ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme June 2002

GCE

Biology B

Unit BYB4

SECTION A

Question 1

(a)		X = grana/lamellae/thylakoid (membranes); Y = stroma;	2
(b)		NADPH$_2$/ NADPH/ reduced NADP/reduced coenzyme; ATP;	2
(c)		carbon dioxide/CO_2;	1
(d)	(i)	stroma; NOT “Y”	1
	(ii)	production/breakdown of starch (or equivalent);	1
		Total	7

Question 2

(a)	*Oryctolagus, Helix, Trichonympha*; (reject if specific names included) (not insisting on generic capitals) *any two for 1 mark*	1
(b)	Animals, Protoctists, Prokaryotes;; (accept Latin equivalents) *any two for one mark, all three for both*	2
(c)	that (they are) fertile;	1
	Total	4

Question 3

(a) *Mark across whole of two parts in (a) to credit the following possible points*

(structure)	*Distant object*	*Close object*
Cornea	- converges light/refracts/bends light;	
suspensory ligament	- in tension	- tension relaxed;
Ciliary Body	- relaxed;	- contracts;
Lens	- pulled thin;	- allowed to become fatter/more spherical;
	- the more convex/fatter the lens, the shorter focal length (or converse)	

Each itemised point in a box (-) worth one mark. Any 6 from 8 points.

(b) (i) only blue-(sensitive) cones/cells stimulated; 1

(ii) (mixture of) green- and red(-sensitive) cones/cells stimulated; 1

(c) value or range 575 to 600(nm) (accept any range within 551 to 649 nm); 1

(d) there are two phases/sections to the curve (or equivalent idea) OR one cell type reaches full sensitivity before other; (ignore any 'cell' identification if wrong) 1

(e) rhodopsin was bleached/is resynthesised;
to/ from pigment/retinal;
and to/from protein/opsin;
any 2 from 3 2

Total 12

Question 4

(a)		(acetylcholine) made in/stored in synaptic vesicles; released into (synaptic) cleft; diffuses/moves across (cleft); binds to protein/receptor molecules on (postsynaptic) membrane/neurone; causes depolarisation/action potential/new impulse (in postsynaptic neurone); *any 3 from 5*	3
(b)		to provide energy for the (re)<u>synthesis</u> of Ach OR associated active transport;	1
(c)		receptor detects <u>stimulus</u>; impulse to muscle *(escape response effected by muscle to withdraw head into burrow)* muscle (M) longitudinal OR when it contracts it pulls animal shorter; no coordinator involved/only 3 neurones in reflex (arc); reflex is 'automatic' (or equivalent point); *any 3 from 5*	3
(d)		(impulses) may cross synapses in one direction only/transmitter may only travel one way;	1
(e)	(i)	axon P myelinated; OR axon diameter of P greater (than that of other axons);	1
	(ii)	(increased speed of escape response) increases the animal's chances of <u>survival</u>;	1
		Total	10

Question 5

(a)	D;	1
(b)	Krebs cycle; electron transport/transfer chain/oxidative phosphorylation; (glycolysis negates one point of credit) (link reaction and glycogenesis etc. are 'neutral')	2
(c)	some radioactivity in intermediates/other compounds (e.g. glucose); ACCEPT idea of less present because of radioactive decay; NOT because of 'rounding off'	1
(d)	(1200 / 8000) x 100; 15 (%); (*allow (1800 / 8000) x 100 = 22.5% for 1 mark)* *(2 marks for the correct answer as 15% without working, 1 mark for 22.5%))*	2
	Total	6

Question 6

(a) sandy stated as heterozygous/suitable allusion to alleles;
suitable cross chosen; (as in table) *N.B. second two points linked, not stand-alone*
explained why could not be codominance;

Suitable cross	*Reason why **not** codominance*
3 and 4	Offspring should all be sandy
10 and 11	Offspring should all be sandy
7 and 8	Offspring should all be read

