UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary and Advanced Level

MARK SCHEME for the June 2005 question paper

9700 BIOLOGY

9700/02 **Paper 2 (Structured Questions AS), maximum mark 60**

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. This 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*.

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

CIE is publishing the mark schemes for the June 2005 question papers for most IGCSE and GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

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International Examinations

Grade thresholds for Syllabus 9700 (Biology) in the June 2005 examination.

	maximum mark available	minimum mark required for grade:		
		A	B	E
Component 2	60	44	39	25

The thresholds (minimum marks) for Grades C and D are normally set by dividing the mark range between the B and the E thresholds into three. For example, if the difference between the B and the E threshold is 24 marks, the C threshold is set 8 marks below the B threshold and the D threshold is set another 8 marks down. If dividing the interval by three results in a fraction of a mark, then the threshold is normally rounded down.

June 2005

GCE A AND AS LEVEL

MARK SCHEME

MAXIMUM MARK: 60

SYLLABUS/COMPONENT: 9700/02

BIOLOGY
Paper 2 (Structured Questions AS)

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Question		Expected Answers		Marks
1	(a)	**W**	cytosine;	
		X	deoxyribose;	
		Y	nucleotide (triphosphate);	**[3]**
	(b)	base pairing/A-T and C-G; **A** purine - pyrimidine		
		ref to complementary/explained with ref to H bonds; **R** complementary in wrong context		
		(free) nucleotides pair with both, strands/each strand/polynucleotides/sides;		
		both strands act as templates;		
		to produce two DNA molecules that are identical to one another;		**[max 3]**
	(c)	(all nuclei/cells) are genetically identical; **A** genetic stability, same genetic information, exact genetic material, genetic material does not vary, same genotype;		
		no mutation;		
		any consequence of mutation;		
		e.g. cells not recognised, cells divide uncontrollably, substitution of 1 amino acid results in disease e.g. sickle cell anaemia, enzyme's active site altered, forms different protein with different function.		**[max 2]**

[Total: 8]

Question			Expected Answers	Marks
2	(a)	(i)	**X** to xylem vessel; **S** to phloem sieve tube element; **R** companion cell **E** to lower epidermal cell; (including guard cells) **R** cuticle **D** to palisade mesophyll cell;	**[4]**
		(ii)	Award 1 mark for correct working; Award 1 mark for correct answer; **Expect 120/0.5 = 240** **A** 119 - 121/0.5 = 238 - 242 or any working that gives the correct answer **R** all others,	**[2]**
	(b)		sucrose; amino acids; **A** two named amino acids for two marks	**[2]**
	(c)		lower/more negative, water potential; **A** ref to water potential gradient/xylem has a higher water potential **R** less water potential (of) spongy mesophyll cell/tissue; **R** leaf cells large surface area/many cell walls(of spongy mesophyll cells); (moves through) through cell walls/surfaces; **R** ref to appoplast/symplast evaporation of water; from spongy mesophyll cell walls; into (substomatal/intercellular) air space; diffusion of water vapour; through stomata;	**[max 4]**
				[Total: 12]

Question	Expected Answers	Marks
3 (a)	4 polypeptides/4 globins/4 amino acid chains;	
	outwardly pointing hydrophilic (R) groups, maintain solubility/AW;	
	each with a haem group;	
	ref to iron/Fe^{2+} (ion); **R** Fe^{3+}/iron atom	
	temporary attachment to oxygen; **A** readily attaches/binds combines with **R** oxygen binds to haem	
	4 molecules of oxygen; **A** 4 O_2/8 oxygen atoms **R** 4 oxygens unqualified	
	oxyhaemoglobin; **A** HbO_8	
	ref to cooperative binding;	**[max 4]**
(b)	part of the circulation partial pressure of oxygen/kPa % saturation of haemoglobin	
	capillaries in the lungs accept answers between 12 and 14;	
	capillaries in muscle tissue at rest 5;	
	capillaries in muscle tissue during strenuous exercise 20;	**[3]**
(c)	carbon dioxide reacts with water to form carbonic acid;	
	catalysed by carbonic anhydrase;	
	dissociates to hydrogen carbonate and hydrogen ions;	
	hydrogen ions combine with haemoglobin; **R** hydrogen ions replace oxygen in haemoglobin	
	forms haemoglobinic acid/HHb;	
	so releasing oxygen;	
	ignore ref to Bohr shift (question says 'explain')	
	A from equations.	**[max 3]**
		[Total: 10]

