



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme January 2002

GCE

Biology B

Unit BYB4

SECTION A**Question 1**

- | | | |
|-------|---|-------|
| (a) | A = rods AND B = cones; | 1 |
| (b) | Fovea centralis / fovea / yellow spot; | 1 |
| (c) | more receptor cells at 8 / fewer receptor cells at 12 OR
cones present in 8 / cones not present in 12;
cones capable of greater acuity (than rods);
because each cone has / is more likely (than rods) to have its own
ganglion / bipolar cell / nervous supply; | 2 max |
| Total | | 4 |
-

Question 2

- | | | |
|-------|--|---|
| (a) | (i) Centromere; | 1 |
| | (ii) Attaches (chromatids / chromosomes) to spindle (in
cell division) OR divides to separate chromatids; | 1 |
| (b) | Chromatids; | 1 |
| (c) | <u>Haploid</u> , because no homologous / paired chromosomes present /
<i>allow</i> “because all the chromosomes are different”; | 1 |
| Total | | 4 |
-

Question 3

- | | | |
|-------|--|---|
| (a) | (i) (Kidneys) <i>function</i> : removes urea from blood, <i>evidence from graph</i> : when kidneys not working the level of (blood) urea rises; | 1 |
| | (ii) (Liver) <i>function</i> : makes urea / adds urea to blood, <i>evidence from graph</i> : no rise in urea (when liver not working) OR when working, urea not removed, so level rises; | 1 |
| (b) | <i>Shown on graph. Firstly need to demonstrate change in gradient at 12 hours.</i>
Time 0 to 12 hours – steady decline in urea level (below line Q);
Curve horizontal from 12 hours;
<i>Still award full credit if the line falls to x axis within first 12 hours and remains on the x axis thereafter.</i> | 2 |
| Total | | 4 |
-

Question 4

- (a) Condominance; 1
(Allow incomplete / inheritance without dominance)
- (b) $X^B Y$ **OR** B(-); 1
- (c) Parental genotypes are given: $X^R X^R$ ($X^B Y$) - no mark
- Offspring 1 genotypes: $X^R X^B$ $X^R Y$;
- Offspring 2 genotypes: $X^R X^R$ $X^R X^B$ $X^R Y$ $X^B Y$;
- Offspring 2 phenotypes: round eyed wide-bar round eye bar-eye
 female female male male ; 3
- Ratio: 1 : 1 : 1 : 1
- (Ignore ratio unless it contradicts: be alive to other possible ratios)
(No marks as such for “gametes”, though may inform markers where unclear.)
- Total 5

Question 5

- (a) (Radioactive) carbon dioxide is used / incorporated;
New compound(s) / intermediate(s) / names egs formed /
become labelled; 2
- (b) (i) Because stops reaction(s)/ process / pathway / enzyme action /
kills algal cells; 1
- (ii) Because reactions occur quickly
OR need to remove samples after short / precise time; 1
- (c) Q → R → S → P ; 1
- (d) Idea of cycle (or equivalent);
Compound Q is used / reformed; 2
*If either above present allow identification of possible Q as: G3P /
PGA / triose phosphate / GALP / RuBP
Any two from three (noting special arrangement re. third point)*
- Total 7

Question 6

- (a) Phylum,
Order,
Genus;
Any 2 score 1, all three gain 2 marks
- (b) F. serratus and F. spiralis;
Highest % value (for non-self);
The more closely related they are, the more similar their DNA;
Explanation of value / complementarity in terms of joining strands; 3 max
(Special case: if spiralis / spiralis given, then max 1 possible if complementarity explained)
- Total 5
-

Question 7

- (a) Reduced light intensity;
Receptors identified as in retina / rods / cones;
Nerve impulses to CNS / along sensory nerve;
Nerve impulses from CNS / motor;
Sympathetic action;
To radial muscles which contract; 3 max
- (b) (i) Prevents parasympathetic NS from working
OR allows sympathetic nervous system to work unopposed; 1
- (ii) Eserine (no mark itself) involves acetylcholine;
Inhibits enzyme which normally breaks down Ach **OR** stops it being broken down;
Effect of Ach / parasympathetic effect not stopped / enhanced e.g. "Ach continues to bind to receptors" or similar; 2 max
- Total 6
-

