

Mark Scheme for June 2010

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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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.
- 9 Abbreviations, annotations and conventions used in the 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
	()	= 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)		between different species ;	1
	(b)		there are other, prey species / food ;	1
	(c)		feed at different depths ; feed on, different species / named species ; ref. to figures from table ; little overlap in <u>niches</u> ; relate to different size of, beaks / necks / birds ;	max 4
	(d)		nesting sites / territories / other foods / nesting materials ; <i>If list of resources mark first only</i>	1
				[Total: 7]

Question			Expected Answers	Marks
2	(a)	(i)	award two marks if correct answer (180 000) is given award one mark for calculation – if answer incorrect 125 x 60 x 24 ; 180 000 ;	2
		(ii)	award two marks if correct answer (99-99.2) is given award one mark for calculation – if answer incorrect ecf applies if uses incorrect answer from (a) (i) 180 000 – 1500 ÷ 180 000 x 100 ; 99 – 99.2 ;	2
	(b)	(i)	Too large / greater RMM than 68 000 - 70 000 / unable to pass through <u>basement membrane</u> ;	1
		(ii)	reabsorbed ; in, proximal convoluted tubule / pct ; cotransport with sodium ions ;	max 2
		(iii)	water is reabsorbed (from filtrate) ; (approximately half) urea remains in urine; <i>must be linked to first marking point</i> R all urea ref. to reabsorption of other substances ;	max 2
		(iv)	uric acid ; creatinine ; ammonium ions / ammonia ; hormones / named hormone ; AVP ; e.g. bile pigments R creatine	max 2

	(c)	<p>1 osmoreceptors in hypothalamus ;</p> <p>2 (hypothalamus) detects low water potential of blood / AW ;</p> <p>3 (production of) ADH ;</p> <p>4 by hypothalamus ;</p> <p>5 (ADH passes to and from) <u>posterior</u> pituitary ;</p> <p>6 released / transported , in blood ;</p> <p>7 acts on collecting ducts (of kidney) ;</p> <p>8 binds to receptor (in plasma membrane of collecting duct cells) ;</p> <p>9 activates (phosphorylase) enzyme ;</p> <p>10 causes vesicles with, water permeable channels / aquaporins ;</p> <p>11 to bind with plasma membrane ;</p> <p>12 increased permeability to water ;</p> <p>13 water reabsorbed by osmosis ;</p> <p>14 stimulation of thirst centre of brain / feel thirsty ;</p> <p>15 water potential of blood rises switching off ADH release ;</p> <p>16 AVP; e.g. ref. to phosphorylase enzyme ref. to neurosecretion / ADH transported via axons ref. to nerve impulses passing from hypothalamus to pituitary ref. to how water potential gradient in medulla is set up.</p>	max 7
		<p>QWC – clear well organised using specialist terms ;</p> <p><i>Award the QWC mark if four of the following terms are used in the correct context</i></p> <p>osmoreceptors, pituitary gland, hypothalamus, collecting duct , vesicle, aquaporins, phosphorylase, neurosecretion.</p>	1
			[Total:19]

Question			Expected Answers	Marks
3	(a)		<p><i>chinchilla</i> – $C^{Ch}C^{Ch}$ $C^{Ch}C^H$ $C^{Ch}C^a$;</p> <p><i>agouti</i> – C^AC^A C^AC^{ch} C^AC^H C^AC^a ;</p>	2
	(b)	(i)	test cross ; A back cross	1
		(ii)	<p>Himalayan rabbit either C^HC^H or C^HC^a ;</p> <p>A correctly derived gametes in genetic diagram</p> <p>albino rabbit must be C^aC^a ;</p> <p>albino offspring produced if Himalayan rabbit is heterozygous / ora ;</p> <p><i>if genetic diagrams given with no annotations, max 2</i></p>	3
	(c)		<p><i>stability</i></p> <p>1 limited, food supply / space ;</p> <p>2 competition ;</p> <p>3 predation ;</p> <p>4 disease ;</p> <p>5 reached carrying capacity / death rate = birth rate ; <i>internal max 3</i></p> <p><i>gene pool</i></p> <p>6 individuals show variation;</p> <p>7 variation due to, combination of alleles / mutations ;</p> <p>8 best adapted survive / ora ; A <i>survival of fittest idea</i></p> <p>9 reproduce ;</p> <p>10 pass alleles to offspring ;</p> <p>11 frequency of favourable alleles will, increase / be maintained ; A ora <i>internal max 3</i></p>	max 5
				[Total: 11]

