RECOGNISING ACHIEVEMENT

Subject: Biology Foundation Code: 2801

Session: January 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 (½) 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.

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

Question	Expected Answers	Marks
1 (a) (i)	2 cells / 2 nuclei ; same chromosome number / preserves chromosome number / n → n / 2n → 2n ; genetically identical / same DNA ; clone ; identical to parent / identical to each other ; identical to parent / identical to each other ;	**2 max**
(ii)	growth ; ***NOT growth of cells*** repair ; replacement of cells ; named e.g. ; cancer ;	**2 max**
(b)	48 ; 48 ; 24 ; 48 ;	**4**
(c)	(C) D E B A F ; ; ; ; ;	**5**

Award 5 marks for all 5 in correct order.
D as the first = 1
F as the fifth = 1

Then look for the three central letters

EBA = 3
BAE = 2
EAB = 1
BEA = 1
AEB = 2
ABE = 0

If D or F is wrong, then look for the sequence of the middle three letters to award marks.
If D and F are wrong, then 0.

(d) ***NOT stress***
pollution
diet

radiation ; ***Allow mobile phones / radon***
UV light / sunlight / sunburn ;
X rays ;
gamma rays ;
smoking / tobacco ;
named carcinogen ; ; ; **(*three marks*)**

tar
aniline dyes
asbestos
alcohol
benzpyrene
benzene
vinyl chloride
etc.

(named) virus ;
heredity / family history / genetic predisposition / possession of oncogenes ;
low fibre diet ;
high fat diet ;
free radicals ;
increased age ;
ref. weakened immunity ;
high voltage power cables ;

3 max

[Total: 16]

Question			Expected Answers	Marks
2	(a)	(i)	3 fatty acids ; glycerol ; ***Allow 1 mark (maximum) for fatty acids & glycerol if no numbers stated or if wrong numbers stated.***	2
		(ii)	condensation / esterification ; AW	1
	(b)		***NOT functions of waxes or phospholipids*** energy (source) ; (energy) storage ; ***NOT food store*** insulation ; ***NOT warmth*** protection ; buoyancy ; AVP ; (e.g. to form other (suitable) compounds)	1 max
	(c)	(i)	-S---S- / joins 2 sulphur atoms ; ***NOT sulphate / sulphide / molecules / ions*** covalent ; between R groups / between SH and SH / between side chains / between functional groups ; between cysteines / between cys amino acids ; between different parts of the protein chain ; AW strong ; AVP ; (e.g. can be broken down by reducing agents)	2 max
		(ii)	***NOT covalent*** hydrogen / dipole attraction ; ***NOT H_2 bonding*** ionic ; intermolecular / van der Waals forces / hydrophobic / attraction of non-polar chains ;	2 max
	(d)		helix / spiral ; ***NOT coil / double helix "or β pleated sheet" = max 1*** α ; left handed ; (stabilised by) hydrogen bonds ; further detail of hydrogen bonds ;	2 max
				[Total: 10]

Question	Expected Answers	Marks
3 (a)	***Answers may be given in the context of an example.***	
	producer	
	autotrophic ;	
	uses inorganic sources / description / equation ;	
	photosynthesis / chemosynthesis ;	
	converts light energy into , chemical energy / food / ATP ; AW	
	provides (total) input of energy into ecosystem ; AW	
	start of the food chain ; AW	
	trophic level	
	feeding level ;	
	position in , food chain / food web / food pyramid / biomass pyramid / energy pyramid ;	
	indicates (main) source of , food / energy ;	
		4 max
(b) (i)	98 ; ; (***correct answer = 2 ticks = 2 marks***)	**2**
	If answer incorrect, look for working (***one mark***)	
	$^{5600 - 125}/_{5600}$ x 100 ***or*** $^{5475}/_{5600}$ x 100 ***or*** 100 - ($^{125}/_{5600}$ x 100)	
	or 97.7 (unrounded)	
(ii)	energy loss in producers ;	
	e.g. (not contributing to primary consumers) ;	
	some parts of the plant are not (available to be) eaten ;	
	e.g. ; (roots)	
	some parts of the plant (can be eaten but) not digested ;	
	e.g. ; (ref. cellulose / other indigestible matter / lack of cellulase / egestion / faeces)	
	digestion releases energy as heat ;	
	energy cannot be assimilated ;	
	heat loss (from herbivores) ;	
	respiration (by herbivores) ;	
	excretion / urea / urine ;	
	movement ;	
	maintaining body temperature ;	
	loss to gut microorganisms ;	
	AVP ; (e.g. plant produces toxin to prevent being eaten plant has spines to prevent being eaten herbivores have been eaten by carnivores / AW)	
		4 max

