



RECOGNISING ACHIEVEMENT

**2801 Biology Foundation**

**June 2004**

**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.

<b>Mark Scheme</b> Page 3 of 9	<b>Unit Code</b> 2801	<b>Session</b> June	<b>Year</b> 2004	<b>Version</b> Final
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<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
	A	= accept
	( )	= words which are not essential to gain credit
	<u>      </u>	= (underlining) key words which <b>must</b> be used to gain credit
	ecf	= error carried forward
AW	= alternative wording	
ora	= or reverse argument	

Question	Expected Answers	Marks
1 (a)	organ(s) ;	1
(b)	<u>primary</u> consumer / herbivore ; ignore e.g.s R vegetarian	1
(c)	community ;	1
(d)	active site ;	1
(e)	activation (energy) ;	1
(f)	gene / allele ; A cistron R genes / alleles / operon / intron	1
(g)	resolution / resolving power ;	1

[Total : 7]

<b>Mark Scheme</b> Page 4 of 9	<b>Unit Code</b> 2801	<b>Session</b> June	<b>Year</b> 2004	<b>Version</b> Final
-----------------------------------	--------------------------	------------------------	---------------------	-------------------------

Question	Expected Answers	Marks
2 (a)	<p><i>treat references to 'replication' or 'chromosome number' as neutral</i></p> <p>makes cells / cell division ; <b>A</b> nuclei <u>genetically</u> identical / clone ;</p> <p>growth ; <b>R</b> 'of cell' repair (of tissues) ; <b>R</b> 'of cell' asexual reproduction ;</p>	<b>max 3</b>
(b) (i)	<p><i>treat 'growth' and 'cytokinesis' as neutral</i></p> <p>replication of DNA ; centrioles replicate ; production of (named) organelles ;</p> <p>protein synthesis ; <b>A</b> named e.g. RNA / nucleotide , synthesis ; respiration / active transport / named e.g. of usual cellular activity ;</p> <p>AVP ; e.g. semi-conservative chromosome = 2 chromatids</p>	<b>max 3</b>
(ii)	clockwise arrow head drawn ;	<b>1</b>
(c)	<p><i>ignore refs. to late or early stage - except in (i)</i> <i>any ref. to I or II = 0</i> <i>invalid choice = 0</i></p>	
(i)	(early) anaphase ; <b>A</b> (late) metaphase	<b>1</b>
(ii)	prophase ;	<b>1</b>
(iii)	telophase ;	<b>1</b>
(iv)	anaphase ;	<b>1</b>
(v)	metaphase ;	<b>1</b>

**[Total : 12]**

<b>Mark Scheme</b> Page 5 of 9	<b>Unit Code</b> 2801	<b>Session</b> June	<b>Year</b> 2004	<b>Version</b> Final
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**Question**      **Expected Answers**      **Marks**

- 3 (a)      *if only ticks, assume blank boxes = X*  
*If only crosses, assume blank boxes = ✓*  
*reject hybrid ticks*

X	✓ ;
✓	X ;
✓	X ;
✓	X ;

4

- (b)      *nucleus / DNA*
- 1 controls , activities of cell / transcription / named activity / cell division ;
  - 2 contains genetic information that can be transmitted to next generation ;  
*nucleolus*
  - 3 produces , ribosomes / rRNA ;
- smooth ER*
- 4 makes / transports , lipids / steroids / hormones ;    **A** named plant e.g.  
*rough ER / ribosomes*
  - 5 protein synthesis ;  
*rough ER*
  - 6 transport of proteins ;  
*Golgi*
  - 7 processes , molecules / proteins ; AW
  - 8 use in secretion ;
  - 9 lysosome formation ;
- lysosome*
- 10 hydrolytic / digestive , enzymes ;
  - 11 breakdown , organelles / cell / ingested material ;
- mitochondria*
- 12 formation ATP / suitable energy ref. ;
  - 13 aerobic respiration ;

Mark Scheme	Unit Code	Session	Year	Version
Page 6 of 9	2801	June	2004	Final

*plasma (cell surface) membrane*

- 14 controls exchange between cell and environment / selectively permeable ;  
**R** water  
 15 receptors for , cell recognition / attachment ;  
 16 fluid to allow , endocytosis / exocytosis ;

*cell wall*

- 17 gives , cell shape / strength / support ;  
 18 prevents bursting (when water enters cell by osmosis) ;  
 19 fully permeable ;

*chloroplast*

- 20 photosynthesis ;  
 21 chlorophyll / pigment , absorbs light ;

*vacuole / tonoplast*

- 22 reservoir of , salts / sugars / waste / pigment / other e.g. ;  
 23 ref. to , turgor / support / controlling  $\Psi$  ;

*starch grain / amyloplast*

- 24 storage ;