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

Question			Expected Answers	Marks
5	(a)		photosystems / antennae complex / LHC / quantasome;	1
	(b)		chlorophyll; <i>treat a and b as neutral</i>	1
	(c)		electron carrier / cytochrome / protein / electron acceptor / ferredoxin / plastoquinone;	1
	(d)		higher concentration of / more, hydrogen ions / protons; R hydrogen, H A hydrogen ions produced in lumen	1
	(e)		hydrogen ions / move down gradient / diffuse; <i>allow ecf if candidates do not refer to ions</i> ref. to an electrochemical gradient / proton motive force ; across / through, (thylakoid) membrane / lumen, to stroma ; (through) ATP synth(et)ase / protein channel / stalked particles ; generates ATP ; by chemiosmosis ;	max 3
	(f)		no <u>photophosphorylation</u> ; no ATP produced ; no NADP red produced ; no, Calvin cycle / light independent / dark stage ; no, GP to TP / TP to RuBP ; no fixation of carbon dioxide ; no production of, organic molecules / named organic molecules ; A autotrophic nutrition stops R food Ref. to no respiratory substrate ;	max 5
	(g)		do not absorb the chemical ; thick cuticle / small surface area of leaves / AW ; resistant; R immune break herbicide down / have specific enzymes / inhibit herbicide ; have tolerance allele ; AVP; e.g. ref. to mutation, natural selection.	max 2
				[Total: 14]

Question			Expected Answers	Marks
6	(a)	O P I Z Y	Where, repressor / I, binds / AW ; where <u>RNA polymerase</u> binds / AW ; prevents <u>RNA polymerase</u> binding with, promoter/P ; <i>if correct answer given to P accept 'prevents RNA polymerase binding'</i> binds to, operator / O ; breaks down lactose ; increases uptake of lactose ;	max 5
	(b)		(regulator gene) produces, repressor protein / I ; binds to, operator region / O ; prevents RNA polymerase binding; no, transcription / reading of, genes / lac Z / lac Y; saves energy ; saves, amino acids / resources ;	max 3
	(c)		lactose binds to repressor ; changes its shape / AW ; unable to bind to, operator/O ; transcription / reading of genes ; translation / protein synthesis / production of (named) enzymes ; breakdown of lactose ; AVP; e.g. lactose broken down to glucose and galactose.	max 4
				[Total: 12]

Question			Expected Answers	Marks
7	(a)		ratio of, volume / amount of, carbon dioxide given out to, volume / amount, of oxygen taken in ; or <u>volume / amounts of carbon dioxide given out</u> volume /amounts of oxygen taken in	1
	(b)		55 CO ₂ ; 50 H ₂ O ;	2
	(c)		55/77 ; 0.7 / 0.71 ; (2 marks for correct value if no working present) 2 marks for correct value if no working present ecf if correctly use wrong figures from (b)	2
	(d)		lipid / oil / fat / triglyceride ; ecf	1
	(e)		Overall RQ decreases as oxygen availability increases ; Immediately soaking prevents oxygen entering ; anaerobic respiration ; therefore high RQ value ; 12 hours becoming more aerobic / less anaerobic ; absorption of oxygen 36 hours aerobic after 36 hours ; Radicke splits, testa / AW, to allow oxygen in ; mainly carbohydrate ; value very close to 1.0 ;	max 4
				[Total: 10]

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