Question 8

(a) Carbohydrate / named example from food / diet / gut; 1

(b) (i) Pancreas; 1

(ii) (1 for each hormone correct / per column)

Effect of hormone	Insulin	Glucagon
Reduces carbohydrate in reservoir D		✓
Promotes A – fat breakdown	✓	
Promotes C – protein breakdown		✓
Increases rate of outflow at E	✓	

2

(c) (i) Glycogen; 1

(ii) Fats / lipid / triglyceride / adipose; 1

(d) (Adrenaline) D; 2
(Thyroxine) E;

Total 8

Question 9

(a) The higher the altitude, the lower the frequency (or converse);
Below 400m altitude, frequency levels off / pretty constant; 2

(b) (*Higher frequencies found at certain (low) altitudes because*)
Malaria found mainly among people at low altitudes;
Because warmer here **OR** more sources of still / slow-moving water;
t allele / heterozygous condition confers some resistance
against malaria;
Selection operates / heterozygotes favoured over
homozygous (dominant); 3 max

(c) Mainland Italians didn't bring / import the t allele with them
OR hadn't been exposed previously to malaria;
Malaria not / less of a factor in Sardinia since Carloforte established;
Insufficient time / generations for selection to operate / have an effect; 2 max

Total 7

SECTION B

Question 10

- (a) Needed to make ATP / for phosphorylation; 1
- (b) (Oxygen) needed for formation of ATP / phosphorylation;
(Oxygen) used (so its level falls);
(Oxygen) reacts (with 'H') to produce water;
In the electron transport chain / at terminal acceptor;
Allows recycling of reduced coenzymes / NAD / FAD; 3 max
- (c) Because equal amounts of ADP were added; 1
- (d) Less oxygen available in medium at Z than at Y
OR because oxygen all used up / 'runs out'; 1
- (e) (i) Glucose cannot enter mitochondria BECAUSE too large to enter /
no carrier system for it;
OR glucose cannot be metabolised / equivalent BECAUSE necessary
enzymes not present; 2
*(Note single marks here for a suitable suggestion, and for a
connected, plausible reason / also that suggestion and reasons
may 'cross over'. Allow, each for 2: "no cytoplasm, no glycolysis,
not to pyruvate")*
- (ii) Label glucose and determine its failure to enter mitochondria;
'Break' mitochondrial membrane (to allow entry of glucose);
'Release' appropriate enzymes from mitochondrion;
Add glycolytic enzymes / 'cytoplasm' to medium in advance;
(**OR** suitable suggestions re. possible reason previously given) 1
- (f) Structure of sarcomere explained re. chains of sarcomeres in fibres;
Actin – thin filaments, myosin – thick filaments;
Relating sarcomere structure to thin / thick filaments
OR acting / myosin;
Idea of sliding filament hypothesis;
Cross bridges formed between actin and myosin;
ATP to ADP releasing energy;
ATP / energy required for detachment / re-attachment;
Explanation of ratchet mechanism;
Need for Ca^{++} to move tropomyosin out of way / change its shape;
Movement of tropomyosin allows attachment;
Need for Ca^{++} in splitting of ATP; 6 max
(Note that answers may use annotated diagrams)

Total 15

Question 11

- (a) (Gene 1) allele A makes enzyme converting J to K / colourless to red;
 Allele a produces no / non-functional enzyme;
 (Gene 2) allele B makes enzyme converting K to L / red to purple;
 Allele b produces no / non-functional enzyme;
 (“Recessive alleles produce no / non-functional enzyme” = 2)
 White flowers result from genotype aa;
 ... regardless if B or b / even if aaB_
 Colourless (substance) / J produces white;
 Red flowers when A_bb / enzyme 1 only;
 Purple flowers when A_B_ / enzymes 1 and 2; 6 max
- (b) (i) (1) (red parent) AAbb;
 (2) (white parent) aaBB; 2
- (ii) F₁ are AaBb;
 F₂ ratio of 9 : 3 : 4;
 Purple : red : white;
 Suitable working shown; 4
- (c) (i) aabb, aaBb, and aaBB; (allow aabb & aaB_) 1
- (ii) (Crush each type of white petal to make an extract, and)
 add some of the (red) pigment / K, to petal **OR** incubate with K;
 (extract becoming) purple is identified as aaBB **OR** that staying red,
 after K is added, is aabb; 2
- Total 15

Quality of written communication 1