Question			Expected Answers	Marks
4	(a)	(i)	**A** transcription; (ignore mRNA synthesis)	
			B translation;	
			C exocytosis; **R** secretion	**[max 3]**
		(ii)	**D** (sub unit of) ribosome	
			E Golgi apparatus/body;	**[2]**
		(iii)	**F** mRNA;	**[1]**
	(b)		active site;	
			(is) specific shape; **A** complementary/other amino acids are the wrong shape to fit, **R** same shape	
			only accepts R groups of these two amino acids; **R** accepts peptide bond	**[2]**
	(c)		correct bond broken (between C-N);	
			involvement of water molecule in breaking the peptide bond shown clearly;	
			two amino acids with free groups as follows	
			$-COOH/-COO^-$ and $-NH_2/-NH_3^+$;	
			A from diagram(s).	**[3]**
				[Total: 11]

Question	Expected Answers	Marks
5 (a)	1 mark for working 86.5/809 x 100 (= 10.69); **A** 42 + 42 + 2.5/400 + 409 x 100 **R** 42/400 x 100 = 10.5 = 11 1 mark for correct answer 11%; **R** 10.7/other units if specified	**[2]**
(b)	Energy losses in respiration; **R** used up in/needed in respiration, energy lost in movement waste/urine/faeces/dead parts/excreta/excretion; primary consumers do not eat all the plant matter; **A** for secondary consumers not all parts of, plants/primary consumers, are digestible; energy losses as heat qualified e.g. in digestive system (of consumers)/to environment/atmosphere/surroundings; plants/primary consumers, migrate/swept away, by tide/waves AW; energy losses to decomposers;	**[max 4]**
(c)	proteins → amino acids; **A** proteins are decayed into amino acids deamination; ammonification/ammonia/ammonium ion; ammonia/ammonium ions, to nitrate; **A** nitrification oxidation;	**[max 2]**
		[Total: 8]

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

6 **(a)** <u>one mark per row, do not penalise where crosses are omitted</u>

Statement	plasma	tissue fluid	lymph	cytoplasm of red blood cells
contains haemoglobin	×	×	×	✓
contains water	✓	✓	✓	✓
contains antibodies	✓	✓	✓	×
in direct contact with muscle cells	×	✓	×	×

[4]

(b) increases heart rate;

increases blood pressure;

constricts, arterioles/arteries; **A** narrows diameter/lumen **R** ref to blood vessels

reduces blood flow to, periphery/hands/fingers/AW;

increases 'stickiness' of platelets; **R** blood cells

ref to atheroma, plaque, atherosclerosis, cardiovascular disease, damage to endothelium;

<u>Generally, mark 1st 2 sentences (look for full stops!). However if 2 correct points in 1st sentence allow this.</u> **[max 2]**

(c) <u>mark two parts together</u>

(in every country) the death rate for men is higher than that for women; **R** ref to % of death

in some countries where many people smoke there are low death rates from lung cancer;

data quote to support either part;

<u>Here we need to be very precise! We can accept male or female data quoted in the correct context. R any 'ADDITIVE %s'!/incorrect units.</u> **[max 3]**

(d) age;

how long men have been smoking/age at which start smoking;

how many cigarettes are smoked per day; **A** heavy/light smokers

any 2 risk factors that are linked with lung cancer;;

e.g. Hereditary/running in families;

working environment (pollution/passive smoking/exposure to other carcinogens/radiation);

type of cigarette(tar levels/cigars/cigarettes smoked/brand of cigarette/whether filtered/unfiltered);

depth of inhalation;

R refs to diet/alcohol/lifestyle/stress. **[max 2]**

[Total: 11]