UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Level and GCE Advanced Subsidiary Level

MARK SCHEME for the May/June 2006 question paper

9700 BIOLOGY

9700/04 Paper 4

Maximum raw mark 60

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 Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

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 must be read in conjunction with the question papers and the *Report on the Examination*.

The minimum marks in these components needed for various grades were previously published with these mark schemes, but are now instead included in the Report on the Examination for this session.

- CIE will not enter into discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the May/June 2006 question papers for most IGCSE and GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

UNIVERSITY of CAMBRIDGE
International Examinations

Question	Expected Answers	Marks
1 (a)	cytoplasm ;	[1]
(b)	hexose bisphosphate / phosphorylated 6C sugar / fructose bisphosphate ;	[1]
(c)	hexose energy rich ; does not react easily / AW ; phosphorylation activates hexose ; maintains concentration gradient of glucose inside and outside cell ;	[2 max]
(d)	does not enter Krebs cycle ; decarboxylated / CO_2 released ; forms ethanal ; reduced / ref: reduced NAD ; to ethanol ; reduced NAD does not enter ETC ; ref: alcohol dehydrogenase ; irreversible ;	[4 max]
		[Total: 8]
2 (a) (i)	at low light intensities ; rate of photosynthesis is proportional to light intensity / light intensity is limiting ; after 1 units of light ; rate levels off / reaches plateau ; relevant fig plus units ;	[3 max]
(ii)	(B) after 3 units light intensity not limiting ; CO_2 now limiting ; (C) curve continues to increase until 5 units of light ; light intensity limiting ; correct description of law of limiting factors ; detail. collisions of CO_2 and enzymes ; AVP ; e.g., further detail of enzymes	[4 max]
(b)	optimum temperature ; method e.g. heaters / ventilation ; optimum CO_2 concentration ; burners / combustion / add dry ice / pump in CO_2 up to 1% ; high light intensity / longer duration of light / artificial lighting ; ref. irrigation ; ref. fertilisers ; ref. pest / disease control ; ref. artificial pollination ;	[2 max]
		[Total: 9]

© University of Cambridge International Examinations 2006

Question	Expected Answers	Marks
3 (a)	A – basement membrane ; B – minor process / foot ;	**[2]**
(b)	arrow going from capillary (through pore in capillary wall) and through gaps in podocyte processes ; arrow continues into renal capsule ;	**[2]**
(c) (i)	glomerular filtrate ;	**[1]**
(ii)	less protein ; no large protein ; ref. less than MM 68 000 to 69 000 ; no blood cells ; AVP ;	**[2 max]**
(d)	sufficient hydrostatic (blood) pressure ; comparison between afferent and efferent vessels ; to force fluid through ; basement membrane ; selective barrier / AW ;	**[3 max]**
		[Total: 10]
4 (a)	acetylcholine / Ach ;	**[1]**
(b)	wave of depolarisation / action potential, in pre-synaptic axon / membrane ; Ca^{2+} channels open ; Ca^{2+} enter pre-synaptic neurone / synaptic knob ; causes synaptic vesicles to move towards presynaptic membrane ; ref. exocytosis of Ach / neurotransmitter ;	**[4 max]**
(c)	vesicles found **only** in, pre-synaptic knob / neurone ; receptors found **only** in post-synaptic membrane ;	**[2]**
		[Total: 7]
5 (a)	parental genotypes ; e.g. AaBb x AaBb gametes ; correct use of punnett square ; F1 genotypes ; F1 phenotypes ; (must link to genotypes) yellow and sphere $^{1}/_{16}$;	**[6]**
(b) (i)	contract / die from, malaria ;	**[1]**
(ii)	contract / die from, sickle-cell anaemia ;	**[1]**
(c)	resistant to malaria ; detail ; more likely to survive ; and reproduce ; pass on sickle-cell allele ;	**[3 max]**
		[Total: 11]

© University of Cambridge International Examinations 2006

Question			Expected Answers	Marks
6	(a)	1	maintenance of constant / stable, internal environment ;	
		2	despite changes in external environment ;	
		3	negative feedback ;	
		4	receptor and effector ;	
		5	beta cells ;	
		6	in islets of langerhans / pancreas ;	
		7	release insulin (into blood) ;	
		8	alpha cells stop releasing glucagon ;	
		9	affects liver / muscle cells ;	
		10	increased permeability to glucose / absorption from blood ;	
		11	increased use of glucose in respiration ;	
		12	increase in conversion of glucose to glycogen ;	
		13	stored in liver and muscles ;	
		14	fall in blood glucose concentration / return to normal ;	**[8 max]**
	(b)	15	low blood water content / water potential ;	
		16	detected by osmoreceptors ;	
		17	in hypothalamus ;	
		18	ADH produced / released ;	
		19	from posterior pituitary gland ;	
		20	target kidney ;	
		21	cells of collecting duct ;	
		22	binds to receptors ;	
		23	vesicles with water permeable channels ;	
		24	fuse with cell membrane ;	
		25	cells more permeable to water / water passes into cells ;	
		26	urine lower volume ;	
		27	higher concentration ;	**[7 max]**
				[Total: 15]

© University of Cambridge International Examinations 2006

Question			Expected Answers	Marks
7	(a)	1	individuals in population have great reproductive potential / AW ;	
		2	numbers in population remain roughly constant ;	
		3	many fail to survive / die ;	
		4	do not reproduce ;	
		5	due to environmental factors / named factor ;	
		6	variation in members of population ;	
		7	those best adapted survive ;	
		8	reproduce / pass on alleles ; **R** genes	
		9	genetic variation leads to change in phenotype ;	
		10	ref: changes in gene pool ;	
		11	<u>over time</u> produces evolutionary change ;	
		12	new species arise from existing ones	**[8 max]**
	(b)	13	gene) example ; (sickle cell / PKU)	
		14	change in gene / DNA / base change ;	
		15	different amino acid ;	
		16	different polypeptide / different protein / non-functional protein ;	
		17	AVP ; details	
		18	AVP ; details	
		19	(chromosome) example ; (Down's, Turner's syndromes)	
		20	structural changes in chromosomes ;	
		21	change in number of chromosomes ;	
		22	change in sets of chromosomes / ref. polyploidy ;	
		23	AVP ; details	
		24	AVP ; details	**[7 max]**
				[Total: 15]

© University of Cambridge International Examinations 2006