

Subject: Central Concepts Code: 2804

Session: January Year: 2002

Mark Scheme

MAXIMUM MARK	90
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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.

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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 <u> </u> = (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) (i)	A - glycolysis; B – (lactate) fermentation / anaerobic respiration / reduction of pyruvate; C - aerobic respiration / Krebs cycle <u>and</u> oxidative phosphorylation / ETC;	3
(ii)	C ;	1
(iii)	A ;	1
(b) (i)	nucleus, ribosomes; (<u>both for mark</u>) <i>If more than two mentioned score zero</i>	1
(ii)	pyruvate is end product of glycolysis; A glucose to pyruvate in cytoplasm / cytosol; glycolytic enzymes not in mitochondria; pyruvate can enter mitochondria / glucose cannot; no carriers for glucose (in mitochondrial membranes); carbon dioxide produced in Krebs cycle; and link reaction; decarboxylation / decarboxylase(s); <i>can refer to pathways A,B and C</i>	max 3
(iii)	cyanide prevents, oxidative phosphorylation / aerobic respiration / full oxidation of glucose / AW, taking place; R ETC / cytochromes reduced NAD not oxidised / AW; no dehydrogenation / no oxidation; Krebs cycle stops / no decarboxylation; lactate is produced in cytoplasm / lactate pathway can occur / only B can occur / only anaerobic respiration can occur / pyruvate acts as H acceptor; does not involve, cytochromes / ETC / oxidative phosphorylation; enzymes in cytoplasm not inhibited by cyanide;	max 3
(c)	carbon dioxide, ethanol; (both for mark) R ethanal, alcohol	1
		[Total: 13]

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Question	Expected Answers	Marks
2 (a) (i)	X - stroma; Y - granum / grana / thylakoids; Z - starch (grain); <i>ignore references to lipid</i>	3
	(ii) label line to a granum / thylakoid / lamella;	1
(b)	<p>1 large surface area of chloroplast, qualified; e.g. biconvex shape</p> <p>2 grana / thylakoid(s) (membranes), give large surface area;</p> <p>3 site of, light dependent reactions / photophosphorylation;</p> <p>4 ref to energy, transduction / conversion;</p> <p>5 chlorophyll / pigments, for light absorption / lose excited electrons;</p> <p>6 ref to wavelengths absorbed by chlorophyll (blue + red or 450 + 680 nm);</p> <p>7 ref to (orientation of) chlorophyll in membrane;</p> <p>8 other photosynthetic pigments / named pigment(s);</p> <p>9 absorb different wavelengths of light;</p> <p>10 arranged into photosystems / light harvesting complexes (or clusters); A quantasomes;</p> <p>11 chlorophyll (a) molecule at centre of, photosystem / reaction centre;</p> <p>12 pigments 'funnel' electrons to centre of photosystem (idea of antennae / AW);</p> <p>13 electron carriers / ETC system, in membrane;</p> <p>14 proton pumps / chemiosmosis / ref to movement of hydrogen ions / protons into thylakoid space / AW;</p> <p>15 ATP production / synthetase / ATP ase;</p> <p>16 NADP present;</p> <p>17 Calvin cycle / light independent stage, enzymes in stroma;</p> <p>18 ref to rubisco;</p> <p>19 ref to storage of starch or lipid;</p> <p>20 ref DNA / ribosomes, making proteins;</p> <p>21 AVP; e.g. double membrane qualified photosystem 1 and 2 have different absorption peaks</p>	max 7
	Q – legible text with accurate spelling, punctuation and grammar;	1
		max 8
(c) (i)	GP to Q step; RuMP to RuBP step;	2
	(ii) rubisco / ribulose bisphosphate carboxylase;	1
	(iii) GALP / PGAL / triose phosphate / TP;	1

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- (iv) proteins / polypeptides / named protein;
lipids / oils / fats;
DNA / RNA / nucleic acids;
chlorophyll;

2

[Total: 18]

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Question	Expected Answers	Marks
3 (a)	(members of) same species / named species; (compete for) same resource / named resource;	2
(b) (i)	<i>Mark each conclusion separately. Must refer to roots in any conclusion. One mark for statement and second mark for supporting data from table.</i> cheatgrass has longer roots than wheatgrass (when grown separately / always); wheatgrass has reduced root growth in presence of cheatgrass / ora; as proportion of cheatgrass increases root length of wheatgrass decreases; wheatgrass encourages growth of cheatgrass / AW; in mixture with highest proportion of cheatgrass, cheatgrass roots decrease in length; ref to figures;;	2 + 2
(ii)	cheatgrass has longer roots / extensive surface area / grow deeper; able to obtain more water; able to obtain more, minerals / nutrients / ions / salts; release of inhibitors into soil / allelopathy;	2 max
	R any ref to parts of plants except roots	
		[Total: 8]

