

GCE 2004

June Series



Mark Scheme

Biology/Human Biology A

BYA5

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Dr Michael Cresswell Director General.

BYA5**Question 1**

- A = Animalia/animals;
No cell wall/has microvilli; (NOT ‘villi’)
- B = Plantae/plants; [ALLOW Proctoctista/protocists]
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 ‘ $\frac{1}{2} + \frac{1}{2}$ ’]
- (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;
<u>Genetically</u> 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 $\geq$ 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 = (O₂ in – CO₂ 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 CO₂ / Vol O₂ **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

Other named factor constant e.g.	(a)	Samples collected at random; <u>Method</u> for choosing random sites – random coordinates/position from tables/calculator/other suitable means;	
		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)	<i>Caenidae</i> 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)	<i>Caenidae</i> found mainly in deep water AND <i>Baetidae</i> in shallow water / one family mainly in deep water AND the other in shallow water;	1
	(iii)	Reduces competition; For <u>named</u> 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/O₂
 B = ADP and phosphate/P_i/phosphoric acid/correct formula;
 C = reduced NADP; ALLOW NADPH/NADPH₂/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 + CO₂;
 GP → TP/sugar-phosphate/sugar/to RuBP;
 GP formed at same rate as it is used; 3
- (ii) No CO₂ to combine with/not enough CO₂ 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 / $\frac{56 \times 2}{2}$ 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 $W^R W^S$ (ACCEPT 'RS')
AND
 W^S (ACCEPT 'S') /gamete from each parent;

2. $W^S W^S$ (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 W^R allele survive
OR susceptible / $W^S W^S$ rats killed
3. (more likely) to pass on W^R allele to offspring/less likely to pass on W^S
/higher proportion of next generation has W^R allele/lower proportion has W^S ;
4. Chance of mating with $W^S W^S$ is reduced / $W^S W^S$ becomes rare;
5. Rate of selection against W^S slows because 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; } OR ammonia
 Nitrate to nitrate; } → 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 humidity } /maintains microclimate;
 7. Less extremes of temperature;
 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