(c) less light (intensity) / lack of sunlight / less sun / shade / more cloud ; AW
shorter light periods ;
temperature (qualified) ; ***Allow 'winter'***
flood / waterlogging ;
deficiency / lack , of water ;
deficiency / lack , of , nutrients / named nutrient / minerals / salts / ions ;
Allow nitrogen / N NOT poor soil / N_2
suitable human activity (e.g. trampling) ;
overgrazing / increase in herbivores ;
not grazing ;
soil erosion ;
disease ;
leaf damage ;
lack of leaves ;
(chemical) pollution ;
dust ;
chlorosis ;
lack of CO_2 ;
AVP ; (e.g. old plant) **2 max**

(d) (i) feed at (several) different (trophic) levels ; ***Allow 'eat animals and plants'***
not always feeding as , herbivores / carnivores / primary consumers
/ secondary (or higher) consumers ; **1 max**

(ii) carnivores are the last in the food chain ; AW ***ora***
greater , number / biomass , of omnivores ; ***ora***
(omnivores have) greater variety of food available ; ***ora***
ref. seasonal changes in population of small herbivores ;
AVP ; **1 max**

[Total: 14]

Question			Expected Answers	Marks
4	(a)	(i)	glycosidic ;	1
		(ii)	iodine <u>solution</u> / iodine in potassium iodide ;	1
		(iii)	***NOT precipitate*** ***before*** blue / black / blue-black / purple ; ***after*** yellow / orange / brown / red-brown ;	2
	(b)	(i)	no , starch / substrate , left ; AW ***NOT <u>all</u> glycosidic bonds broken / enzyme ref.***	1
		(ii)	more , (kinetic) energy / movement ; ***NOT particles*** more , collisions / enzyme-substrate complexes formed ;	2
	(c)		***Allow redrawn graph, as long as it is clear.*** ***NOT a description alone.*** steeper curve than 23^{o}C ; levels off higher than 23^{o}C ;	2

(d) ***Quality of written communication assessed in this answer.***

Marks may be awarded from suitably labelled or annotated diagrams. Allow marks for the descriptions of the type of inhibition, even if not named or incorrectly named.

1 competitive inhibitor / competes with substrate for active site ;
2 (competitive inhibitor is) similar shape to substrate ;
NOT 'the same shape' Allow 'part that fits in is the same shape'
3 can fit in active site ;
4 blocks active site / prevents substrate entering ;
5 (relative) concentrations of substrate and inhibitor matters ;
6 non-competitive inhibitor ;
7 (non-competitive inhibitor) attaches to site other than active site ;
8 prevent substrate from , entering / binding to , active site ;
9 allosteric ;
10 distorts shape of enzyme ;
11 distorts shape of active site ;
12 increasing substrate concentration has no effect ;

13 ref. tertiary structure of enzyme ;
14 suitable graph to support answer ;

15 AVP ; ; **(*two marks*)** (e.g. inhibition is temporary
16 named inhibitor
end-product inhibition
ref. V max)

6 max

Q - legible text with accurate spelling, punctuation & grammar ;

1

[Total: 16]

