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Mark Scheme (Results)
Summer 2007

GCE

GCE Biology (6115/01)

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General Principles

Symbols used in the mark scheme

Symbol	Meaning of symbol
; semi colon	Indicates the end of a marking point.
eq	Indicates that credit should be given for other correct alternatives to a word or statement, as discussed in the Standardisation meeting. It is used because it is not always possible to list every alternative answer that a candidate may write that is worthy of credit.
/ oblique	Words or phrases separated by an oblique are alternatives to each other.
{} curly brackets	Indicate the beginning and end of a list of alternatives (separated by obliques) where necessary to avoid confusion.
() round brackets	Words inside round brackets are to aid understanding of the marking point but are not required to award the point.
[] square brackets	Words inside square brackets are instructions or guidance for examiners.

Crossed out work

If a candidate has crossed out an answer and written new text, the crossed out work can be ignored. If the candidate has crossed out work but written no new text, the crossed out work for that question or part question should be marked, as far as it is possible to do so.

Spelling and clarity

In general, an error made in an early part of a question is penalised when it occurs but not subsequently. The candidate is penalised once only and can gain credit in later parts of the question by correct reasoning from the earlier incorrect answer.

No marks are awarded specifically for quality of language in the written papers, except for the essays in the synoptic paper. Use of English is however taken into account as follows:

- the spelling of technical terms must be sufficiently correct for the answer to be unambiguous
  e.g. for amylase, 'ammalase' is acceptable whereas 'amylose' is not
  e.g. for glycogen, 'glicojen' is acceptable whereas 'glucagen' is not
  e.g. for ileum, 'illeum' is acceptable whereas 'ilium' is not
  e.g. for mitosis, 'mytosis' is acceptable whereas 'meitosis' is not

- candidates must make their meaning clear to the examiner to gain the mark.

- a correct statement that is contradicted by an incorrect statement in the same part of an answer gains no mark – irrelevant material should be ignored.

Question 1 **Maximum mark**

(a) ref. to (yeast is) genetically-modified / genetically-engineered / ref. to {vegetarians / vegans / religious groups} concerned by use of {animal / calf / eq} ;

1 mark

(b) **The points have to be within the context of the flow diagram.**

1. cDNA produced by reverse transcriptase ;

2. using mRNA as {template / eq} ;

3. {vector / plasmid / (yeast) DNA} {opened / cut / eq} by {restriction enzyme / endonuclease} ;

4. ref. to {sticky ends / eq} ;

5. cDNA and {vector / plasmid / (yeast) DNA} {joined / bonded / annealed / inserted / eq} by ligase ;

6. ref. to polymerase used to {amplify / multiply / eq} cDNA ;

4 marks

Total 5 marks

Question 2 **Maximum mark**

(a) (i) codominance ;

1 mark

(ii) 1 chevron + 2 mixed + 1 patch ;

1 mark

(iii) 1. (genotypes of parents:) V^PV^C and V^PV^C ;
2. correct gametes shown for each ;
3. cross correct to give genotypes ;
4. genotypes matched with phenotypes ;

3 marks

(b) 1. both involve single {gene / allele pair / locus} ;

2. ref. to codominance in both / eq ; **NOT** just **A** and **B**, must use I^A and I^B

3. ref. to multiple alleles in blood groups / ABO involves three alleles, clover patterns only two alleles / eq ;

4. ref. to dominance of { I^A / I^B } over I^o / I^o is recessive to {the others / I^A / I^B };

5. no {dominance shown / recessive allele} in clover patterns ;

6. the ABO blood group has 4 phenotypes, the clover pattern has 3 phenotypes ;

7. both show {discontinuous / discrete} variation ;

4 marks

Total 9 marks

Question 3 **Maximum mark**

(a) (i) (human)

1. bipedal walking / walking on two {feet / legs} ;
2. idea of toes parallel ;
3. form a platform / ref. to arch ;

2 marks

(gorilla)

4. knuckle walking / eq ;
5. walks on side of foot / not on sole of foot / eq ;
6. (big) toe still opposable ;
7. uses foot for grasping ;

2 marks

(ii)

1. {hip bone / pelvis} has become {broader / more shallow / eq};
2. for attachment of muscles ;
3. pelvis lower in body ;
4. centre of gravity in pelvic area for standing upright / eq ;
5. more suited to bipedal walking;
6. legs longer than arms ;
7. femur at an angle / ref to valvus angle ;
8. knee in line with pelvis / eq ;
9. humans able to fully extend leg while walking ;

4 marks

(b)

1. to pick up {food / fruits / eq} ;
2. to carry {weapons / baby / eq} ;
3. to use {tools / eq} ;

2 marks

Total 10 marks

Question 4 **Maximum mark**

(a) 1. made of C, H, O ;

2. glycerol / propan (1, 2, 3) triol ;

3. three fatty acids ;

4. correct location of ester {bond / link} ;

ACCEPT points 2, 3 and 4 made on a clearly labelled diagram

3 marks

(b) 1. rise in external temperature {causes / eq} the brown fat to be metabolised / eq ;

2. break down of {fat / bonds} ;

3. causes release of heat (energy) / ref to exothermic reaction ;

4. causes body temperature to rise ;

