



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme

June 2003

GCE

Biology B

Unit BYB4

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SECTION A**Question 1**

(a)

	Process	
	Respiration	Photosynthesis
Name of coenzyme	NAD	NADP
Stage in the process where coenzyme is reduced	<i>Glycolysis and link reaction/Krebs cycle</i>	<i>light dependent</i>
Stage in the process where coenzyme is oxidised	<i>electron transport chain</i>	<i>light independent</i>

1st column,
glycolysis and Krebs cycle/link reaction;
oxidative phosphorylation/ETC;
2nd column,
light dependent, then light independent;

3

(b) used to reduce G3P;
to sugar/triose phosphate/fructose/glucose;

2

Total 5

Question 2

- (a) (i) antibody cannot get through pores (and attack cells);
glucose small enough to (diffuse) enter / hormones can leave;
protects from lymphocytes / no antigen on silicon box; 2 max
- (ii) killing animals to use for human (transplant);
religious objections;
other valid suggestion; 1 max
- (b) rise/fall in rat blood sugar means more/less glucose enters (diffuses) into box;
detected by animal pancreas cells that release insulin/glucagon;
insulin (diffuses) into rat's blood;
insulin/glucagon makes rat's cells take up/release more glucose; 3 max
- Total 6
-

Question 3

- (a) (i) pyruvate; 1
- (ii) reacts (with coenzyme A) to give acetylcoenzyme A;
decarboxylation / CO₂ given off;
NAD reduced / oxidation; 2
- (b) only glycolysis in anaerobic conditions / CO₂ only produced in Krebs cycle;
with oxygen get aerobic respiration involving Krebs cycle / link reaction;
with release of (radioactively labelled) carbon dioxide;
CO₂ given off in link reaction; 3 max
- Total 6
-

Question 4

- (a) X – ADP,
Y – phosphate/P_i/Ⓟ; 1
- (b) (*candidates may start at any point but must refer to stages*)
 Stage **A**, binding cause(d) myosin head to move and pull actin past;
 Stage **B**, binding of ATP releases myosin head from actin;
 leading to movement of myosin head in Stage **C**;
B/C/D linked to breakdown of ATP to ADP and phosphate;
 Stage **D**, myosin head binds to actin;
 binds to actin to left of first one;
 also causes ADP and phosphate release; 4 max
- (c) without ATP, myosin heads remain bound (to actin); 1
- Total 6
-

Question 5

- (a) cones sensitive to colour/different wavelengths of light;
 three types of cones, red, green and blue absorbing;
 colours due to combinations of cones stimulated; 3
- (b) (i) (with reference to peak absorption)
 both have three different types of cells/three peaks of absorption;
 two types very similar, about 450 nm and 525-550 nm;
(accept blue and green)
 human type at 600 nm and moth type at 350 nm;
(accept red and UV) 2 max
- (ii) flower (has a pigment that) reflects light in 350 nm range;
 moth has cells to detect this (humans do not); 2
- (iii) pattern points to food/nectar/pollen/identifies it from
 flowers with same shape; 1
- Total 8
-

Question 6

- | | | | |
|-----|------|---|---------|
| (a) | (i) | FfGg; | 1 |
| | (ii) | DNA (in each chromosome) has replicated,
(to give two chromatids);
(so) two copies of the gene/allele, one on each chromatid; | 2 |
| (b) | | F and G bearing chromosomes on same side of equator; | 1 |
| (c) | | crossing over shown between non-sister chromatids;
in correct place;
diagram showing chromatids and alleles after cross over; | 3 |
| | | | Total 7 |
-

Question 7

- | | | | |
|-----|------|---|---------|
| (a) | | allele,
one form of a (specific) gene;
sex-linked,
on sex chromosomes/X/Y; | 1 |
| | | | 1 |
| (b) | (i) | 3 and 4 do not show the condition but 9/one male does;
4 must be carrier; | |
| | | OR | |
| | | 1 affected but not <u>daughter</u> /4;
who gets <u>X</u> from father; | 2 |
| | (ii) | grandfather/1 passed on his (affected) X chromosome
to his daughter/4;
who was unaffected, because of the 'normal' X
inherited from her mother/2;
9 inherited his X chromosome from his mother/4; | 2 max |
| | | | Total 6 |
-

Question 8

- (a) (greatly) reduces growth of field grass seedlings compared to mine waste seedlings;
wider range of effects seen with mine waste seedlings; 2
- (b) copper harms/reduces growth in field grass/group **M**
(more) resistant to/better able to grow on soil with lots of copper;
group **M** have selective advantage/product of natural selection;
group **M** have genes/alleles for copper resistance;
(*reject environmental arguments*) 2 max
- (c) suggestion; and explanation;
for example:
mutation;
producing allele for copper resistance/new protein for resistance;
OR
cross-breeding/pollination with group **M** plant;
introducing resistance allele; 2 max

Total 6

SECTION B**Question 9**

- (a) heterotrophic;
no cell walls;
blastula formation;
(chemical and) nervous control;
growth not confined to meristems;
starch in plants;
(*accept have muscles*) 3 max
- (a) Phylum, Class, Order, Family;
Ensatina eschscholtzi; 2
- (c) (i) (populations) isolated/in different areas;
no interbreeding (between populations)/gene exchange/flow;
variation in each (population); (*accept example of variation*)
due to mutation/meiosis; (*accept reference to types of mutation*)
each population adapting to its own/different environment;
through natural selection;
producing differential survival;
producing changes in allele/phenotype frequencies;
producing reproductive isolation; 4 max
- (ii) breed together salamanders from different areas;
if fertile offspring, then still same species; 2
- (iii) phenotype depends on genotype and environment;
different local environments can produce variation;
different selection pressures;
mutations producing new alleles;
meiosis produces new combinations of
alleles/example;
random fusion of gametes / sexual reproduction 4 max

Total 15

Question 10

- (a) (epithelial cell) of tubule cells carry out active transport;
transport chloride/sodium ions out (of filtrate);
against concentration gradient;
into surrounding tissue/tissue fluid;
creates/maintains water potential gradient for water reabsorption;
countercurrent multiplier; 5 max
- (b) if water potential of blood falls, detected by receptors in hypothalamus;
leads to ADH released from pituitary gland;
ADH makes cells of collecting duct/distal convoluted tubule permeable to water;
(accept DCT)
water leaves filtrate by osmosis;
smaller volume of urine produced;
(accept converse if water potential of blood rises) 4 max
- (c) (i) (autonomic reflex),
autonomic ganglion involved;
extra synapse outside the spinal cord;
inhibitory rather than excitatory neurone;
more neurones involved; 2 max
- (ii) (full bladder) stimulation of stretch receptor;
sends nerve impulses to spinal cord;
synapse with neurone connecting to brain/nerve impulses go to brain;
impulses from brain to inhibitory motor neurone;
via synapse in spinal cord;
external sphincter relaxes;
internal sphincter already relaxed so bladder empties;
(1 mark for statement that both sphincters are relaxed for urination)
4 max
- Total 15

QWC (See guidance)

1