

**Subject: Biology Foundation**

**Code: 2801**

**Session: June**

**Year: 2002**

**Mark Scheme**

<b>MAXIMUM MARK</b>	<b>60</b>
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## 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.

<b>Abbreviations, annotations and conventions used in the Mark Scheme</b>	/ = 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 _____ = (underlining) key words which <b>must</b> be used to gain credit ecf = error carried forward A = accept AW = alternative wording ora = or reverse argument
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Question	Expected Answers	Marks
1 (a)	collection / group / (large) number / mass , of cells ; single type / few types / same / similar ; specialised ; performing (particular) function(s) ; <i>(A) working together</i>	<b>max 2</b>
(b) (i)	<p><i>NOT '..... cells'</i></p> <p><b>A</b> squamous ;  <b>B</b> ciliated / columnar ; <i>NOT cuboidal</i></p>	<b>2</b>
(ii)	<p><i>Assume candidate is referring to cells of tissue B unless otherwise stated.</i>  <i>Allow converse points as appropriate.</i>  <i>( cells of tissue B ... )</i>                      energy / active / ATP ;                      respiration ;                      movement of cilia / ref. absorption by microvilli ;</p> <p><i>NOT ref. to size</i></p>	<b>max 2</b>
(c)	<p><i>Assume candidate is referring to eukaryotic cells unless otherwise stated.</i>  <i>Allow converse points as appropriate.</i></p> <p><i>( eukaryotic cells have ... )</i>                      nucleus / nuclear membrane / nucleolus ;                      organelles / named organelle ; ; <i>NOT chloroplast</i>                      chromosome / DNA associated with histones / not naked DNA ;                      linear DNA / DNA not circular ;                      larger ribosomes ;                      larger cell ;                      no plasmids ;                      no cell wall ;                      AVP ;</p>	<b>max 2</b>

[Total: 8]

Question	Expected Answers	Marks
2 (a) (i)	haemoglobin ;	1
(ii)	haem group / described , binds with (oxygen) ; reversibly / binding at high conc. / releasing at low conc. ; 8 oxygen <u>atoms</u> / 4 oxygen <u>molecules</u> , carried (per haemoglobin) <i>or</i> equivalent for haem ; AVP ; e.g. 4 haem groups detail of change of shape of haemoglobin as oxygen binds forms oxyhaemoglobin	
	<i>A equivalent marks for myoglobin (1 haem, 1 oxygen molecule)</i>	<b>max 2</b>
(b)	3 fatty acids ; 1 glycerol ; <i>allow 1 mark max for 'glycerol + fatty acid' with no numbers or wrong numbers given.</i> <i>ignore heads and tails.</i> condensation (in correct context) / ester linkages ; ref. saturation of / different , fatty acids ;	<b>max 3</b>

- (c) *No mark for naming an ion. Mark 1<sup>st</sup> function for each ion to a maximum of 1. Check for plant references as well. Suitable functions include ~*

*sodium*

membrane , function / pumps ;  
nerve / muscle , function ;  
ref. osmotic balance / AW ;

*calcium*

bone / teeth , formation / strengthening ; *NOT 'healthy' alone*  
enamel / shell , formation / strengthening ;  
muscle / nerve , function ;  
blood clotting ;  
spindle formation ;  
AVP ;

*potassium*

membrane , function / pumps ;  
nerve / muscle , function ;  
ref. osmotic balance / AW ;  
stomatal , opening / closure ;

*magnesium*

part of chlorophyll ;  
cofactor for enzymes ;  
bone ;

*chloride*

ref. osmotic balance / AW ;  
carbon dioxide transport in blood ;  
pH buffering ;  
constituent of , hydrochloric acid / gastric juice ;

*phosphate*

nucleic acid / ATP (synthesis) ;  
bone / enamel , formation / strengthening ;  
phospholipids (for membranes) ;  
AVP ;

max 2

[Total: 8]

Question	Expected Answers	Marks
3 (a) (i)	position of -OH is different ; on , carbon 1 / correct C on diagram ; (-OH is) downwards in $\alpha$ -glucose / upwards in $\beta$ -glucose ; <i>abba</i>	max 2
(ii)	1 -OH from each glucose involved ; 2 elimination of water / condensation ; 3 linked by oxygen atom ; 4 (between carbons) 1 & 4 / 1 & 6 ; <i>stated</i> 5 glycosidic ;	max 3
(b)	insoluble ; strong / tough / AW ; <i>NOT rigid</i> forms fibrils / cross linkage between chains / ref. to 180° rotation ; <i>NOT fibrous</i>	max 1

[Total: 6]