BUT if candidate assumes sandy is homozygous, mark accordingly e.g. "look at cross 1 and 2; all their offspring would be sandy;" and not that, if red or white then identified as heterozygote, then full 3 marks are still possible. 3

(b) 11 aabb,
10 = AaBb, *(N.B. only possibility, not A-B-)*
2 = A_bb or aa B- (or one possible genotype);;
if all 3 correct – 2 marks/ if 2 correct - 1 mark; one or fewer – 0 marks 2

(c) *1 mark for each element of clear explanation i.e.*
- choice of a suitable piece of evidence;
- explaining why Hypothesis 2 could not account for the observed result;

(only cross really possible is 1 and 2) i.e. if sandy was aaB_, individuals 1 and 2 would both have been aaB; so their offspring could only be either white or sandy (as no A alleles present); 2

(d) (*Mark line by line, not to 'first error': do not allow for consequential errors)*

	Individual 18	*Other parent*
Parental genotypes	**AaBb;**	*No mark for this (Aabb)*
Parental gametes	**AB Ab aB ab** *and*	**Ab ab;**

Offspring genotypes

AABb	**AAbb**	**AaBb**	**Aabb**
AaBb	**Aabb**	**aaBb**	**aabb**

(Punnett not necessary

Offspring phenotypes	**red**	**sandy**	**white**
Expected ratio	**3**	**4**	**1**;

4

Total 11

SECTION B

Question 7

(a)	(i)	amino acids;	1
	(ii)	deamination/oxidation/redox;	1
	(iii)	liver;	1
(b)		urea; (IGNORE ornithine cycle intermediates)	1
(c)	(i)	acetate/acetyl coenzyme A (and carbon dioxide);	1
	(ii)	<u>matrix</u> of <u>mitochondrion</u>;	1
	(iii)	<u>ATP</u>;	1

(d)

- detection by osmoreceptors;
- in hypothalamus;
- <u>impulses</u> to pituitary;
- pituitary produces/stores ADH; (*IGNORE issue of anterior or posterior)*
- ADH increases permeability of the collecting duct;
- of <u>distal</u> convoluted tubule;
- causes <u>more</u> water reabsorption;
- which raises blood WP;
- *(negative feedback explained re.)* explanation of norm level (of blood water potential);
- departure from the norm brings about a corrective mechanism, which restores the norm;
- ADH production inhibited/reduced if/as blood WP rises;

Any 8 from 11 8

Total 15

Question 8

(a) (i) *diagram should indicate:* (appropriate) separation;
and then either: homologous partners distinguished;
chromosomes shown made up of two chromatids; 2

(ii) TB, Tb, tB, tb; 1

(b) (i) if chromosomes segregate without crossing over, only two gametic types possible (TA & ta);
crossing over enables exchange of chromosomal/genetic material (between them);
so new/different combinations of alleles produced (or specific example);
(*below) any 2 from 3 (approach may also be diagrammatical)* 2

(ii) more normal gamete types/crossing over (between loci) necessary/ rareness of event; 1

(iii) presence of chiasma/chiasmata; or drawn 1

(c) (1) independent assortment/random alignment of chromosomes;
new arrangement of alleles;
(2) random fertilisation;
chance combinations of gametes;
(3) mutation (or suitable description of);
creates new alleles/allelic combinations (by changes in DNA);
any two 'causes', to maximum of 4 from 6

*(**NOTE** in any answer, full credit can be achieved only within TWO of possible three factors)* 4

(d) *(between the two groups)*
discontinuous variation
- discontinuous variation because the two groups don't overlap;
- genetic difference/major environmental difference;
- 2 different alleles at locus; (or similar);

continuous variation
- continous variation as small sample size causes absence of 9-seed pods;
- probably caused by environmental factor(s);
- bimodal distribution explained as genetic difference/ major environmental cause;

(within each group)
continuous variation
- continuous variation as (complete) spread of seed numbers (within range);
- because many alleles/polygenic;
- probably caused by environmental factor(s);

any 4 from 9 4

Total 15

Quality of Written Communication 1