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 <u>in</u> 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 <u>strand</u> 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; <u>both</u> strands act as template/complementary base pairing occurs on <u>both</u> 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 <u>in nucleus</u>; 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 ; <u>consequence</u> of lack of variation (e.g. all susceptible to same disease); long term effect not known; *(ignore ethical issues / genetic diseases)*	1 max
		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