5. credit ref to detail of fatty acid break down / 2C / link reaction etc ;

6. {fats / fatty acids} respired {using oxygen / aerobically} ;

7. oxygen and temperature rises until 160 mins ;

8. (then) oxygen peaks at 160 min but temperature continues to rise until 180 mins / eq ;

9. body temperature levels off / eq at {normal body temperature / 37 °C} ;

10. {brown fat metabolism / eq} is reduced so {oxygen use falls / eq} ;

6 marks

(c) 1. provide (physical) protection to organs ;

2. idea of {thermal / eq} insulation ;

3. (combines with phosphate) to form phospholipids ;

4. buoyancy / eq ;

5. electrical insulation / myelin ;

6. waterproofing / eq ; **NOT** waxes on leaves / steroids / hormones

7. source of metabolic water ;

8. {solvent / storage} for vitamins ;

3 marks

Total 12 marks

Question 5 **Maximum mark**

(a) 1. {proteins / amino acids / organic nitrogen compounds / eq} {broken down / decomposed / converted} to {ammonium / ammonia} by {bacteria / fungi / putrifiers / microorganisms / decomposers / eq} ;
2. {ammonium / ammonia} converted to nitrites by {*Nitrosomonas* / *Nitrococcus* / nitrifying bacteria} ;
3. nitrites converted to nitrates by {*Nitrobacter* / *Nitrobacillus* / nitrifying bacteria} ;
4. ref. to oxidation in correct context ;

3 marks

(b) 1. {nitrates / minerals / eq} can be {washed / eq} into stream ;
2. ref. to eutrophication / nutrient enrichment (in stream) ;
3. leads to {exercise plant growth / algal bloom};
4. relevant consequence ;

3 marks

(c) (i) 1. compost heap {warmer / higher temperature} than air ;
2. difference in range 15 – 25 ^{o}C / specified difference ;
3. both fluctuate in similar pattern / ref to both show a downward trend / eq ;

2 marks

(ii) 1. ref. to {respiration / metabolic activity} of microorganisms ;
2. (which) releases heat ;
3. ref. to insulation effect of {compost / container} ;

2 marks

(iii) **ANY TWO FROM:**
{reduced food / substrate / toxin / inhibitor / more waste product / competition / more anaerobic / less oxygen / cooling effect of rain / change in water / change in pH} ;;

2 marks

Total 12 marks

Question 6 **Maximum mark**

(a) biotic involve {other organisms / living / eq}, abiotic are {physical / non-living / chemical / eq} ;

1 mark

(b) 1. named organism appropriate to habitat ;

2. specified abiotic factor and means of measuring abiotic factor / named apparatus/eq ;

3. appropriate technique for measuring distribution of organism in the habitat e.g. {belt / transect / systematic / stratified} sampling ;

3 marks

(c)(i) 1. {partial pressure / tension / eq} oxygen lower (at high altitudes) ;

2. diffusion gradient between air and blood {lower / eq} ;

3. diffusion of oxygen into blood {slower / less efficient/ eq} ;

2 marks

(ii) 1. ref. to Ethiopia, Andes and Tibet have high mean altitudes ;

2. Ethiopia seems to have adapted ;

3. (because) has {similar % saturation as USA / higher than USA} has high % saturation compared with Andes / Tibet ;

4. Andes / Tibet do not seem to be adapted ;

5. (because) lower % saturation than {Ethiopia / USA} ;

4 marks

(d) 1. increased red blood cell density / eq ;

2. ref. to increased haemoglobin density / changes in haemoglobin {structure / eq} / increased affinity for O_2 in haemoglobin ;

3. increased lung {volume / (vital) capacity} ;

4. ref. to {more / denser} capillaries (around alveoli) ;

3 marks

Total 11 marks

Question 7 **Maximum mark**

(a) 1. the rise in the (average) temperature of the Earth's surface ;
NOT 'air temperature' / 'atmosphere'
2. due to the increase in greenhouse gases ;
3. carbon dioxide / methane / CFCs / nitrogen oxides / water vapour ;
ACCEPT correct formula: CO_2 / CH_4 / NOx
IF ozone / sulphur dioxide mentioned, **DO NOT AWARD** this marking point
4. (which) {trap / reflect back / absorb } {heat / long wave / infra red} ;
5. reference to {enhanced / increased} greenhouse effect ;

3 marks

(b) (i) 1. overall trend generalists increased in abundance and specialists decreased ;
2. peaks and troughs in the abundance for both correspond ;
3. generalists always greater than specialists ;

2 marks

(ii) 1. specialists have lost their specific habitat ;
2. specialists have lost a food source ;
3. {weather /predation / common food} has effected both groups of butterflies ;
4. {climate change / temperature} has favoured generalists ;
5. generalists more able to {exploit new habitats / adapt / larger niche} ;

3 marks

(c) 1. comma once found only in the warmer south ;
2. (global warming) produces milder winters further north / eq ;
3. (global warming has) increased {food supply /egg plants / habitats} of the comma ;
4. other butterflies cannot survive so well so comma outcompetes them / moves to avoid intraspecific competition / eq ;
5. (global warming) reduces the number of predators (so more commas survive) ;

3 marks

Total 11 marks