



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme January 2003

GCE

Biology/ Human Biology A

Unit BYA5

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Unit 5: Inheritance, Evolution and Ecosystems

Question 1

(a)

Statement	Plantae	Fungi	Proctocista
Cell wall is present in some or all organisms	✓	✓	✓
Kingdom includes autotrophic organisms	✓	✗	✓
All organisms are multicellular	✓	✗	✗
Cells contain membrane-bound organelles	✓	✓	✓

[Note: Mark each column]

3

(b)

DNA not enclosed / in loop / nucleoid / no nucleus / no nuclear membrane;

[*Reject: Naked DNA*]

Mesosome;

Slime layer / capsule;

Smaller cells;Smaller ribosomes / 70S;No membrane-bound organelles / 1 named example; [*Reject: Internal membranes*]

Plasmids;

Binary fission / no mitosis;

Pili / fimbriae;

Murein cell wall;

max 2

Total 5 marks

Question 2

(a)

Figure 1 = addition;

Figure 2 = deletion;

Figure 3 = substitution;

3

(b)

Degenerate code / clear description;

(New triplet) codes for same amino acid;

[*Reject: codes for protein*]

2

Total 5 marks

Question 3

(a)

One form of a / the same gene;

1

(b)

Probability (girl with cystic fibrosis) = 1 in 8 / 1/8 / 0.125 / 12.5%; = 2 marks

Prob. Of cystic fibrosis = 1/4 / 0.25 / 25% and P girl = 1/2 / 0.5 / 50%; = 1 mark 2

(c)

Chiasma formation / crossing over;

Random / independent assortment / segregation;

[*Ignore: Ref to stages*] [*Reject: Mutation*]

2

Total 5 marks

Question 4

- (a) Organisms cannot interbreed/ breed or mate or reproduce with another group/ incompatible gametes/ wrong courtship behaviour/ other valid; 1
- (b) 1 Populations separated by physical barrier/ example;
 2 No mixing of gene pools;
 3 Different selection pressures;
 4 Become adapted to local environment;
 5 Survive and reproduce;
 6 Mutation in one group (different from other group);
 7 Change in allele frequencies; [*Reject: Gene*]
 8 Isolated populations/ new species cannot interbreed; max 4

Total 5 marks

Question 5

- (a) (i) 0.24 : 1; 1
- (ii) Mammals more active / higher metabolic rate;
 Respiration provides heat;
 To maintain body temperature / for endotherms / warm-blooded; 2
- (b) $R = C - (F + P)$ / $R = C - F - P$; [*Accept: transposed F and P*] 1
- (c) Diet of primary consumer contains more cellulose / more indigestible material;
 OR Diet of secondary consumers protein rich / more digestible material;
 OR Primary consumers lose more (energy) in faeces; 1

Total 5 marks

Question 6

- (a) (i) Discrete groups / types / categories / explained e.g. large and small seed diameters / types exist; [*Reject: Bimodal*] 1
- (ii) Different survival advantages / explained e.g. size linked to location; selection against intermediate forms / in favour of extreme forms; 2
- (b) Interbreed / cross the two types of flax plants;
 Offspring fertile (if same species)/ offspring can also interbreed/ or reasonable alternative; [*Reject: Viable*] 2

Total 5 marks

Question 7

- (a) 1 and 3;
- (b) Some energy lost as heat; 1
- (c) (i) Arrow indicates between Glucose to Triose phosphate;
- (i) Arrow indicates between Triose phosphate to Pyruvate; 2
 [Note: Extra arrow cancels]
 [Reject: Ambiguous labels / arrows]
- (d) 4; 1
- (e) (i) Grana/ thylakoids/ internal membranes; 1
- (ii) Reduces/ reducing power/ source of hydrogen/ electrons;
 Glycerate-3-phosphate to Triose phosphate/ GP to TP; 2
 [Ignore: Reference to molecules]
- (f) (i) To show chloroplasts responsible for change; 1
- (ii) Photolysis/ light splits water molecule/ excitation of chlorophyll;
 Electrons released;
 Electrons reduce DCPIP/ DCPIP becomes colourless;
 So can only see (green) colour of chloroplasts/ chlorophyll; max 3
- (g) (i) Mitochondria are sites of (aerobic) respiration/ active in dark;
 Reactions also release hydrogen ions/ electrons;
 (Tube B) would also become green/ reduce DCPIP (if responsible);
 [Reject: Colourless] [Reject: Converse argument]
- OR Tube B shows light is necessary for colour change;
 Mitochondria do not have pigment to absorb light/ chlorophyll; max 2
- (ii) Only one set of results/ not repeated; 1
 [Reject: Need more results]

Total 15 marks

Question 8

- (a) Gg / suitable equivalent;
 Grey : black about 3:1; 2
 [Note: Can be in table / diagram]

- (b) (i) To determine the probability; [Accept: Likelihood]
 Of the results being due to chance; [Accept: Coincidence] 2

(ii)	O	E	O-E	(O-E) ²	$\frac{(O-E)^2}{E}$	
	152	150]	2	4	0.027]	
	48	50];	2	4	0.08]	method ignore calculation errors);

[Note: Alternative showing of E and method]

$$\left[\frac{(152 - 150)^2}{150} + \frac{(48 - 50)^2}{50} \right]$$

$$\chi^2 = 0.107 / 0.11; \quad 3$$

- (iii) df = 1 and p = 0.05 / 95% level or critical value / described = 3.84;
 [Accept: Ringed / indicated on table]
 Accept hypothesis because χ^2 is less than (table / critical) value / there
 is no significant difference / difference is due to chance; 2
 [Note: Check carry forward of χ^2 value or critical value for interpretation or converse
 argument]

- (c) (i) both alleles will be expressed (in the phenotype); 1

- (ii) 0.25 / 25%; = 2 marks
 $C^N = 250/1000$; = 1 mark 2

- (iii) $p^2 = (0.25)^2 / 0.0625$ / square of calculated figure for C^N ; = 2 marks
 $p^2 + 2pq + q^2 = 1.0$; = 1 mark
 = 31.25 / 31; 3
 [Accept: Derived from either p^2 or q^2]

Total 15 marks

Question 9

- (a) ‘Slash’ / cutting down trees reduces photosynthesis;
Reduces removal of carbon dioxide from atmosphere;
‘Burn’ / combustion releases carbon dioxide;
OR ‘Slash’ / cutting down trees removes respiring organisms;
Reduces removal of carbon dioxide into atmosphere;
‘Burn’ / combustion releases carbon dioxide; max 2
- (b) (Before clearing) soil exists / already produced;
(After clearing) recolonisation by new plants / seeds;
(Brings about) change in environment / soil;
(Allows) succession;
(Leading to) climax (community); max 3
- (a) 1 Ammonium compounds from proteins / amino acids / urea / N-containing;
2 Converted into nitrite;
3 Into nitrate; [*Reject: Incorrect sequence once*]
4 By nitrifying bacteria / correctly named;
5 Nitrogen-fixing bacteria;
6 Fix nitrogen from atmosphere / air;
7 Nitrate taken up by plants;
8 Nitrogen needed for protein synthesis / plant growth; max 6
- (b) Trees available as a sustainable resource;
Maintain habitats / niches / shelter;
Maintain diversity / avoid loss of species / protect endangered species;
Maintain stability (of ecosystem);
Maintain food chains / webs / supply of food;
Reduced loss of soil / erosion;
Reduced flooding;
Act as carbon sink / maintain O₂ and CO₂ balance / reduce greenhouse effect /
Reduce global warming;
Source of medicines;
[*Ignore: eutrophication*] max 4

Total 15 marks