GCE 2004
June Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Biology B
BYB2

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 paper.

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Guidance on the award of the mark for Quality of Written Communication

Quality of Written Communication assessment requires candidates to:

- select and use a form and style of writing appropriate to purpose and complex subject matter;
- organise relevant information clearly and coherently, using specialist vocabulary when appropriate; and
- ensure text is legible, and spelling, grammar and punctuation are accurate, so that meaning is clear.

For a candidate to be awarded 1 mark for quality of written communication on the question identified as assessing QWC in a unit test, the minimum acceptable standard of performance should be:

- the longer parts (worth 4 marks or more) should be structured in a reasonably logical way, appropriate and relevant to the question asked;
- ideas and concepts should be explained sufficiently clearly to be readily understood. Continuous prose should be used and sentences should be generally be complete and constructed grammatically. However, minor errors of punctuation or style should not disqualify;
- appropriate AS/A level terminology should be used. Candidates should not use such phrases as 'fighting disease', 'messages passing along nerves', 'enzymes being killed' etc, but a single lapse would not necessarily disqualify. Technical terms should be spelled correctly, especially where confusion might occur, e.g. mitosis/meiosis, glycogen/glucagon.

The Quality of Written Communication mark is intended as a recognition of competence in written English. Award of the mark should be based on overall impression of performance on the question identified on the paper as assessing QWC. Perfection is not required, and typical slips resulting from exam pressure such as 'of' for 'off' should not be penalised. Good performance in one area may outweigh poorer performance in another. Care should be taken not to disqualify candidates whose lack of knowledge relating to certain parts of a question hampers their ability to write a clear and coherent answer; in such cases positive achievement on other questions might still be creditworthy. No allowance should be made in the award of this mark for candidates who appear to suffer from dyslexia or for whom English is a second language. Other procedures will be used by the Board for such candidates.

Examiners should record 1 or 0 at the end of the paper in the Quality of Written Communication lozenge. This mark should then be transferred to the designated box on the cover of the script.

BYB2

Question 1

(a) **X**, phosphate;
Y, deoxyribose/pentose/5-carbon sugar;
Z, (nitrogenous) base; (*accept named base*) 3

(b) (specific) hydrogen (bonds); 1

(c) thymine 28% so adenine 28%
therefore 44% cytosine and guanine;
therefore 22% cytosine; 2

(idea of equal amounts T and A, C and G – 1 mark, correct answer 2 marks)

Total 6

Question 2

(a) (i) prophase;
chromosomes thickening/becoming visible; 2

(ii) anaphase;
chromatids/chromosomes moving to opposite poles/
ends of spindles; 2

(b) DNA replication;
synthesis or proteins/build-up of energy stores/growth/increase in cytoplasm;
replication of organelles/named example; 2 max

Total 6

Question 3

(a) (i) to separate polynucleotide strands/form single strands; 1

(ii) not denatured (at 95^{o}C); 1

(iii) for binding of primers/nucleotides (to DNA strands); 1

(b) (i) doubling (of DNA) each cycle;
but very low numbers to start with, so appears flat;
then exponential growth; 2 max

(ii) suggestion; with explanation e.g.:

nucleotides being used up;
so less/nothing to make complementary chains;

primers used up;
so cannot start complementary chains;

enzymes losing activity/denatured;
so no polymerisation of complementary strands; 2 max

Total 7

Question 4

(a) to get haploid/n/half number of chromosomes (in cells);
so that each cell gets one copy of each chromosome/gene/full set of genes;
so that fertilisation produces diploid/constant chromosome number;
results in independent assortment; 2 max

(b) (i) 4; 1

(ii) meiosis (has halved the chromosome number); 1

(ii) (mitosis because) zygote gets two chromosomes from each gamete/
has four chromosomes;
(accept haploid for two and diploid for four)
gamete-producing plant has two chromosomes, so mitosis to
produce gametes with two; 2

Total 6

Question 5

(a) (i) number of bases = 4440 (*allow 4446 if they refer to start/stop*);
each amino acid coded for by triplet/three bases (so three times more bases than amino acids); 2

(ii) deletion;
(deletion) of three bases;
because substitution/addition would change amino acid(s); 2 max

(b) (i) codon on mRNA;
specific/complementary base pairing with;
anti-codon on tRNA;
specific tRNA for each amino acid;
protein formed by condensation reactions / peptide bonds formed; 4 max

(ii) (loss of amino acid) changes tertiary structures/3D shape;
so sugar molecules cannot be attached (to form glycoprotein/ functional protein);
so (defective) unable to bind to chloride ions/use ATP; 2 max

Total 10

Question 6

(a) vegetative involves mitosis / sexual involves meiosis;
sexual involves fertilisation (but vegetative not);
sexual involves gamete formation (but vegetative not);
vegetative produces genetically identical (organisms)/clones/
sexual reproduction produces genetic variation;
one parent for vegetative/two for sexual; 3 max

(b) (i) two advantages with reason for each e.g.:

seeds genetically identical to parent plants, so get high-yielding offspring;
no need to buy new seed each year, so increased profit/ more money for themselves; 2 max

(ii) two reasons with explanation for each e.g.:

companies could only sell once, so big loss in profit;
(apomixis) genes might get into other weeds, increasing their numbers;
genetically modified organisms usually made to be sterile to avoid spread of genes, but these can reproduce; 2 max

Total 7

Question 7

(a) isolate wanted gene/DNA from another organism/mRNA from cell/organism;
using restriction endonuclease/restriction enzyme/reverse transcriptase to get DNA;
produce sticky ends;
use ligase to join wanted gene to plasmid;
also include marker gene;
example of marker e.g. antibiotic resistance;
add plasmid to bacteria to grow (colonies);
(replica) plate onto medium where the marker gene is expressed;
bacteria/colonies not killed have antibiotic resistance gene and (probably) the wanted gene;
bacteria/colonies expressing the marker gene have the wanted gene as well; 6 max

(b) (i) injection, rapid rise and fall;
virus, slower rise and longer in effective/harmful range;
capsule slowest rise, longest in effective/harmful range;
injection and virus give harmful concentrations but capsule does not; 3 max

(ii) advantage e.g.:

substance never reaches harmful levels /no side effect/
less likely to harm the organism, longer relief from symptoms/
less frequent treatment needed/longer effective range/
longer but without harmful side effects; 1 max

disadvantage e.g.:

takes longer to take effect; 1

Total 11

QWC (See guidance) 1