Mark Scheme (Results)

Summer 2007

GCE Biology (6101/01)

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 marks**

Structure	Bacterial cell	Liver cell
Ribosomes	✓	✓
Centrioles	x	✓
Starch grains	x	x
Nucleus	x	✓

(1 mark for <u>two</u> correct boxes)

Blank spaces are incorrect.
A tick which has been crossed through and is ambiguous is incorrect.

Total 4 marks

Question 2   **Maximum marks**

1. covalent;

2. <u>fatty acid</u>;

3. glycerol / propan-1,2,3-triol / propantriol;

4. condensation;

5. unsaturated;

Total 5 marks

Question 3   **Maximum marks**

(a) A = cisterna / cisternae;

    B = (Golgi / secretory) vesicle / lysosome;

                                       2 marks

(b) 1. {modified / ref. to attachment (of another molecule)} (of protein);

    2. carbohydrate / glycoside / (oligo)saccharide (chain) / to form glycoproteins;

    3. (proteins) concentrated / eq;

    4. idea that proteins end up in vesicles / <u>within</u> a membrane / lysosome;

                                       3 marks

                                       Total 5 marks

Question 4   **Maximum marks**

(a)   1. {both / eq} are reducing sugars / contain a reducing sugar;

        2. B has a {lower concentration / eq} of reducing sugar than A / converse

          statement;

                                                        2 marks

(b)   1. {heat / hydrolyse / eq} with {acid / named acid};

        2. (then) neutralise / add {(sodium) hydrogencarbonate / alkali / sodium

          hydroxide / potassium hydroxide};

        3. (then) ref to Benedict's test / add Benedict's reagent;

        4. red / orange / brown / yellow / green;
                                                        3 marks

                                                        Total 5 marks

Question 5   **Maximum marks**

(a) acetic orcein / Schiffs / Feulgens / acetocarmine / lactopropionic acid /

toluidine blue;

1 mark

(b) prophase, telophase, metaphase and anaphase;

1 mark

(c) (i) 1. idea that P1 is earlier (in prophase) than P2 ;

2. {chromosomes / threads / chromatids} can be seen (more) clearly / eq;

3. because (chromosomes / DNA) {shorten / spiral / condense / coil};

4. idea of chromosomes spreading out more;

5. ref to effect of preparation technique;

3 marks

(ii) correctly labelled cell;

IF two cells are labelled, both must be correct

1 mark

(iii) 1. centromeres divide / split / separate / pulled apart;

2. {spindle <u>fibres</u> / microtubules} become {shorter / contract / condense};

3. chromatids {separate / pulled apart};

4. chromosomes / chromatids move towards (opposite) {poles / ends /

sides / centrioles};

2 marks

Total 8 marks

Question 6   **Maximum marks**

(a) <u>Facilitated diffusion</u> :

    1. (proteins provide) {channels / gates / pores / carriers / transporters}

       in membrane

       OR

       {channels / gates / pores / carriers / transporters} carry molecules across

       the membrane;

    2. (channels / gates / pores) can open or close / (carriers / transporters) can

       change shape;

    3. for ions / {large / polar} molecules / molecules insoluble in lipids to pass

       through;

    4. down {concentration / diffusion} gradient / eq;   **(Max 3 marks)**

    <u>Active transport</u> :

    5. molecule {binds to / fits into / attaches to / combines with} protein;

    6. use of {ATP / energy};

    7. up concentration gradient / eq;

    8. for faster uptake / eq;   **(Max 3 marks)**

                                                            5 marks

Question 6 continued   **Maximum marks**

(b) (i) 1. increase in concentration (in cytoplasm) for first {2.3 hours / 2.4 hrs /

2h 18 min / 2h 24 min /eq} ;

2. (then) concentration remains {constant / plateau / levels off};

3. calculation of rate of uptake e.g. (2.8 ÷ 2.3 = 1.22 $\mu gcm^{-3}h^{-1}$);

2 marks

(ii) 1. active transport cannot occur;

2. at first, X diffuses in / can enter down concentration gradient / eq;

3. idea that once concentration of X in cytoplasm equals concentration

outside, no more can be taken up;

4. correct reference to some ATP present at start, so some active transport

will occur;

2 marks

Total 9 marks

Question 7   **Maximum marks**

(a) (i) Uracil and cytosine (or vice versa);

   ACCEPT U and C

                                                                              1 mark

   (ii) C T A G C A C;

                                                                              1 mark

(b) 200 x 3 / 600;

   ÷ 50;

   12 <u>seconds</u>;

                                                                              3 marks

(c)   1. The mRNA {attaches /eq} to a ribosome;

        2. <u>two</u> tRNA molecules (held in ribosome) / eq;

        3. tRNA carries one {specific / eq} amino acid;

        4. ref to anticodons on tRNA;

        5. (which bind to) {complementary bases / codons} on mRNA;

        6. peptide bonds form between amino acids;

        7. idea of ribosome moves relative to mRNA;

        8. until a stop codon is reached;

                                                                              5 marks

(d)   1. {DNA / bacterial chromosome} is in the cytoplasm / not in a nucleus;

        2. idea of mRNA doesn't have to travel / ribosomes bind straight away;

        3. (because) {transcription / mRNA formed) in the cytoplasm;

                                                                              2 marks

                                                                      Total 12 marks

Question 8   **Maximum marks**

(a)   1. {digest / breakdown / hydrolyse} {proteins / peptide bonds};

2. into (small) peptides / amino acids;

3. (which) {dissolve / are soluble} in (washing) water;

2 marks

(b)(i)   1. {optimum / peak} at same pH / pH 7;

2. max activity of P is greater than Q;

3. Q works over wider range of pHs;

4. activity of P is greater than Q at pH 6.8 - 7.2;

5. activity of P is less than Q at pH 5 - 6.8 and at 7.2 - 9;

6. correct manipulation of activity figures to compare;

e.g. P max 1 unit greater than Q

3 marks

(ii)   1. use (enzymes) R and Q;

2. protease R is needed to break down the egg;

NB references to other enzymes breaking down egg negates this point

3. {protease Q because it has the greatest overlap (with R) / converse} /

both work well at {pH 8 / similar pHs};

4. detergent can only be at one pH;

3 marks

Question 8 continued   **Maximum marks**

(c)   1. idea of link between pH and {H$^+$ / eq} concentration;

2. affects {ionisation / charge / eq} of {R groups / side groups};

3. {disruption /eq} of bonds;

4. {changes shape / distortion} of active site;

5. {fewer / no} enzyme-substrate complexes formed / substrate does not fit

{active site / enzyme} / eq;

6. idea of {decreasing activity / denaturing} of enzyme away from optimum

pH / {no activity / denatured} at extremes of pH;

4 marks

Total 12 marks