



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme January 2004

GCE

Biology A/ Human Biology

Unit BYA5

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Question 1

A = Prokaryotae / Prokaryotes / Prokaryotic;
(Accept *Monera*) (Ignore '*Bacteria*')

B = Fungi / Fungus;

C = Protoctista / Proctists;

D = Plantae / Plants;

E = Animalia / Animals;

5

Total 5 marks

Question 2

- (a) Concept of preservation/maintenance – e.g. sustainable management/sustainable use of resources/management to maintain diversity/maintain forest;
(Allow ref. To '*keeping*' / '*saving*' / '*non-destruction*') 1
- (b) To avoid: Any **three** from:
- loss of species / decrease in diversity / loss of habitat / loss of niche / disruption of food chain;
- loss of pharmaceuticals / '*medicines*' / timber / '*wood*' ;
- CO₂ build-up in atmosphere / global warming / trees take in CO₂ / trees = carbon sink (described) / to maintain CO₂ in air; (NOT just '*carbon*' in air)
- leaching of ions / mud slides / flooding / desertification; max 3
- [ALLOW converse of above – e.g. '*Rainforest is a habitat for (various) species*']

Total 4 marks

Question 3

- (a) On diagram, correctly labelled:
- Light-dependent: granum/thylakoid membranes – labelled ‘X’
AND
Light-independent: stroma – labelled ‘Y’; 1
- (b) Any two from:
- (Water) forms H^+ /hydrogen ions and electrons/ e^- ;

 O_2 /oxygen formed; [*NOT* ‘O’, *NOT* ‘O⁻’]
- (Light) excites electrons / raises energy level of electrons / electrons to chlorophyll / to photosystem; max 2
- (c) (ATP) Provides energy for $GP \rightarrow TP$ / provides P for $RuP/TP \rightarrow RuBP$;

(Reduced NADP) Provides H / electrons for $GP \rightarrow TP$ / reduces GP to TP; 2

Total 5 marks

Question 4

- (a) (i) $P = C - R - U - F$ / $C - (R + U + F)$ / eq; 1
- (ii) 3.74; 1
- (b) Correct answer: 2.18 (*Accept* 2.19 or 2.2)
/ correct for candidate’s (a)(ii) ;; = 2 marks
- Correct use of data but wrong answer:
- $$\frac{(a)(ii) \times 10^6 \times 100}{21135 \times 8100}$$
 = 1 mark 2
- (c) Less energy lost as heat / in maintaining body temperature / in movement; 1

Total 5 marks

Question 5

- (a) (i) Only seen in males / not in females; 1
- (ii) Unaffected parents/mother \rightarrow child with M.D. /
 $(1 \times) 2 \rightarrow 5 / (3 \times) 4 \rightarrow 11 / 8 (x 9) \rightarrow 13$; 1
- (b) $5 = X^dY$
 $6 = X^DY$
 $7 = X^DX^d$ AND X^DX^D
 $8 = X^DX^d$; All 4 correct = 2 marks
 2 or 3 correct = 1 mark max 2
- (c) $\frac{1}{4} / 0.25 / 25\% / 1:3 / 1$ in 4; (NOT '1:4') 1

Total 5 marks

Question 6

- (a) No - very little increase / no increase in yield of grass when *Rhizobium* added / no difference between C and D; 1
- (b) Yes: increased yield with nitrates;
 Correct reference to result in graph C c.f. graph A / use of correct numbers (from C + A)
 e.g. greater yield of soyabean in C than in A /
 greater yield of soyabean with nitrate than without if no *Rhizobium*; 2
- (c) Forms mutualistic/symbiotic union with soyabean / forms root nodules / mutual benefits (/described);
 makes ammonia/ammonium; (Nitrates – CANCEL)
 Helps produce organic-N / amino acids / protein; max 3

