be , brought / carried away ; maintains (diffusion) gradient ; capillaries have thin wall ;	max 1
(iv)	brings oxygen to exchange surface / takes away carbon dioxide ; maintains (diffusion) gradient ;	max 1
(b)	large surface area ; thin wall ; no cuticle ; carrier proteins ; channel proteins / permeable ; many (root hairs) ; ref. to low water potential inside ; shaped to penetrate between soil particles ; many mitochondria ;	max 2
(c)	<i>Quality of written communication assessed in this answer.</i> <i>osmosis ~</i> 1 movement of water ; 2 <u>down water potential</u> gradient / high Ψ to low Ψ ; 3 (type of) diffusion ; 4 through selectively permeable membrane ; AW 5 <u>protein</u> channels ; 6 through phospholipid layer ; 7 passive process ; <i>active transport ~</i> 8 movement of , ions / molecules ; NOT water 9 <u>against</u> concentration gradient / low conc. to high conc. ; 10 requires energy ; 11 requires ATP ; 12 uses <u>protein</u> carriers ; 13 detail of mechanism ; 14 AVP ; (comparison made / active transport stops when respiration stops / active transport stops with metabolic poison)	max 6
	Q ~ legible text with accurate spelling, punctuation & grammar ;	1

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Question	Expected Answers	Marks
6 (a) (i)	centromere ;	1
(ii)	(single) strand of chromatin / chromosome / DNA (molecule) ; replicated / described ; semi-conservative / using original as template / AW ; separate during mitosis ; so each cell produced has the same genetic information ; for , growth / repair ;	<i>max</i> 2
(b)	one pair of homologous chromosomes only shaded ;	1
(c)	<i>If more than 1 diagram supplied without stage identified, select the one which represents anaphase and mark to a maximum of 2.</i> <i>Marking points 1-4 can be awarded without labels.</i> 1D chromatids / single strand chromosomes ; 2D being drawn to opposite poles ; 3D 6 to each pole (correctly) ; 4D centromeres first ; 5 centromere attached to spindle ; 6 spindle shortening towards poles ; 7 pole to pole spindle (microtubules) ; 8 centrioles ; 9 cell membrane present (& no nuclear envelope) ; 10 AVP ;	<i>max</i> 4
(d) (i)	3 ;	1
(ii)	<i>Look for the ideas expressed rather than the precise words on the scheme.</i> need to maintain , constant / normal , number of chromosomes (for individual / species) ; gametes fuse ; if diploid cells fuse results in doubling of chromosomes ; doubling each generation ; fusion of haploid cells produces normal number of chromosomes ;	<i>max</i> 3

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Question	Expected Answers	Marks
7 (a) (i)	deoxyribose ;	1
(ii)	5 ;	1
(b) (i)	thymine ; NOT thiamine / thiamine / tyrosine / T	1
(ii)	uracil ; NOT U	1
(c) (i)	A ribosomal (RNA) / rRNA ✓ ^(A) mRNA / tRNA	1
(ii)	B messenger (RNA) / mRNA ; C transfer (RNA) / tRNA ;	2
(iii)	D anticodon(s) ; E codon(s) ; F amino acid(s) ;	3
(iv)	peptide (bond) ;	1
(d)	transcription ; DNA copied into mRNA ; base pairing / explained ; triplet / 3 bases , = codon ; triplet / codon , codes for 1 amino acid ; specific , triplet / codon / anticodon , codes for a specific amino acid ; sequence of triplets (determines order of amino acids) ; translation ;	max 4

[Question Total : 15]

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