GCE BIOLOGY BY5

Question		Marking details		Marks Available
1.	(a)	A		1
	(b)	I		1
	(c)	H/C		1
	(d)	F		1
	(e)	G		1
			Question total	**5**

Question			Marking details	Marks Available
2.	(a)		The transfer of pollen from the anther to the stigma.	1
	(b)	(i)	Embryo sac.	1
		(ii)	Through stigma, style, ovary wall, micropyle. (Must travel through ovary wall to bottom before going into micropyle)	1
	(c)	(i)	Oviduct / fallopian tube;	
		(ii)	• (Acrosome / Y) <u>contains enzymes</u>; Not Y is an enzyme • which {<u>hydrolyse / dissolve / breakdown / digest / softens</u>} the {<u>zona pellucida / jellycoat</u>};	2
	(d)		• <u>Formation / growth</u> of <u>tube</u>; • <u>nucleus</u> travels along a {<u>tube / channel / pathway</u>} (into the egg / ovule); • <u>enzymes are produced</u> which {<u>allow a tube to grow / which digests a path</u>}; • both are chemotropic; • membranes burst to release male gametes;	2
			Question total	**8**

Question			Marking details	Marks Available
3.	(a)		1. Smooth, coloured; 2. Wrinkled, colourless; Accept non- coloured;	2
	(b)		Linked / on same chromosome / (genes) are inherited together; NOT sex linked;	1
	(c)	(i)	Smooth, colourless AND wrinkled, coloured;	1
		(ii)	Crossing over / exchange of alleles; Not independent assortment / recombinants / chiasmata alone.	1
	(d)		F1 SsCc	1
			F2 Sscc or SScc or ssCc or ssCC	1
			Question total	**7**

Question	Marking details	Marks Available
4.		6

Part	Correct	Ignore	Reject
(a)	4 and 5	3	1,2
(b)	2		1,3,4,5
(c)	1 and 3	5	2,4
(d)	1 and 3	5	2,4
(e)	2		1,3,4,5
(f)	3	5	1,2,4

Question total **6**

Question			Marking details	Marks Available
5.	(a)	(i)	Inserting a {normal / correct} {gene / DNA sequence} / <u>Replacing</u> {defective / faulty} genes with {copies of a new DNA sequence / normal allele / normal gene} / (owtte);	1
		(ii)	<table><tr><td>Somatic cell therapy</td><td>Germ line therapy</td></tr><tr><td>1 and 4</td><td>2 and 3</td></tr></table> (Must have both for 1 mark)	2
	(b)	(i)	• CFTR is a {Channel protein / carrier protein / ion pump}; Not active transport alone • Blocks {transport / movement} of chloride ions out of cells (into mucus) / ORA; • Water retained in cell / water prevented from leaving / no osmosis; • Unable to remove mucus in lungs; • {Infection/ more susceptible to disease} / coughing {more likely / increased}; • {<u>Narrowing / blocking</u>} of air passages (so reduced air flow); • {<u>Increased diffusion distance / reduced surface area</u>} for <u>gas exchange</u> / insufficient oxygen received / not enough oxygen absorbed; Max 2 for symptoms only	4
		(ii)	• (Modified / normal / correct) genes are inserted; • into liposomes / virus (as vector); • Liposomes fuse with cell membrane / virus infects cell / ref to endocytosis; • (Modified) gene passes through membranes / into cell; • Applied by aerosol / spray / inhaler; (Any 3 points)	3

Question			Marking details	Marks Available
(c)	(i)		Each new DNA molecule consists of one {original / parent / old / template} strand and one new strand of DNA;	1
	(ii)	I	To (break bonds between DNA strands or bases to) <u>separate</u> original DNA into two single strands;	1
		II	Triggers / Allows {primers / short pieces of RNA / single-strand DNA / free nucleotides} to {bind / attach / join} (to single stranded DNA);	1
		III	TAQ / DNA polymerase {makes nucleotides join / makes a strand of DNA / catalyses the synthesis of a complementary strand};	1
	(iii)		• (Percentage) risk is too high (for *human* application) / Incorrect base sequence; • Incorrect mRNA; • Different tRNA / brings incorrect amino acid; • Structure of protein synthesised unknown / folding of protein is different / sequence of amino acid altered; • Protein {non-functional / function altered} / chloride ions not transported / thick mucus still produced / gene therapy not effective; (Any 3 points)	3
			Question total	**17**

Question			Marking details	Marks Available
6.	(a)		RNA polymerase;	1
	(b)	(i)	CGT TAC CAA;	1
		(ii)	CGU UAC CAA;	1
	(c)	(i)	Alanine;	1
		(ii)	• Mutation 1 – no change to sequence of amino acids; • Codon for alanine / degenerate codon / same amino acid coded for; Neutral mutation; • Mutation 2 – valine replaced by alanine / codon for alanine; • (Tertiary) {structure / shape of protein} may change / position of bonds may change / sequence of amino acids changing / structure of protein changing / protein non functional;	2 2
	(d)		• Translation prevented; • Tetracycline {binds to / blocks / inhibits} {mRNA triplet / codon / CGC / second attachment site}; • {Anticodon / tRNA triplet} cannot pair with {mRNA triplet / codon} / cannot form codon-anticodon complex; • Amino acid not added to polypeptide chain / peptide bonds not formed; (Any 3 points)	3
			Question total	**11**