Question **Expected Answers** **Marks**

5 (a) ***One mark for each correct row.***

	eukaryotic cell	***prokaryotic cell***	
cell wall	*sometimes present*	✓	
nuclear envelope		×	;
Golgi apparatus	✓		;
flagellum		**sometimes present**	;
ribosomes	✓		;
carries out respiration		✓	;
chloroplast		×	;

6

(b) (i) group of cells **;** AW
with intercellular material **;**
one / mixed / more than one / two **,** type(s) **;** ***Allow 'common origin'***
(specialised to) perform function(s) **;** ***NOT job*** **2 max**

(ii) xylem / phloem / epidermis / mesophyll / palisade / spongy mesophyll / chlorenchyma / etc./ meristem / cambium / suitable named tissue **;**
NOT leaf tissue / root tip / vascular tissue alone / xylem vessels / sieve tubes **1**

(iii) muscle / bone / epithelium / nervous / connective / blood / endothelium / cartilage / epidermis / adipose / suitable named tissue **;**
NOT blood cells / brain tissue / liver tissue / lung tissue / skin / a muscle / a bone / a nerve / tendon / ligament **1**

[Total: 10]

Question			Expected Answers	Marks
6	(a)	(i)	restriction / endonuclease **;** ***Allow named example*** **(** ***BamHI / EcoRI / HindIII / HpaI / HpaII*** **)** ***Allow 'restrictase'***	**1**
		(ii)	plasmid **;** ***NOT vector***	**1**
		(iii)	sticky ends / unpaired nucleotides **;**	**1**
		(iv)	to help them to bind with the **,** bacterial DNA / plasmid **;** AW	**1**
		(v)	recombinant (plasmid) **;** ***Allow 'vector'***	**1**
	(b)		shortage of **,** blood / donors **;** needs a lot of blood **;** risk of **,** disease / HIV / appropriate named disease **;** AVP **;** (e.g. greater production) ***NOT economic considerations***	**1 max**

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

Marks may be awarded from suitably labelled or annotated diagrams. A description of transcription could be awarded marking points 1 - 4 only.

1 DNA / helix **,** unwinds **;**
2 (polynucleotide) strands **,** separate / unzip **;**
3 hydrogen bonds break **;**
4 bases exposed **;**
5 activated / free **,** (DNA) nucleotides **;**
6 complementary (DNA) nucleotides bond **;**
7 (DNA) polymerase **;**
8 A to T **;**
9 C to G **;**
10 detail of pairing **;** (e.g. the number of H bonds
purine - pyrimidine)

11 joining of nucleotides to form (polynucleotide) chain **;**
12 phosphodiester bonds / sugar - phosphate bonds **;**

13 semi-conservative / 1 new strand & 1 old one **;**

14 AVP **; ;** **(*two marks*)** (e.g. named enzymes (ligase / helicase)
15 continuous / discontinuous formation
3' & 5' / antiparallel
proof reading)

7 max

Q - clear, well organised using specialist terms ;

1

[Total: 14]

Question		Expected Answers	Marks
7	(a)	***difference*** active transport against gradient / facilitated diffusion down gradient ; active transport requires , energy / ATP ; ***ora***	**1 max**
		similarity both use proteins ;	**1**
	(b)	***Vitamin C*** polar / ionic ; cannot pass through , phospholipid layer / hydrophobic regions ; use protein channels ; (with) hydrophilic linings ; use , protein carriers / transport proteins ; ***Vitamin D*** non polar ; will dissolve in , phospholipid / hydrophobic regions ; so can pass through it (directly) ;	**4 max**
	(c)	water moves out of cells / cells become dehydrated ; by osmosis ; **} *these marks*** down Ψ gradient / from high Ψ to low Ψ ; **} *stand alone*** ***NOT 'along' or 'with'*** leaving cells much more concentrated (with solutes) ; enzymes / metabolic reactions , require aqueous conditions ; reactions / metabolism , disrupted ; reduction in (cell) size ; cells become separated from adjacent cells ; cell death ; AVP ;(e.g. crenation ref. reaching equilibrium)	**4 max**
			[Total: 10]