



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme

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GCE

Biology B

Unit BYB4

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Registered address: Addleshaw Booth & Co., Sovereign House, PO Box 8, Sovereign Street, Leeds LS1 1HQ
Kathleen Tattersall: *Director General*

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 <u>starch</u> (or equivalent);	1
	Total	7

Question 2

(a)	<i>Oryctolagus, Helix, Trichonympha</i> ; (reject if specific names included) (not insisting on generic capitals) <i>any two for 1 mark</i>	1
(b)	Animals, Protoctists, Prokaryotes;; (accept Latin equivalents) <i>any two for one mark, all three for both</i>	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

<i>(structure)</i>	<i>Distant object</i>	<i>Close object</i>
<i>Cornea</i>	- converges light/refracts/bends light;	
<i>suspensory ligament</i>	- in tension	- tension relaxed;
<i>Ciliary Body</i>	- relaxed;	- contracts;
<i>Lens</i>	- 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)synthesis of Ach OR associated active transport; 1
- (c) receptor detects stimulus;
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 survival; 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) $(1200 / 8000) \times 100$;
15 (%);
(allow $(1800 / 8000) \times 100 = 22.5\%$ 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;

<i>Suitable cross</i>	<i>Reason why not codominance</i>
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 aaB- (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)*

<i>Parental genotypes</i>	<i>Individual 18</i> AaBb;	<i>Other parent</i> <i>No mark for this (Aabb)</i>	
<i>Parental gametes</i>	AB Ab aB ab	<i>and</i>	
<i>Offspring genotypes</i>	AB	Ab	aB
	AABb	AAbb	AaBb
	AaBb	Aabb	aaBb
<i>Offspring phenotypes</i>	red	sandy	
<i>Expected ratio</i>	3	4	
		white	
		1;	

(Punnett not necessary)

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)	<input type="checkbox"/> detection by osmoreceptors; <input type="checkbox"/> in hypothalamus; <input type="checkbox"/> <u>impulses</u> to pituitary; <input type="checkbox"/> pituitary produces/stores ADH; (<i>IGNORE issue of anterior or posterior</i>) <input type="checkbox"/> ADH increases permeability of the collecting duct; <input type="checkbox"/> of <u>distal</u> convoluted tubule; <input type="checkbox"/> causes <u>more</u> water reabsorption; <input type="checkbox"/> which raises blood WP; <input type="checkbox"/> (<i>negative feedback explained re.</i>) explanation of norm level (of blood water potential); <input type="checkbox"/> departure from the norm brings about a corrective mechanism, which restores the norm; <input type="checkbox"/> ADH production inhibited/reduced if/as blood WP rises; <i>Any 8 from 11</i>	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/
rarity 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**
- continuous 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