

Mark Scheme (Results) January 2007

GCE

GCE Biology (8040/9040)

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.

Questions 1.

Maximum marks

Statement	Natural cloning	Artificial cloning
Involves mitosis	✓	✓
Occurs in both plants and animals	✓	✓
Produces offspring that are genetically identical	✓	✓
Produces offspring by sexual reproduction	x	x

[1 mark for every two correct answers]

Total 4 marks

Question 2

Maximum Marks

- 1 Covalent ;
- 2 Dipole / dipolar ; **NOT** polar / bipolar
- 3 Solvent ;
- 4 Hydrogen / H ; **NOT** H₂
- 5 (Specific) heat capacity ; **NOT** latent heat

Total 5 marks

Question 3

Maximum marks

(a) (i) Hydrogen / H ;

1 mark

(ii) Amino acid ;

1 mark

(iii) 1 A {triplet of / three} bases (on tRNA) ;

2 complementary to codon (on mRNA) / complementary to the
triplet on mRNA ;

2 marks

(b) 1 tRNA molecule is {folded/cloverleaf shape/L-shaped} but mRNA is a {straight chain / hairpin loop};

2 tRNA is a fixed length but mRNA molecules are of variable length / ^{eq};

3 tRNA molecule is (usually) a short chain but mRNA is (usually) longer ;

4 tRNA molecule contains (regions of) {hydrogen bonds / H bonds / double-stranded regions} within it ;

5 Ref. to modified base (or named modified base) in tRNA ;

2 marks

Total 6 marks

Question 4

- 1 Centrioles ;
- 2 Nucleolus ;
- 3 Golgi (apparatus / body) ;
- 4 Lysosomes ;

Total 4 marks

Question 5

Maximum Marks

(a) (i) 7 ;

1 mark

(ii) 1 UCUGA ;

2 TCTGA ;

2 marks

(b) 1 (% adenine must equal (% of) thymine ;

2 (double figure) 58.8 ;

3 Guanine and cytosine must make up rest of molecule / ^{eq};

4 (subtract from 100) = 41.2 ;

5 (% of) guanine = (% of) cytosine / ^{eq};

6 (divide by 2) = 20.6 ;

OR

1 Adenine (and guanine) are purines;

2 purines bind to pyrimidines;

3 (purines) must equal 50%;

4 Guanine = {50 - 29.4 / 20.6};

5 Guanine and cytosine bind together;

6 Therefore cytosine = 20.6(%);

OR

1 Adenine binds with thymine;

2 Therefore thymine = 29.4 (%);

3 Thymine and cytosine are pyrimidines;

4 Thymine + cytosine = 50 (%);

5 50 - 29.4;

6 Cytosine = 20.6(%);

5 marks

Total 8 marks

Question 6

Maximum Marks

- (a)
- 1 Ref to cellulose ;
 - 2 Cellulose arranged into microfibrils ;
 - 3 Embedded into a matrix ;
 - 4 Named component of matrix e.g. pectin / hemicellulose ;
 - 5 Ref to {primary and secondary cell walls / several layers of microfibrils} ;
 - 6 Ref to plasmodesmata ;

3 marks

- (b) (i) Cells damaged / some cell content released (during blending) / some of the added water coming through / ^{eq} ;

1 mark

- (ii)
- 1 Enzyme A and enzyme B (both) increase the yield of apple juice ;
 - 2 Both enzymes yield similar volumes of apple juice/^{eq} ;
 - 3 A combination of enzymes yields a greater volume of juice than either enzyme on its own /^{eq} ;
 - 4 Ref to any correctly manipulated figures ;

2 marks

- (iii)
- 1 Disrupt the cell wall /^{eq} ;
 - 2 {Breakdown / digest} the {pectin / cellulose /^{eq}} ;
 - 3 ref to glycosidic bonds being broken ;
 - 4 Resulting in an increase in permeability / juice able to leak out of cells /^{eq} ;
 - 5 (one) enzyme could be pectinase ;
 - 6 (other) enzyme could be cellulase ;
 - 7 Enzyme A breaks down a different component (or named component) to enzyme B ;
 - 8 Two enzymes together destroy more molecules / cell wall ;

4 marks

Total 10 marks

Question 7

Maximum Marks

- (a) (i)
- 1 There is no increase (in the intensity of red coloration) until 45°C /^{eq} ;
 - 2 There is a small/^{eq} increase in the (red coloration) from 45-65°C ;
 - 3 At 65° - 75°C there is a large increase in (red coloration) ;
 - 4 There is a small/^{eq} increase after 75°C / No further increase in (red coloration) above 85°C / ^{eq} ;
 - 5 Manipulation of data ;

3 marks

- (ii)
- 1 Up to 45°C there is no effect on the membrane ;
 - 2 Increasing temperature increases the kinetic energy of the molecules (in membrane) /^{eq} ;
 - 3 Proteins may change shape/^{eq} ;
 - 4 Phospholipids move more /^{eq} ;
 - 5 Allowing pigment to leak through vacuole membrane / ^{eq} ;
 - 6 And plasma membrane / ^{eq} ;
 - 7 By diffusion /down a concentration gradient ;
 - 8 Reference to plateau /^{eq} as {all membrane now disrupted/no longer a diffusion gradient}/ ^{eq} ;

3 marks

- (b)
- 1 Movement (of molecules) against concentration gradient/^{eq} ;
 - 2 Requires{energy/ATP} ;
 - 3 Occurs in one direction ;
 - 4 Involves proteins ;
 - 5 Which span the membrane / ^{eq} ;
 - 6 Molecule binds to protein/carrier ;
 - 7 Protein/carrier changes shape / ^{eq} ;
 - 8 Reference to sodium pump or named ion pump ;

5 marks

Total 11 marks

Question 8

Maximum Marks

- (a)
- 1 Ref to {same /stated} {volume / concentration} of starch ;
 - 2 Ref to {same / stated} volume of amylase ;
 - 3 Another appropriate named variable kept constant ;
 - 4 Ref to use of iodine (in KI) ;
 - 5 Colour change from blue/black to yellow/brown / ref to use of colorimeter /^{eq};
 - 6 Time how long it takes starch to be broken down / ^{eq} ;

3 marks

- (b)
- 1 Incubation time increases activity decreases /^{eq};
 - 2 Large drop in enzyme activity within first minute /^{eq};
 - 3 Incubation for further 3 minutes causes further decrease in activity / ^{eq} ;
 - 4 No activity after 5 minutes of incubation / ^{eq} ;
 - 5 Manipulation of figures to compare activity ;

3 marks

- (c) (i)
- 1 Ref to folding of secondary structure / ^{eq} ;
 - 2 To produce a globular structure ;
 - 3 Held together by hydrogen / ionic / disulphide bonds ;
 - 4 Between the R groups ;
 - 5 Ref to relative positions of hydrophilic/hydrophobic R groups ;
 - 6 Ref to active site (as part of tertiary structure) ;
 - 7 Nature /Shape (of active site) determined by R groups ;

3 marks

- (ii)
- 1 Both time and temperature are involved in decrease in {activity / denaturation} ;
 - 2 (this results) in {more / ^{eq}} vibration of the molecules ;
 - 3 More bonds break ;
 - 4 Ref to distortion of active site / starch no longer fits into active site ;
 - 5 Increasing number of {enzymes denatured / active sites distorted} (up to 5 minutes) ;
 - 6 All enzyme molecules completely denatured after 5 minutes/^{eq} ;

3 marks

Total 12 marks