OCR

RECOGNISING ACHIEVEMENT

2804   Central Concepts

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 (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 <u>part</u> question should be indicated in the margin provided on the right hand side of the page. The mark <u>total</u> 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 <u>and</u> 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.

Mark Scheme

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
	A	= accept
	( )	= 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)	stomata; **A** stoma **R** pores, stroma air spaces / AW; thin cell walls; thin (leaf); cylindrical / vertical, palisade cells; large surface area of, palisade / (spongy) mesophyll, cells / tissue; **R** moist cell walls	**4 max**
(b)	0.0025 / 2.5 x 10^{-3}; **A** 0.003 / 3 x 10^{-3} 11.4;	**2**
(c)	photosynthesis takes place; oxygen is produced; **R** gas produced collects, in air spaces / on surface of disc / AW; discs, less dense / more buoyant; **R** refs to mass / weight	**3 max**
(d)	rate increases as light intensity increases / ora; two pairs of data quotes from columns 2 and 4 of table;	**2**
(e)	light intensity;	**1**
(f)	increase light intensity the rate increases / use appropriate data quote / ora; *ecf - if no mention of intensity in (e)*	**1**
(g)	light intensity no longer limiting / some other factor limiting / AW; ref to carbon dioxide concentration *or* temperature; temperature too high / denature enzymes;	**2 max**

[Total: 15]

Mark Scheme

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Question	Expected Answers	Marks

2 (a) stimuli; **A** stimulus **1**

(b) need to keep internal conditions constant / homeostasis occurs / ora;
so enzymes / biochemical pathways / cells/ tissues / organs work
    (efficiently) / ora;
corrective mechanism switched on / AW;
named mechanism; **3 max**

(c) *max 4 for following examples*

1 rods / cones / retina / photoreceptors, detect light;
2 taste buds / olfactory cells / chemoreceptors, detect chemicals;
3 Pacinian / Meissner's corpuscle / mechanoreceptors, detects pressure /
    touch;
4 Ruffini's endings in skin / thermoreceptors, detect temperature changes;
5 proprioreceptors / stretch receptors in muscle, detect mechanical
    displacement / AW;
6 hair cells / AW, in semicircular canals detect movement;
7 hair cells / stereocilia, in cochlea detect sound;
8 baroreceptors detect blood pressure changes;
9 osmoreceptors detect changes in blood water potential;

10 stimulus causes sodium channels to open;
11 sodium ions enter cell;
12 depolarisation;
13 receptor potential / generator potential;
14 greater than threshold / all or nothing principle;
15 increased stimulus leads to increased frequency of action potentials;
16 AVP; e.g.   hyperpolarisation in rod cell
               deformity of capsule in Pacinian corpuscle **7 max**

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

[Total: 12]

Mark Scheme

Question	Expected Answers	Marks

3 **(a)**   **X** + **Y**;
Z;
Z;   **3**

(b)   enters mitochondrion;
active uptake / ATP used;
into matrix;
link reaction;
decarboxylation / carbon dioxide released / AW;
dehydrogenation / AW;
reduced NAD formed;
forms acetyl coenzyme A / combines with coenzyme A;   **A** Co A
combines with oxaloacetate / forms citrate;   **4 max**

(c)   *muscle*

pyruvate converted to lactate; **A** lactic acid
hydrogen combines with pyruvate;
lactate dehydrogenase;

max 4 for yeast
yeast

pyruvate converted to ethanal;
release of carbon dioxide / decarboxylated;
hydrogen combines with ethanal;
ethanal converted to ethanol;
alcohol dehydrogenase;   **5 max**

        [Total: 12]

Question	Expected Answers	Marks

4 (a) *kingdoms must match photographs in (i)*
if bacterium is classified as protista and Euglena *is classified as prokaryotae*
in (i), award marks for features if they are correct for the kingdoms given by
the candidate up to max 4 in (ii)

(i) *kingdoms*

prokaryotae / prokaryotes / monera;   protoctista / protista;   **2**

(ii) *features*

no nucleus;   nucleus;
no membrane bound organelles;   membrane bound organelles /
                                          named membrane bound organelle;

no, ER / golgi;   ER / golgi, present;