Question			Marking details	Marks Available
7.	(a)	(i)	C and D;	1
		(ii)	Fragments 64 and 36 (kb);	1
	(b)	(i)	1, 2, 3 & 6 AND 1 and 3;	1
		(ii)	• Colonies {1, 2, 3 & 6 / shown / present} have taken up {plasmid / ampicillin resistant gene}; Reject taken up human gene; Ignore recombinant plasmid; • Because they are resistant to ampicillin / able to grow on ampicillin; • 4 and 5 have not taken up the {plasmid / ampicillin resistant gene}; • And so are not resistant to ampicillin;	2
		(iii)	• Colonies 1 and 3 do not have the gene / recombinant plasmid; • As they (remain) resistant to tetracycline / gene for tetracycline resistance has not been {disrupted / destroyed}; • Colonies 2 and 6 do have the gene / recombinant plasmid; • Tetracycline resistance destroyed / prevents gene from being expressed;	3
			Question total	**8**

Question			Marking details	Marks Available
8.	(a)	(i)	• Change in structure in a <u>community</u> over time; • Change in {composition of species / species present} (in a community) over time; • Either due to change in environmental / (named) abiotic factors;	2
		(ii)	A stable community which {undergoes no further change / reached equilibrium} / no further succession;	1
	(b)		• (Increased) interspecific competition / other plant species compete with heather / heather outcompetes other plant species; • For light / nutrients / minerals / named nutrient / water (linked to competition); Reject resources unqualified.	2
	(c)		• More energy used in respiration; • Higher respiration relative to {photosynthesis / GPP} / NPP decreases; • {Fewer leaves / less surface area} for photosynthesis; • Less energy / glucose to {produce new biomass / for growth / synthesis of protein or named compound}; • (Heather increases in size / ages / more competition from other species) soil fertility decreases / less minerals or nutrients available / greater competition for named resources; • Growth rate decreases / fewer leaves produced; • (As heather increases in size) less light penetrates the centre of the plant; • Loss of central leaves, (therefore woody parts increase); (Any 3 points)	3
			Question total	**8**

Question		Marking details		Marks Available
9	(a)	A	Extinction is the loss of species;	1
		B	Conservation is the planned preservation of wildlife / the {enhancement / maintenance} of biodiversity;	1
		C	To ensure the survival of the species;	1
		D	Conservation of existing gene pools;	1
		E	To conserve potentially useful {genes / genetic sources} (for future generations);	1
		F	Qualification / Example of E – resistance to disease or other;	1
		G	Use of plants / animals as a gene bank to cross with highly cultivated varieties;	1
		H	Conservation of plants with medicinal properties;	1
		I	(Planned) preservation of habitat, with example – wetlands, coral reef, sand dune;	1
		J	Seed / sperm banks;	1
		K	Re-introduction programmes, e.g. Red Kite;	1
		L	Protection / breeding of endangered species in specialised zoos / captive breeding programmes / rare breeds;	1
		M	Trade restrictions on endangered species / reference to CITES / ivory / whaling;	1
		N	Relevant reference to NGOs {e.g. WWFN / government agency / CCW / SSSI / National Parks / nature reserves} / ecotourism / education;	1
		O	Correct reference to relevant legislation e.g. to prevent over-grazing / over-fishing / hunting / poaching in context / collecting birds eggs / picking wild flowers / collecting plants;	1
			Question total	**10**

Question		Marking details		Marks Available
9	(b)	A	(Embryo cloning) {in vitro fertilised egg / zygote} divides to form {a ball of cells / embryo} / undergoes mitosis;	1
		B	Embryo is split into separate cells;	1
		C	Before differentiation / 8 cell stage;	1
		D	(Nuclear transplant) nucleus / DNA may be removed from diploid / somatic / udder;	1
		E	(Nuclear transplant) nucleus / DNA may be removed from egg / ovum / secondary oocyte;	1
		F	Introduce nucleus to donor egg / Donor and recipient cells are fused together;	1
		G	The embryo is allowed to develop in a surrogate;	1
		H	Animal born is genetically identical to the original donor;	1
		I	Reference to totipotent / cells are able to differentiate into more than one cell type / form a whole organism;	1
		J	Example of tissue that contains stem cells – bone marrow, testes, embryonic stem cells;	1
		K	Human stem cells could be used to {grow into required organ or tissue / therapeutic uses (treat range of diseases) / or named example;	1
		L	Less likelihood of rejection / no need for immunosuppressant drugs	1
			(Any 8 from 13)	
		M	Embryos have to be destroyed to provide the stem cells/ Pro-life issues -embryos have the potential for independent life (in the future);	1
		N	Unknown long term side effects of stem cells;	
		O	Genetic modification of humans for non-medical reasons / eugenics issues related to selection of embryos;	1
			(Any 2 from 13)	
			Question total	**10**