ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme June 2002

GCE

Biology B

Unit BYB2

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Question 1

(a)	(i)	release <u>energy</u>/<u>ATP</u> for movement		1
	(ii)	move easily/less resistance to movement/quicker/more per ejaculate;		1
(b)		chromosome number is halved/haploid; allowing a constant number/diploid to be restored by fertilisation/ over generations;		2
			Total	4

Question 2

(a)		replace defective genes/treat genetic diseases with (healthy) genes;	1	
(b)	(i)	thick/sticky mucus/shortness of breath with moderate exercise/ susceptibility to chest infections/weight loss through poor digestion/sterility;		1
	(ii)	<u>one</u> amino acid missing/different/changed;		1
(c)	(i)	gene is expressed; healthy genes replicated with cells so not lost;		1 max
	(ii)	gamete cells are not affected/do not take up the healthy gene; still able to pass on the defective gene;		2
			Total	6

Question 3

(a)		different recognition sites/base sequences; different active sites;		1 max
(b)	(i)	single stranded/sticky ends/hydrogen bonding; complementary/base pairing occurs;		2
	(ii)	different plasmids contain different numbers/sized/types of fragment;		1
	(iii)	ligase;		1
(c)	(i)	smaller/less dense/lower mass/fragments move further/faster; *(not lighter) (allow the converse)*		1
	(ii)	four bands identical bottom and middle bands, extra band between these, top band lower;		2
			Total	8

Question 4

(a) 30, 31, 61; 1

(b) chromatids did not separate/chromosomes move to one pole;
centromeres did not divide;
spindle did not form/spindle was not active;
daughter cells did not separate/cytokinesis did not occur; 2 max

(c) vegetative propagation/asexual reproduction/cloning/runners /tubers/bulbs/corns/grafting/micropropagation/tissue culture;
by mitosis; 2

Total 5

Question 5

(a) (DNA) polymerase; 1

(b) different lengths;
because different numbers of nucleotides/strand synthesis stops at modified nucleotide; (*allow references to base*) 2

(c) lay (gel) close to photographic/X ray film;
develop film/dark areas/fogging/bands/autoradiogram; 2

Total 5

Question 6

(a) (i) high energy ionized particles/X-rays/ultraviolet light/high energy radiation/uranium/plutonium/gamma rays/tobacco tar/ caffeine/pesticides/mustard gas/base analogues/free radicals;
(reject radiation) 1

(ii) mutation;
change in the sequence of nucleotides/bases/addition/deletion/ substitution;
changed order of amino acids/different protein/different tertiary; structure;
inactive enzyme if shape of active site is changed/enzyme-substrate complex does not form; 3 max

(b) mutation in gene 1;
enzyme e_1 inactive/faulty; (*disqualify if both e_1 and e_2 inactive)*
ornithine not converted to citrulline/citrulline not produced /unable to grow on ornithine;
gene 2 not mutated/not affected;
enzyme e_2 active;
arginine produced from citrulline;
arginine produced from citrulline; 4 max

Total 8

Question 7

(a)		deoxyribose in DNA and ribose in RNA; thymine in DNA and uracil in RNA;		2
(b)	(i)	1000 000 000 / 125 000 000 = 8: 8/10 = 0.8nm; (allow one mark for any answer with 8 – eg 80, 800 etc)		2
	(ii)	Sequence of bases is the code; DNA strands separate /Hydrogen bonds break; producing mRNA/transcription (linked to mRNA production); role of RNA polymerase; complementary base pairing; mRNA attaches to ribosome/rER; tRNA bring amino acid; anticodons of tRNA complementary to codons on mRNA/translation; amino acids join by peptide bonds/condensation reaction;		7 max
(c)		DNA strands separate/hydrogen bonds are broken (*a labelled diagram could show this*); each strand forms a template/is copied/one new strand & one old (*a labelled diagram could show this*); complementary base pairing; radioactivity incorporated into (all) new strands;		4
			Total	15

Question 8

(a) (i) genetically identical cells/individuals; 1

(ii) separated cells are genetically identical/copies of the zygote;
produced by mitosis;
no differentiation at this stage/appropriate genes expressed to form whole organism; 3

(b) contain different alleles/genes;
nucleus X is diploid/nucleus Y is haploid; 2

(c) mated/treated with fertility hormones/embryo removed/in season; 1

(d) coffee-coloured (because only contains genes from coffee-coloured mouse); *reject if explanation gives wrong context* 1

(e) cut out the human gene using an endonuclease/restriction enzyme;
reference to specificity/sticky ends;
use the same enzyme;
to cut a plasmid/virus DNA;
fixed by ligase;
human gene joined to a mouse gene/promoter;
wrap inside a liposome virus;
treatment used to introduce this into a mouse cell/electric shock/micropipette/virus injects DNA/liposome dissolves through membrane;
human gene expressed in mouse cell; 6 max

Total 14

Quality of Written Communication 1