ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme January 2002

GCE

Biology B

Unit BYB2

Question 1

(a) (i) Metaphase; 1

(ii) Centromeres divide;
Chromatids separate / pulled apart;
By spindle fibres; 2 max

(iii) Three chromosomes;
One of each homologous pair; 2

(b) 7.6 is replicated DNA / chromatids joined together / late interphase / prophase / metaphase / before cell division;
3.8 contains single chromatids / DNA is not replicated / telophase / early interphase; 2

Total 7

Question 2

(a) Phosphate;
Sugar / deoxyribose / pentose; 2

(b)

	4	5	
4	6	2	

2

(c) Different genes are expressed in each;
Producing different enzymes / proteins; 2

Total 6

Question 3

(a) Male gametes are motile / flagellum / tail;
Male gametes contain less cytoplasm / yolk / nutrients / food;
Male gametes contain an acrosome;
Some male gametes carry a Y chromosome;
More male gametes released per ejaculate; 2 max

(b) (i) Contain more cytoplasm / yolk / food / nutrients; 1

(ii) Each is less likely to survive / less protection from parents (so more produced) / greater chance of fertilisation; 1

Total 4

Question 4

(a)		A gene (may) have more than one type of allele; Different chromosomes in a homologous / pair have different alleles; Homologous / pairs of chromosomes separate in meiosis; One chromosome from each pair goes to each daughter cell;	3 max
(b)		7, 7; 14;	2
		Total	5

Question 5

(a)	(i)	Cells do not secrete chloride ions / lower water potential in cell; Water is retained in cells / exit from mucus; Sticky / thick mucus (collects in airways); Coughing caused by irritation / inflammation;	3 max
	(ii)	mucus blocks pancreatic duct preventing release of digestive enzymes / thick mucus layer reduces absorption of digested food;	1
(b)	(i)	DNA strands separate / unzipped / hydrogen bonds break in the region of the gene; Nucleotides / bases line up according to base pairing rules / complementary / examples given / transcription; Role of RNA polymerase;	3
	(ii)	4437;	1
		Total	8

Question 6

(a)		Asexual / vegetative propagation / cloning;	1
(b)	(i)	Genetically identical; By mitosis;	2
	(ii)	Environment affects plants in different ways / mutations;	1
(c)		Many plants produced in short period of time / seeds take longer to produce new plants / quicker; Desirable features are conserved;	2
		Total	6

Question 7

(a)	(i)	Codon;	1
	(ii)	Tyrosine;	1
(b)	(i)	Base sequence / codon (of DNA) is changed; Different (sequence of bases in) mRNA; Attracts different tRNA / anticodon; Different amino acid inserted into protein / polypeptide;	3 max
	(ii)	More than one base triplet / codon codes for one type of amino acid; Suitable example / true for the third base of the codon;	2
(c)		Endonuclease / restriction enzyme cuts DNA; Reference to specificity sticky ends / use the same restriction enzyme on fragment and plasmid; Ligase used to fix ends;	3
(d)		Details of taking a replica: ef filter paper / felt / nylon membrane; To obtain an <u>exact</u> copy; Bacteria spread on agar to obtain separate colonies; Grown on agar containing ampicillin; Bacteria containing plasmid survive; For principles and detail of replica plating: Placed on agar containing tetracycline; Bacteria growing on ampicillin, but not tetracycline contain the recombinant plasmids; Because foreign DNA has been inserted into the tetracycline gene;	5 max
		Total	15

Question 8

(a)		DNA strands separate / hydrogen bonds broken; Parent strand acts as a template / copied / semi-conservative replication; Nucleotides line up by complementary base pairing; Role of DNA polymerase;	4
(b)	(i)	Production of single / separate stranded DNA;	1
	(ii)	Attaches to / complementary to start of the gene / end of fragment; Replication of base sequence from here;	2
	(iii)	Enzymes active / not denatured at high temperatures; Allowing rapid replication of DNA;	2
(c)		256;	1
(d)	(i)	Large scale / cheap / easier production of human protein;	1
	(ii)	Long term effects unknown / effects of introducing foreign genes not fully known; Ethical issue explained - eg wastage of sheep embryos / embryos have potential for development / animal rights, eg wrong to experiment on animals; May encourage similar research using cells from human embyros / that develop into humans; May spread antibiotic resistance into other species; *(Playing God / references to evolutionary effect – neutral)*	3 max
		Total	14