*cytoplasm*

- 25 site of chemical reaction(s) / correct e.g. ;  
 26 AVP ;  
 27 AVP ;

*for further detail of function*

- e.g. protein , channels / carriers , to transport , ions / polar substances  
 phospholipid (bilayer) transports lipid soluble substances  
 ref. waterproofing cell wall (lignin / suberin)  
 mitochondria involved in lipid synthesis  
 addition of carbohydrate to protein to form glycoprotein  
 plasmodesma

**max 9**

**QWC - clear, well organised answer, using specialist terms;**

**1**

**[Total : 14]**

<b>Mark Scheme</b> Page 7 of 9	<b>Unit Code</b> 2801	<b>Session</b> June	<b>Year</b> 2004	<b>Version</b> Final
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Question	Expected Answers	Marks
4 (a) (i)	add / mix with , alcohol / ethanol / propanone / (suitable) organic solvent ; then , add to / add / mix with , water ; <i>water alone = 0</i> <b>R</b> heat	2
(ii)	emulsion / milky colour / cloudy / AW ; <b>R</b> precipitate	1
(b)	<i>phospholipids have</i> 1 less fatty acid (residue) / 2 fatty acid (residues) not 3 ; <b>A</b> hydrocarbon 1 less ester bond / 2 ester bonds not 3 ; phosphate ; choline / base / nitrogen ; hydrophilic / polar , end / head ;	max 3
(c) (i)	add , copper sulphate (solution) and sodium hydroxide (solution) / biuret (reagent) ; <b>R</b> Biuret test unqualified <b>R</b> heat	1
(ii)	purple / mauve / lilac ; <b>R</b> blue	1
(d)	<i>primary</i> <u>sequence</u> / <u>order</u> , of amino acids (in a polypeptide) ; <b>A</b> R groups	(1)
	<i>secondary</i> coiling / folding , of the , polypeptide / chain of amino acids / peptide chain / primary structure ; ( $\alpha$ -) <u>helix</u> ; ( $\beta$ -) pleated sheet ; hydrogen bonds ; between amino acids in (same) chain ; (between) –NH and –CO ; AVP ; e.g. random coiling	(max 4)  max 5

**[Total : 13]**

<b>Mark Scheme</b> Page 8 of 9	<b>Unit Code</b> 2801	<b>Session</b> June	<b>Year</b> 2004	<b>Version</b> Final
-----------------------------------	--------------------------	------------------------	---------------------	-------------------------

Question	Expected Answers	Marks
5 (a)	<p>(malonate) same / similar , shape as , succinate / substrate ;  <b>A</b> idea that inhibitor is complementary to active site</p> <p>binds to / fits / blocks , <u>active site</u> ;  for a limited time / reversible / may leave / AW ;  <b>R</b> does not bind permanently</p> <p>prevents , formation of ESC / substrate from binding ; AW  no / less , product formed ;      <b>A</b> suitable ref. to conversion of succinate</p>	<b>max 3</b>
(b)	<p>rate increased ;  greater chance of substrate binding with , active site / enzyme ; ora  more , product formed / substrate converted ;</p> <p>will reach Vmax / rate unaffected , if great excess of succinate;</p> <p>AVP ;      e.g. graph of rate against substrate concentration  effect of time (using up substrate)</p>	<b>max 3</b>

**[Total : 6]**



<b>Mark Scheme</b> Page 9 of 9	<b>Unit Code</b> 2801	<b>Session</b> June	<b>Year</b> 2004	<b>Version</b> Final
-----------------------------------	--------------------------	------------------------	---------------------	-------------------------

Question	Expected Answers	Marks
6 (a)	<p>lower , water / solute , potential inside cell / converse ;</p> <p>water enters ; (enters) by osmosis / down <math>\Psi</math> gradient ;</p> <p>increase in pressure ; <u>membrane</u> cannot withstand pressure / no cell wall to prevent bursting ;</p>	<b>max 3</b>
(b) (i)	<p>4 ;                    <b>R</b> incorrect units</p>	<b>1</b>
	<p>(ii) <i>ignore refs. to size, oxygen, genetic differences</i></p> <p>each rbc has (slightly) different , water potential / solute concentration / AW ; <b>R</b> water concentration</p> <p>each , rbc / membrane , has (slightly) different , strength / elasticity ; <b>R</b> thickness of membrane</p> <p>ref. different ages of cells ;</p>	<b>max 1</b>
(c) (i)	<p>active , transport / uptake ;</p>	<b>1</b>
	<p>(ii) oxygen required for , uptake / respiration / ATP production ; <b>A</b> release / provide , energy <b>R</b> make / produce , energy</p>	<b>1</b>
	<p>(iii) passively / by diffusion ; residual ATP ; anaerobic respiration ; AVP ;</p>	<b>max 1</b>
<b>[Total : 8]</b>		