GCE 2004
June Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Biology/Human Biology A
BYA5

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination p aper.

Further copies of this Mark Scheme are available from:

Publications Department, Aldon House, 39, Heald Grove, Rusholme, Manchester, M14 4NA
Tel: 0161 953 1170

or

download from the AQA website: www.aqa.org.uk

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales 3644723 and a registered charity number 1073334. Registered address AQA, Devas Street, Manchester M15 6EX. *Dr Michael Cresswell Director General.*

BYA5

Question 1

A = Animalia/animals;
No cell wall/has microvilli; (NOT 'villi')

B = Plantae/plants; [ALLOW Proctoctista/protoctists]
Has vacuole/has chloroplasts;

C = Prokaryotae/Prokaryotes; [ALLOW 'Prokaryotic']
No Nucleus/DNA free in cytoplasm/single-stranded DNA/circular DNA; 6

Total 6 marks

Question 2

(a) Later fertilisation/cell fusion; (NOT just 'sexual reproduction')
Restoring diploid/original number/not doubling chromosome number; 2
[ALLOW ref '½ + ½']

(b) Any three pairs from:
need comparison of meiosis and mitosis each time

Meiosis	Mitosis
(Homologous) chromosomes associate in pairs	(Homologues) independent/do not pair (IGNORE ref. separation
Crossing-over/chiasmata formation	No crossing-over;
Two/(nuclear stages) divisions/ → 4 offspring cells	One/(nuclear stage) division/ → 2 offspring cells;
Genetically different (product)	Genetically identical (product);

[IGNORE refs. To location] max 3

Total 5 marks

Question 3

(a)	May/June/July;	1
(b)	Loss of energy/heat/use of energy/loss of materials/loss of mass; By respiration/movement/excretion/excreta/egestion/egesta *IGNORE 'waste' REJECT 'growth'* Less energy/mass/matter left to sustain higher level/to be passed on inedible parts/Non-digestible parts;	3
(c)	Phytoplankton reproduce at rate ≥ rate of their consumption;	1

Total 5 marks

Question 4

(a)	(i)	Volume decrease/change in A/reading in A/ 'A'; [ALLOW '20']	1
	(ii)	Volume decrease in B = (O_2 in – CO_2 out); (= 1 mark) Vol. change in A – Vol. change in B/A-B; (= 2 marks) [ALLOW '20-10']	2
(b)	(i)	EITHER Correct answer = 0.73;; (2 marks) OR Correct formula **or** Correct use of data but wrong answer: Vol CO_2 / Vol O_2 **or** 114/157; 0.7; max	2
	(ii)	Using some carbohydrate (as well as triricinolein) /using protein/ / some anaerobic respiration/mixture of aerobic and anaerobic respiration;	1

Total 6 marks

Question 5

(a) Samples collected at random;
Method for choosing random sites – random coordinates/position from tables/calculator/other suitable means;

Other named factor constant e.g.
Same size of net/same width of opening of net/use of one quadrat/ Quadrats of sma size/of stated size/same area disturbed/collect each Sample for same time; 3

(b) *Caenidae* in deep water – because highest standard deviation/ 'S.D.= 7.92' 1

(c) (i) An organism's role/ in the ecosystem/ community;
[ALLOW refs. To trophic levels/named]
(IGNORE refs. To habitat) 1

(ii) *Caenidae* found mainly in deep water AND *Baetidae* in shallow water / one family mainly in deep water AND the other in shallow water; 1

(iii) Reduces competition;
For named factor – e.g. food/shelter/O_2 ;
To ensure both types survive/otherwise better adapted type displaces other type;
OR
Ref. to 'Competitive exclusion principle' = 2 marks max 2

Total 8 marks

Question 6

(a)		Grana/thylakoids/ lamellae;		1
(b)		**A** = oxygen/O_2 **B** = ADP and phosphate/P_i/phosphoric acid/correct formula; **C** = reduced NADP; ALLOW NADPH/$NADPH_2$ /NADPH + H^+		3
(c)	(i)	Absorbs light/energy; Loses electrons/becomes positively charged/is oxidised; Accepts electrons from water/from OH^- ; Causes more water to dissociate/pulls equilibrium to the right;	max	3
	(ii)	Electrons raised to higher energy level/electrons excited; Use of electron carriers/cytochromes/acceptors; For production of ACT [REJECT 'energy production']		3
(d)	(i)	GP formed from RuBP + CO_2; GP → TP/sugar-phosphate/sugar/to RuBP; GP formed at same rate as it is used;		3
	(ii)	No CO_2 to combine with/not enough CO_2 to combine with; RuBP not changed into GP/TP; RuBP reformed from GP/TP;	max	2

