



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme

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GCE

Biology B

Unit BYB2

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Registered address: Addleshaw Booth & Co., Sovereign House, PO Box 8, Sovereign Street, Leeds LS1 1HQ
Kathleen Tattersall: *Director General*

Question 1

- | | | |
|---------|---|---|
| (a) (i) | release <u>energy/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; (<i>not lighter</i>) (<i>allow the converse</i>) | 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; (<i>allow references to base</i>)	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 <u>tar</u> / caffeine/pesticides/mustard gas/base analogues/free radicals; (<i>reject radiation</i>)	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; (<i>disqualify if both e_1 and e_2 inactive</i>) 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) $1000\ 000\ 000 / 125\ 000\ 000 = 8: 8/10 = 0.8\text{nm}$;
(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
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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
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Quality of Written Communication 1