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Question	Expected Answers	Marks
4 (a)	<p>form / variety / AW , of a <u>gene</u>; unique, nucleotide / base, sequence / AW; A ref to protein product only one can occur at a locus; occupies same, locus / position, on homologous chromosomes; produce different effect (on same process / structure / characteristic); A ref to an example</p>	max 2
	<p>allele not expressed in heterozygote / not in presence of dominant / only expressed in homozygous; correct ref to <u>phenotype</u>; often no active enzyme is produced; A use of example, use of symbols</p>	max 2
	<p>allele / gene, located on X chromosome; on non homologous part of X chromosome / not found on Y chromosome; only females are carriers;</p>	max 2
(b)	<p><i>If wrong genotypes, only award second and third marking points if correctly derived. i.e. ecf max 2</i></p> <p>parental genotypes (XY) b - x (XX) BB; gametes b - , B (B); genotypes of offspring correct Bb (Bb) B - (B -);</p> <p><i>phenotype(s) linked to genotype(s)</i> normal female(s), normal male(s);</p> <p>A all normal</p>	4
(c)	<p>25% / 1 in 4 / ¼ / 0.25; R ratios</p>	1
[Total: 11]		

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Question	Expected Answers	Marks
6 (a)	<p>E - synaptic cleft / synapse / synaptic gap; F - postsynaptic membrane; G - bouton terminal / synaptic knob / synaptic bulb / end button; H – vesicles / acetylcholine / ACh / (named) transmitter substance;</p>	4
(b)	<p>1 depolarisation / action potential / sodium channels open, of presynaptic membrane / axon / cell A; R impulse 2 increased permeability to calcium ions / calcium channels open; 3 calcium ions enter; 4 (calcium ions cause) vesicles to fuse with, membrane / exocytosis; 5 acetylcholine / Ach / neurotransmitter, released into cleft; 6 <u>diffusion</u> across gap; 7 binds to receptors / proteins; 8 on post synaptic membrane; 9 opening of sodium ion channels; R if ref to potassium channels opening at same time 10 causes depolarization / sodium ions enter neurone; 11 if reaches threshold value; 12 an action potential is fired; R impulse is fired 13 ref to role of mitochondria / ATP; 14 AVP; e.g. details on channels or large calcium gradient.</p>	<p>max 7</p> <p>1</p> <p>max 8</p>
(c)	<p>electrical resistance / insulation; impermeable to sodium / potassium ions; ref to nodes as sites of depolarisation / movement of sodium and potassium ions; saltatory conduction / jumps from node to node / increased lengths of local circuits; fast conduction;</p>	max 3
(d)	<p>action potential is fixed in, size / amplitude ; either produced in full as result of stimulus greater than threshold or not at all;</p>	2
[Total: 17]		

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Question	Expected Answers	Marks
7 (a)	<p>maintenance of internal environment / named internal examples; at set point / constant / normal level / stable / within normal limits; despite changes in external environment;</p>	max 2
(b)	<p><i>in context of low water content (ora high water content of blood)</i></p> <ol style="list-style-type: none"> 1 low water content / potential causes release of ADH; 2 acts on collecting ducts / distal convoluted tubule; 3 ADH binds to, receptors / proteins; 4 activates enzyme in cells; 5 increases the number of water permeable channels / makes membrane or cells more permeable to water; 6 water reabsorbed, into tissue fluid / out of collecting duct / out of DCT; 7 <u>down</u>, water potential / osmotic gradient; A by osmosis; 8 into, blood vessels / vasa recta / blood; 9 high concentration of salts / low water potential, between collecting ducts / in medulla; 10 ref to role of loops of Henle (in creating high concentration of salts); 11 urine is (more) concentrated / less water lost in urine / AW; 12 water content of blood restored to normal; 13 AVP; e.g. action of aldosterone 14 AVP length of loop of Henle and environment slow breakdown of ADH ref to osmoreceptors / hypothalamus 	max 7

[Total: 9]