DNA naked;   chromosomes / DNA plus protein;
circular DNA;   linear/ non circular, DNA;
70S / smaller, ribosomes;   80S / larger, ribosomes;
cell wall always present;

pili;
diameter cell 0.5 – 5 μm;
mesosome;   **4 max**

(b) mutation;
named mutagen;   **R** carcinogen
occurs randomly;
change in, base / nucleotide, sequence;
substitution / deletion / named mechanism;   **3 max**

(c) interbreed (with domesticated camels);
ref to offspring produced;
ref to fertility of offspring;   **3**

(d) body fluids / AW, become more concentrated / lower water potential / AW;
water lost from, cells / tissues;
by osmosis;   **2 max**

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(e)   salt not absorbed in gut / salt in faeces;
salt secreting glands;
cells have lower water potential;
more salt in urine;
kidneys reabsorb less salt / excrete more salt;
longer, loop of Henle / collecting duct, for increased water (re)absorption;
increased ADH production;
AVP; e.g. increased ability to maintain normal blood viscosity   **2 max**

(f)   variation in tolerance to salt;
due to advantageous, DNA / alleles;
pass, DNA / alleles, to offspring;
change in allele frequency;
ref to isolation mechanism;   **2 max**

              [Total: 18]

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Question	Expected Answers	Marks

5 **(a)**

A A   no trim
A a^s no trim
A a^c no trim; *three correct for 1 mark*

a^s a^s sable
a^s a^c sable;   *two correct for 1 mark*

a^c a^c copper; *1 mark*

alternative symbols accepted if key given - ecf section (b)   **3**

(b)   *parental genotypes*   A a^c A a^c ;
gametes   A   a^c A   a^c ;

(gamete and genotype marks can be credited in Punnett square)

offspring genotypes   A A   A a^c A a^c a^c a^c ;
offspring phenotypes no trim no trim   no trim   copper ;

*If only one heterozygote shown in offspring genotypes lose genotype mark
but ecf for offspring phenotypes*   **4**

(c)   **(i)**   test cross / backcross; **A** cross with, copper / a^c a^c **1**

(ii)   homozygous, all offspring sable;
if any offspring are copper;
must be heterozygous / must carry a^c allele;   **3**

(d)   *multiple alleles*
more than two;
forms / varieties, of a gene;

locus
position of a gene / allele;
on a chromosome / length of DNA   **4**

[Total :   **15**]

Mark Scheme

Question	Expected Answers	Marks

6 **(a)** starts with, uncolonised area / bare ground / bare rock / AW;
reference to pioneer species;
organisms modify environment / soil development;
series of recognisable stages / seres / AW;
progresses to, climax community / woodland;   **2 max**

(b) **1** identify <u>species</u> present;
2 use of keys;
3 from, strand line / sea, to woodland; **A** other named habitat;
4 use, tape / string, to mark out line;
5 carry out (belt or line) <u>transect</u>;
6 interrupted sampling / AW;
7 use (frame / open) <u>quadrat</u>;
8 ref to ideal size of quadrat / size changing in different parts of transect;
9 placed randomly within (belt) transect;
10 estimate percentage cover;
11 use, ACFOR / abundance scale;
12 use point quadrat; **A** pin quadrat
13 mechanics of use;
14 number touches on each species proportional to percentage cover;
15 method for capturing animals;
16 ref to capture mark recapture / estimating abundance of animal species;
17 suitable graphical representation; e.g. kite diagram
18 AVP; e.g.   repeat for reliability
                      ref to calculating species density / species frequency   **7 max**

QWC – clear, well organised using specialist terms;   **1**

                                                            [Total: 10]

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Question			Expected Answers	Marks
7	**(a)**	**1**	(apical / terminal) bud is source of auxin;	
		2	auxin inhibits growth of side shoot / ora;	
		3	remove bud and auxin concentration drops;	
		4	(this allows) cell division / elongation to take place;	
			ecf – marking points 2 and 3 if growth regulator or hormone used instead of auxin	**3 max**
	(b)		*award two marks if correct answer (80%) is given* *award one mark for calculation if answer is not correct*	
			(90 – 50 = 40) 40 / 50 x 100;	
			80%;	**2**
	(c)		no growth until day, 8 / 10; auxin moves out of paste / AW; inhibits growth; growth occurs after, 8 / 10, days; because auxin, levels fall / 'used up';	**3 max**
				[Total: 8]