Total 15 marks

Question 7

(a) Mutation/(spontaneous) change in a gene/change in DNA; 1

(b) (i) Correct answer: 0/6;; 2 marks
OR
Use of 56 and $\frac{176}{2}$ or 88 / 56 x 2 or 112 and 176; 1 mark max 2

(ii) 64; 1

(c) (i) Correct answer = 42%;;; (only if $q^2 = 0.49$) 3 marks
OR 0.42;; 2 marks
OR
$p+q=1$ / $p^2 + 2pq + q^2 = 1$ / $p=1- 0.7$ / $q^2 = 0.49$ / $q = 0.7$;

Answer = 2pq / use of appropriate numbers; 2 marks max 3

(ii) 1. Parental genotypes correct: both $\mathbf{W^RW^S}$ (*ACCEPT 'RS'*)

AND

W^S (*ACCEPT 'S'*) /gamete from each parent;

2. $\mathbf{W^SW^S}$ (*ACCEPT 'SS'*) / offspring formed and identified as susceptible;
If different symbols:
- defined : max 2 marks
- not defined max 1 mark (= pt.2) 2

(iii) 1. Description: decrease + rate of decrease slows with time;

Explanation: Any **three** from:

2. Resistant rats/rats with $\mathbf{W^R}$ allele survive
OR susceptible / $\mathbf{W^SW^S}$ rats killed

3. (more likely) to pass on $\mathbf{W^R}$ allele to offspring/less likely to pass on $\mathbf{W^S}$
/higher proportion of next generation has $\mathbf{W^R}$ allele/lower proportion has $\mathbf{W^S}$;

4. Chance of mating with $\mathbf{W^SW^S}$ is reduced / $\mathbf{W^SW^S}$ becomes rare;

5. Rate of selection against $\mathbf{W^S}$ slows because $\mathbf{W^S}$ allele is in heterozygotes;

max 4

(iv) No selective advantage / All genotypes equally fertile;
Large population;
Random mating; (IGNORE 'random fertilisation')
No mutation;
No emigration/immigration; max 2

Total 15 marks

Question 8

Quality of Communication
The answers to all sections of this question require the use of continuous prose. Quality of language should be considered in crediting points in the scheme. In order to gain credit, answers should be expressed logically and unambiguously, using scientific terminology where appropriate.

(a) (Decomposers): Secretaion/release of enzymes; [REJECT 'excrete]

Digest/hydrolyse organic matter;
Absorption /'taken in' – by named process
e.g. diffusion/active transport; (ALLOW 'endocytosis)
Respiration
Release carbon dioxide;
Carbon dioxide used in photosynthesis;
Release ammonia/ammonium salts/ions/mineral salts/nutrients;
(ALLOW named small organic molecules)

(Nitrifying bacteria): Ammonia/ammonium to nitrate;
Nitrate to nitrate;
OR ammonia → nitrate = 1mk
Aerobic/use of oxygen/by oxidation; [ALLOW correct symbols]

Nitrates/nitrites/ammonium used in synthesis of amino acids/protein /nucleic acids/other correct organic –N;

max 7

(b) (Increase in carbon dioxide because)-

Burning releases carbon dioxide; [IGNORE ref. to felling]
Less carbon dioxide removed by trees/less removed in photosynthesis; 2

(c)
1. Cleared areas light/tree seeds germinate/grow in light;
2. Light for photosynthesis;
3. Softwoods compete for light;
4. Hardwoods can grow in low light;
5. Additional seeds from close/adjacent areas;
6. Less water evaporation (from hardwood seedlings) /maintains humididy
7. Less extremes of temperature; /maintains microclimate;
8. (canopy) reduces impact of rainfall (on hardwood seedlings)/ref. 'torrential;
9. roots stabilise soil / less soil erosion (by rainfall);
10. less leaching (of ions)(by rainfall);
11. litter fall → recycling of ions (for hardwood seedlings);
12. (Trees) provide food for animals;
13. (Trees) provide habitats/niches/cover/shelter/nest sites for animals;
14. Correct ref to succession / climax established;

max 6

Total 15 marks