ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme June 2003

GCE

Biology B

Unit BYB2

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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)* 4
(*allow labelled diagrams*)

(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 in gametes)*

Accept

no pairing of chromosomes	*pairing of chromosomes*
no chiasma/crossing over	*chiasma/crossing over (may occur)*

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; *also accept* *CFTR genes inserted into plasmids;* *appropriate use of restriction/ligase enzymes;*		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