



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme

June 2003

GCE

Biology B

Unit BYB2

Copyright © 2003 AQA and its licensors. All rights reserved.

Question 1

- (a) prophase – coil up/spiralise/condense;
 (allow shorter/contract/become visible)
 metaphase – move to equator or centre of cell / attach to spindle;
 (reject if reference to pairing)
 anaphase – chromatids separate/centromeres divide;
 (reject chromosomes move to poles without further explanation)
 telophase – uncoil; (allow lengthen/becomes less visible)
 (allow labelled diagrams)

4

(b)

Mitosis	Meiosis
chromosome number remains same / cells produced diploid	chromosome number halved / cells produced haploid
cells produced identical / no variation in cells produced	cells produced not identical / variation in cells produced
only one division/2 cells produced	two divisions / 4 cells produced
somatic/ body cell formation/ used in AR/growth	used in gamete formation / reproductive cell formation / occurs in gonads/named gonad (reject occurs <u>in</u> gametes)

Accept

<i>no pairing of chromosomes</i>	<i>pairing of chromosomes</i>
<i>no chiasma/crossing over</i>	<i>chiasma/crossing over (may occur)</i>

2 max

Total 6

Question 2

- (a) one strand of original molecule in each new molecule/DNA; 1
- (b) (i) each base only pairs with one other/one specific base /
complementary base pairing;
example – pairing of adenine and thymine/cytosine and guanine/
purine and pyrimidine;
- (ii) identical/exact copies made;
same base sequence as original DNA;
both strands act as template/complementary base pairing occurs
on both strands; 3 (max 2 for (ii))
- (c) two strands with specific base pairing;
large number of hydrogen bonds (between strands);
helix/coiling reduces chance of molecular damage / protects H bonds;
strong sugar-phosphate backbone;
(reject strong bonds between nucleotides) 2 max
- Total 6
-

Question 3

- (a) DNA/chromosomes/genetic information in nucleus;
divides by mitosis; *(reject asexual reproduction)* 2
- (b) body cell has full number of chromosomes/diploid;
gamete has only half number of chromosomes/haploid;
require complete genome to form new individual; 1 max
- (c) (i) desired characteristic/qualities kept / exact/known features produced;
produces more of an endangered species;
(ignore genetically identical) 1 max
- (ii) possible development of side effects / early death / named side effect;
high cost due to low chance of success/technology required;
no possibility of adaptation ;
consequence of lack of variation (e.g. all susceptible to same disease);
long term effect not known; 1 max
(ignore ethical issues / genetic diseases)
- Total 5
-

Question 4

- (a) change in base/nucleotide; 1
- (b) change in base sequence in mRNA / different mRNA codons;
different tRNA molecules pair with mRNA;
with different amino acids / change in primary structure;
(reject *produces different amino acids*)
change in tertiary structure of protein;
change in shape of active site; 3 max
- (c) (i) no accumulation of phenylalanine; 1
- (ii) phenylalanine needed to form proteins or named protein /
impossible to get diet with none present / essential amino acid /
form other amino acids; 1
- Total 6
-

Question 5

- (a) gene no longer functional / bacteria not resistant to tetracycline;
(reject *gene/plasmid not resistant to tetracycline*) 1
- (b) (i) so that bacteria stick to it / transfer of bacteria; 1
- (ii) identifies those bacteria with plasmid;
as bacteria without plasmid / ampicillin gene killed; 2
- (ii) identifies which bacteria have recombinant DNA/
foreign DNA present / human gene present;
these are killed by the antibiotic;
as the gene for tetracycline resistance has been destroyed /
bacteria not resistant to tetracycline; 2 max
- (c) colony present on ampicillin plate but not on tetracycline plate; 1
- Total 7
-

Question 6

(a)	allele;	1
(b)	(i) cells/embryos/DNA damaged by process; embryo rejected;	1
	(ii) gene not incorporated into plasmid/vector; gene/plasmid not incorporated into sheep cells/DNA /chromosomes; gene not switched on/expressed;	1 max
(c)	(i) meiosis/gamete formation / present in germline cells; fertilisation/fusion of gametes/zygote formation;	2
	(ii) gene in plasmid which is not passed on in <u>the cytoplasm</u> ; only one chromosome of pair passed on / gene or allele only on one chromosome; half the gametes contain the gene;	1 max
Total		6

Question 7

(a)	change in shape of carrier/ channel/membrane protein; (channel) protein no longer transports chloride; lower water potential in cells; water retained by cells;	3 max
(b)	mucus not removed; mucus traps bacteria allows bacteria to breed;	2
(c)	use of liposomes/small lipid droplets / harmless virus; use of aerosol/sprays/inhalers; virus/liposomes fuse with membrane of cells or virus infects cells; genes move across membrane into cells;	
	<i>also accept</i> <i>CFTR genes inserted into plasmids;</i> <i>appropriate use of restriction/ligase enzymes;</i>	4 max
Total		9

Question 8

- (a) heat DNA to 95°C / 90 °C;
strands separate;
cool so that primers bind to DNA;
add DNA polymerase/nucleotides;
use of restriction enzymes;
use of electric current and agar/gel;
shorter fragments move further; 6 max
- (b) probes bind to complementary base sequences;
(bands refer to) different base sequences along DNA /
same base sequences not repeated along DNA; 2
- Total 8
-

QWC (See guidance)

1