Question	Expected Answers	Marks
4 (a) (i)	<i>Correct answer = 2 ticks = 2 marks</i> $\frac{10\,000}{800\,000} (\times 100);$ $1.25 / 1.3 / 1(\%);$	2
(ii)	<i>NOT reference to energy / light missing the plant</i> reflected (off plant) ; passes through leaf / misses chlorophyll / misses chloroplasts ; only certain wavelengths of light can be , absorbed / used ; <i>ora</i> absorbed by / hits , non-photosynthetic parts / bark / e.g. ; some is heat ; used in evaporation ;	max 2
(b) (i)	10 (%) ; <i>allow single figure or a range between 5% and 15% inc.</i>	1
(ii)	<i>Take the first 2 answers.</i> death / dead remains ; excretion ; <i>NOT waste products</i> egestion ; other suitable method ; <i>NOT leaves</i> e.g. insects moulting hatched eggs moulting (fur / feathers)	max 2
(iii)	<i>Take the first idea.</i> heat / respiration ; <i>(A) transpiration / evaporation</i>	1
(iv)	<i>(Primary consumers are eating and ...)</i> producers have , cell walls / cellulose ; <i>ora</i> difficult to digest ; <i>ora</i> energy used by gut microorganisms ; <i>ora</i> much material , wasted / egested ; <i>ora</i> much material can't be eaten (by primary consumer) ; <i>ora</i>	max 2

[Total: 10]

Question	Expected Answers	Marks
5 (a) (i)	enzyme denatured ; <i>NOT killed</i> (enzyme) cannot , work / act ; starch not converted ; <i>A maltose not formed</i>	max 2
(ii)	to ensure that the , enzyme was responsible for the reaction / reaction would not take place unaided / AW ;	1
(b)	specificity ; <u>active site</u> certain shape ; <u>complementary</u> to starch / starch causes <u>induced fit</u> ; <i>A substrate</i> protein will not , enter active site / fit active site / form ESC ;	max 2

[Total: 5]

Question	Expected Answers	Marks
6 (a) (i)	<p><u>plasmid</u> cut ; restriction enzyme ; at specific sequence ; same enzyme as used to cut (insulin) gene ; sticky ends / described ; ref. complementary sticky ends ; ligase ; seals (sugar-phosphate) backbone / AW ;</p>	<b>max 4</b>
(ii)	<ol style="list-style-type: none"><li>1 antibiotic resistance (gene) introduced ;</li><li>2 expose to antibiotic and survivors have plasmid ;</li><li>3 fluorescent marker (gene) introduced ;</li><li>4 glowing bacteria have plasmid ;</li><li>5 identify bacteria producing insulin ;</li><li>6 using antibodies ;</li></ol>	<b>max 2</b>
(b)	<p>risk of disease ; ethical / religious , reasons ; incompatibility / not exactly the same / lack of tolerance ; engineered insulin is cheaper ; <i>ora</i> greater supply of engineered insulin ; <i>ora</i></p>	<b>max 1</b>

(c) *Quality of written communication assessed in this answer*

- 1 transcription ;
- 2 DNA unzips ;
- 3 H bonds break ;
- 4 (particular) sequence of bases / appropriate section , (= template) ;
- 5 (RNA) nucleotides align with DNA ;
- 6 mRNA formed (along DNA strand);
- 7 leaves nucleus through pore ;
  
- 8 translation ;
- 9 mRNA attaches to ribosome ;
- 10 6 bases / 2 triplets / 2 codons , exposed ;
- 11 tRNA brings amino acid (to ribosome / mRNA) ;
- 12 each tRNA attached to specific amino acid ;
- 13 tRNA triplet / anticodon , binds to , mRNA triplet / codon ;
- 14 peptide bond formed between amino acids ;
  
- 15 complementary base pairing ;
- 16 DNA / mRNA , (nucleotide / base) sequence determines sequence of amino acids ;
  
- 17 AVP ;
- 18 AVP ;  
e.g.  
A to U & C to G  
3 H bonds between C and G & 2 H bonds between A and U  
start / stop , codons  
polysomes  
named enzyme(s)  
large and small subunit  
Mg<sup>2+</sup>  
mRNA is reverse copy of DNA / AW

max 9

**QWC ~ legible text with accurate spelling, punctuation and grammar ; 1**

**[Total: 17]**

Question	Expected Answers	Marks
7 (a)	(late) prophase / metaphase ; <i>NOT early prophase / late metaphase</i> telophase ; <i>A early/late NOT telophase II</i>	2
(b)	<i>Allow a maximum of 2 marks for an answer that refers to the cell surface membrane. (marking points 7,8 + 9?)</i> <i>A 'mixed' answer can get up to 2 marks for cell surface membrane plus marks for within cell.</i>	
	1 surrounds nucleus ;	
	2 keeps DNA separate from rest of cell ; <i>A genetic material</i>	
	3 surrounds , organelle / named organelle / vacuole ;	
	4 allows different reactions to take place in the cell / compartmentation ;	
	5 (reactions take place) without interference ;	
	6 attachment for ribosomes ;	
	7 site for reactions ;	
	8 ref. movement of materials , into / out of , organelles ;	
	9 AVP ; e.g. materials moved across by active transport named material moved across named , process / reaction , taking place in named , area / organelle	max 4

[Total: 6]