Total 6 marks

Question 7

- (a) (i) EITHER: Correct answer: 3.45 / 3.44 / 3.4 = 2 marks
OR: Understanding of $\sum n(n-1)$ / use of $134/(2+90+12+30)$
+ wrong answer = 1 mark
- max 2
- (ii) Takes account of number of individuals/abundance/population size
(as well as number of species); 1
- (b) (i) The species at *A/F.spiralis* loses less water/loses water less rapidly/
loses less mass;
- The species at *A/F.spiralis* better adapted to/can survive where exposed
for longer / to drier conditions;
- Water conservation is necessary for metabolism / named aspect;
- The species at *A/F.spiralis* avoids competition;
- For named aspect – e.g. light/substratum/space/CO₂; max 3
[ACCEPT converse argument re. *F. serratus*]
- (ii) At site A – Any two pairs from; (must specify site to get explanation mark)
- Wave action;
Firmer grip on rock is necessary / smaller exposed surface reduces force
experienced / more (physical) damage;
- Wind;
More evaporation / more (physical) damage;
- Light;
More light / more wavelengths available / better photosynthesis;
- Temperature;
Greater range of temperature; (max. 2 x 2) 4
- (c) (i) All/the individuals/organisms/populations in an area/in a habitat; 1
(REJECT: all the species...)
(REJECT: a group of organisms...)
- (ii) At site B
- Higher (index of) diversity / more species present;
Provides more niches / shelter / habitats for other organisms;
More favourable / less hostile / less harsh environment / more stable environment;
Provides more food (for animals) / more variety of foods;
More competition; max 4

Total 15 marks

Question 8

- (a) X = Carbon dioxide;
Y = Acetyl coenzyme A; (ACCEPT Acetyl CoA)
Z = Water; 3
- (b) (i) Cytoplasm; 1
(ii) Mitochondrion; (IGNORE named part) 1
- (c) On the diagram:
- (i) 'A' (ATP used) – between glucose and triose phosphate; 1
- (ii) 'B' Any two from:
(ATP produced) – between triose phosphate and pyruvate;
in Krebs cycle;
from electron carriers
(to right of bracket & not below grey box); max 2
- (d) Any three from:
Source of energy/of phosphate;
Active transport;
Phagocytosis / endo- /exocytosis / pinocytosis;
Bile production;
Cell division / mitosis;
Synthesis of: glycogen;
protein / enzymes;
DNA / RNA;
lipid / cholesterol;
urea; max 3
- (e) Any four from:
Forms lactate; [extras – C₂H₅OH / CO₂ – CANCEL]
Use of reduced NAD / NADH;
Regenerates NAD;
- = 3 marks
- NAD can be re-used to oxidise more respiratory substrate / correct e.g. /
allows glycolysis to continue;
Can still release energy/form ATP when oxygen in short supply/
when no oxygen; max 4

Total 15 marks

Question 9

- (a)
1. Chromosomes shorten/thicken/condense;
 2. Chromosomes associate in homologous/(described) pairs / formation of bivalents / tetrads;
 3. Crossing-over / chiasma formation;
 4. Join to spindle (fibres) / moved by spindle;
 5. (At) equator/middle of cell;
 6. (join via) centromere / kinetochore;
 7. (Homologous) chromosomes move to opposite poles / chromosomes separate/move apart; (*ALLOW* ‘are pulled apart’)
 8. (Pairs of) chromatids separated in 2nd division;
- } OR “independent assortment”
unqualified = 1 mark
- max 6
- (b)
1. Crossing-over; [*IGNORE* any wrong ref. to timing]
 2. Independent/random assortment/orientation/segregation of (homologous) chromosomes in meiosis I;
 3. Independent/random assortment/orientation/segregation of chromatids in meiosis II;
- } OR “independent assortment”
unqualified = 1 mark
- + Any three from:
4. Different adaptations / some better adapted;
 5. Some survive / example described;
 6. To reproduce;
 7. Pass on gene/allele;
 8. Allows for changing environment/different environment/example described;
- max 5
- (c) (i) 21; 1
- (ii)
1. *T. aestivum* has 2 copies of each type of chromosome/is diploid;
 2. *T. aestivum*’s chromosomes can form bivalents/can assort in meiosis/ can produce haploid gametes;
 3. *T. aestivum*’s gametes receive a copy of every chromosome/ receive all the genetic information;
- 3
- [*ACCEPT* converse argument for hybrid plants]

Total 15 marks