ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme June 2002

GCE

Biology A / Human Biology

Unit BYA5

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Question 1

(a) *Any two from:*
(Group of) organisms able to interbreed / reproduce / have offspring;
Giving fertile offspring / which are fertile; **2 max**

(b) *In sequence:*
1. Kingdom
2. Phylum
3. Class
4. Order
5. Family
6. Genus; **1**

(c) No nucleus / no membrane-bound organelles / named e.g. / no mitochondria / don't divide by mitosis / divide by binary fission / 70S ribosomes / smaller ribosomes / circular DNA / only one 'chromosome' / have plasmids / has murein cell wall; **1**
Accept have (slime) capsule / have fimbriae / pili
Ignore references to 'no chloroplasts'

Total 4 marks

Question 2

(a) (i) (Community) The / all the organisms / populations present in an area / habitat / ecosystem; **1**
(*accept named example, reject 'a group')*

(ii) (Population) The / all the individuals of one species in an area / habitat / ecosystem; **1**
(accept named example, accept 'a group')

(iii) (Ecosystem) Environment / habitat (/ described) + community (/ described) / all / the abiotic + biotic factors in an area; **1**

(b) Insufficient / both require same / competition (for environmental resource);
Named example – food / light / water / ions / nest sites / …;
(Better adapted) / one species displaces other species / only (better adapted) / one species survives / none survives; **2 max**

Total 5 marks

Question 3

(a) *Any two from:*

Wrong wavelength / some = heat / UV / used to evaporate water;
Reflected;
Misses chloroplasts / is transmitted;
Inefficiency of photosynthesis / energy loss in photosynthesis / ref. other limiting factor; **2 max**

(b) Energy losses (at each trophic level) / energy use;
In named process – e.g. excretion / egestion / movement / respiration / … / as heat; (*NOT 'growth' – CANCEL, ignore 'waste'*)
Not available / (too) little left to sustain higher trophic levels / to be passed on; **3**

Total 5 marks

Question 4

(a) (i) 1 : 1; **1**

(ii) Random / chance (process); **1**
Allow ref to 'small sample size', ignore 'mutation'

(b)

Parental genotypes correct:	TtYY	ttyy ;
Parental gametes correctly derived from candidate's Parental genotypes: e.g. (clearly identified)	TY tY	ty ;
Offspring genotypes and phenotypes correct:	TtYy Tall yellow	ttYy ; Dwarf yellow

3

Total 5 marks

Question 5

(a)

Event	Division I / II	Phase (anaphase, metaphase, prophase or telophase)
1	I	telophase
2	I	prophase
3	II	anaphase
4	I	metaphase

One mark per row;;;; **4**

(b) 3; **1**

Total 5 marks

Question 6

(a) ($q^2 = 0.52$ / $q = 0.72$)

($p = 1 – 0.72 = 0.28$)

$p + q = 1$ / $p^2 + 2pq + q^2 = 1$;

Answer = 2pq / use of appropriate numbers;
Answer = 40%; **3**

(b) *Any three from: (MARK AS A WHOLE)*

Small founder population / common ancestor;
Genetic isolation / small gene pool / no immigration / no migration / in-breeding;
High probability of mating with person having H-allele;
Reproduction occurs before symptoms of disease are apparent;
Genetic argument – Hh x hh → 50% / Hh x Hh → 75% affected offspring;
No survival / selective disadvantage; **3 max**
Ignore 'survival of the fittest'

Total 6 marks

Question 7

(a) (i) B – higher standard deviation; (*extras CANCEL*) **1**

(ii) 1st: A (*no mark*)

2nd: Limpets have smaller H/W / smaller mean;
Limpets have (relatively) large foot area;
Better grip on rock; **3**

(b) (i) Need representative / 'typical' / 'reliable' / 'valid' value / anomalies less significant / chance variations less significant;
Random sampling overcomes bias / independent of observer; **2**
Ignore 'fair' / 'accurate'

(ii) Use of quadrat / nearest limpet to… ;
Grid / described – e.g. tape measures / walk to random coordinates;
Method of obtaining random coordinates – tables / calculator; **3**

(c) *Any six from:*

Yellow / green OR approx. 500-600mm
1. Penetrates water better;
2. Absorbed by phycoerythrin ;
3. Red seaweeds have phycoerythrin;
4. Red seaweeds photosynthesise in deep water;

Blue AND red OR approx. 460 and 670mm
5. Penetrate water poorly;
6. Absorbed by chlorophyll;
7. Green have only chlorophyll;
8. Green seaweeds can't photosynthesise in deep water

9. Red seaweeds have less competition from green in deeper water / converse in shallow water; **6 max**

Total 15 marks

Question 8

(a) (i)

Stage	Name of stage	Location in cell
A	Glycolysis	Cytoplasm
B	Krebs cycle / citric acid cycle / TCA cycle	Mitochondrion (*ignore named part)*

1 mark per row;; **2**

(ii) 3; **1**

(iii) To oxygen;
Produce water; **2**

(b) (i) 4; **1**

(ii) 34; **1**

(c) (i) Correct calculation - $\frac{[\text{answer from (b)(i) + (ii)}] \times 31}{2880} \times 100$;

Answer correct from calculation;
OR
Correct answer from (b) / 41% (*no working*) = *2 marks*;; **2**

(ii) Lost as heat; **1**

(iii) Energy available (more) rapidly / released in a single reaction;
Energy released in small quantities / manageable quantities; **2**

(iv) *Any three from:*

Active transport;
Phagocytosis;
Synthesis of glycogen;
Protein / enzyme;
DNA / RNA;
Lipid / cholesterol;
Urea in glycolysis;
Bile production;
Cell division;
Any other valid suggestion; **3 max**

Total 15 marks

Question 9

Quality of language

The answer to this question requires continuous prose. Quality of language should be considered in crediting points in the mark scheme. In order to gain credit, answers must be expressed logically in clear scientific terms.

(a) *Any three from:*

Loss of habitat / nest sites / shelter / niche; *ignore 'homes'*
Loss of food;
Exposure of soil leads to erosion / leaching of ions;
Change in (micro)climate / levels of light / temperature / humidity;
Animals move away / higher death rate / extinction; **3 max**

(b) *Any three from:*

Absorb carbon dioxide; (*extra carbon-sources CANCEL)*
In photosynthesis;
Carbon (dioxide) is used in forming permanent plant tissues / biomass / plant structures;
Carbon is incorporated in organic molecules / named e.g.; **3 max**

(c) (i) *Any four from:*

Less oxygen can enter the soil (from the air);
For saprobionts / soil microorganisms / bacteria / fungi / decomposers / correctly named soil organisms;
For use in aerobic respiration;
Less breakdown of organic matter / humus / dead plants / dead animals / other e.g.;
Less carbon dioxide released / formed; **4 max**

(ii) *Any five from:*

Oxygen enters the soil / use of oxygen;
Nitrifying bacteria are aerobic;
Ammonia / ammonium ions → nitrite;
Nitrite → nitrate;
(Ammonia → nitrate = 1 mark)
(If formulae used, worth 1 mark only if correct)
Nitrate is absorbed / used by plants;
To make named organic-N – e.g. protein / amino acids / DNA / ATP / NAD(P) / chlorophyll;
Increased yield / growth; **5 max**

Total 15 marks