

GCE BIOLOGY BY5

SUMMER 2013

Question		Marking details	Marks Available
1.	(a)	<p>Seminiferous tubule - (meiosis) sperm production/ spermatogenesis; <i>Accept spermatids</i></p> <p>Seminal vesicles - produce nutrient (solution) for sperms; <i>Accept aids sperm motility/ mobility</i></p> <p><i>Reject Neutralise acidic urine</i></p>	2
	(b)	<p>Ligase - {splices / joins} two {sections of DNA/ groups of nucleotides/ sugar phosphates} together; <i>Accept joins (donor) DNA into a {plasmid/ vector}</i></p> <p><i>Reject joins strands of DNA</i></p> <p>Polymerase - joins single nucleotides to end of a DNA chain; <i>Accept addition of {free/single} nucleotides to {exposed (DNA) bases/ template};</i></p>	2
	(c)	<p>Gene - {section of DNA / chromosome} which codes for a {single polypeptide / protein/ sequence of amino acids};</p> <p>Allele - {different/ specific} {forms/ versions} of {a/same} gene; <i>Accept different types of the <u>same</u> gene</i></p>	2
	(d)	<p>Primary succession {Colonisation of/ introduction of species to} an area where no living organisms have lived before;</p> <p>Secondary succession colonisation of area where living organisms had previously lived/ recolonisation / reintroduction of species.</p> <p>Question 1 total</p>	2
			[8]

Question			Marking details	Marks Available
2.	(a)	(i)	<p>A. <u>Variation</u> in age at which sexual maturity is reached;</p> <p>B. Caused by mutation;</p> <p>C. Reach sexual maturity earlier/ Small fish {have a selective advantage/ pass through net}/ ora;</p> <p>D. Breed/ reproduce; <i>reject mate</i></p> <p>E. Pass on alleles to offspring; <i>reject genes</i></p> <p>F. Allele frequency for earlier maturity / hence small size at maturity increases;</p> <p>G. Figs quoted from graph (in context);</p>	Max 5
		(ii)	<p>Very few large cod survived/ ORA; <i>reject none</i></p> <p>reduced gene pool;</p> <p>{No/ little} mutation (to increase size) / insufficient time for genetic drift (to increase size) / No gene flow from another gene pool;</p> <p>Small fish produce less gametes/ difficulty in breeding/ few fish remain to reproduce/ reproductive isolation;</p> <p>Not enough food/ increased competition for food/ increased predation/ disease;</p> <p>Change in {temperature/ pH}/ pollution;</p>	Max 3
	(b)	<p>Restricted fishing times/ hours;</p> <p>Quotas/ licenses;</p> <p>Exclusion zones/ OWTTE;</p> <p>Limiting numbers of fishing vessels/ international agreements limiting catches;</p> <p>Limiting season;</p> <p>Restriction of <u>area</u> of nets;</p> <p>Closing spawning and/ or nursery areas;</p> <p><i>REJECT any reference to mesh size</i></p>	2	

Question		Marking details	Marks Available
	(c)	(i) Eutrophication/ pollution; {Disease/ parasites} more likely (to spread) in {cultivated fish/ overcrowded conditions}/ disease may spread to wild fish; {Antibiotics/ pesticides} qualified e.g. can harm other marine organisms/ bioaccumulation of pesticides/ enters food chain/ high cost; Problems associated with flow of alleles into wild population; Higher level of dioxins/ PCBs in farmed fish;	2
		(ii) Three of each type of chromosome / {odd/uneven} number of chromosomes/ unpaired chromosomes; No pairing of <u>homologous</u> chromosomes/ no bivalent formed; Prophase 1 meiosis; Meiosis does not take place; No gametes produced;	Max 4
		Question 2 total	[16]

Question		Marking details	Marks Available																				
3.	(a)	(i) (Genes) on the {X/ Y} chromosomes; Reject sex chromosomes Accept (genes) on sex chromosomes not on the autosomes	1																				
		(ii) <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>Parents</td> <td colspan="2">$X^H Y$</td> <td colspan="2">$X^H X^h$;</td> </tr> <tr> <td>Gametes</td> <td>X^H</td> <td>Y</td> <td>X^H</td> <td>X^h ;</td> </tr> <tr> <td>Offspring</td> <td>$X^H X^H$</td> <td>$X^H X^h$</td> <td>$X^H Y$</td> <td>$X^h Y$;</td> </tr> <tr> <td></td> <td>Normal female</td> <td>Normal/ Carrier female</td> <td>Normal male</td> <td>Haemophiliac/ sufferer/ affected} male;</td> </tr> </table> <p><i>Suitable symbols with key eg. $X^N X^n$ max 3</i> <i>Suitable symbols with no key max 2</i> <i>Reject crosses not involving X and Y chromosomes</i> <i>If wrong genotypes ecf apart from phenotype of offspring which must correctly identify a haemophiliac son</i></p>	Parents	$X^H Y$		$X^H X^h$;		Gametes	X^H	Y	X^H	X^h ;	Offspring	$X^H X^H$	$X^H X^h$	$X^H Y$	$X^h Y$;		Normal female	Normal/ Carrier female	Normal male	Haemophiliac/ sufferer/ affected} male;	4
		Parents	$X^H Y$		$X^H X^h$;																		
		Gametes	X^H	Y	X^H	X^h ;																	
Offspring	$X^H X^H$	$X^H X^h$	$X^H Y$	$X^h Y$;																			
	Normal female	Normal/ Carrier female	Normal male	Haemophiliac/ sufferer/ affected} male;																			
(iii) None;	1																						
(iv) 0.25 / 25%; <i>Accept 1 in 4/ ¼</i> <i>Reject 1:3</i>	1																						
(b)	<table style="width: 100%; border: none;"> <tr> <td style="padding-right: 20px;">AB</td> <td style="padding-right: 20px;">ab</td> <td style="padding-right: 20px;">AB</td> <td>ab ;</td> </tr> <tr> <td>AABB</td> <td>AaBb</td> <td>AaBb</td> <td>aabb ;</td> </tr> </table> <p>3:1 ; <i>Genotypes must show some correct indication of linkage between a and b for ecf</i> <i>Award 0 if dihybrid cross is completed</i></p>	AB	ab	AB	ab ;	AABB	AaBb	AaBb	aabb ;	3													
AB	ab	AB	ab ;																				
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Question		Marking details	Marks Available
	(c)	<p>Incomplete linkage;</p> <p>Genes {further/ far} apart on same chromosome;</p> <p>{Crossing over/ chiasmata} can occur;</p> <p>Four types of gametes produced(but not in equal numbers);</p> <p>Small numbers of recombinants / large numbers parental types;</p> <p>Recombinants equal in numbers / parental equal in numbers;</p> <p>Question 3 Total</p>	<p>Max 2</p> <p>[12]</p>

Question		Marking details	Marks Available
4.	(a)	(i) A = Primary oocyte/ Primary follicle; B = Graafian follicle; <i>Accept secondary follicle/ theca</i> C= Corpus luteum; <i>reject yellow body</i>	3
		(ii) Ovulation;	1
		(iii) HCG/ human chorionic gonadotrop(h)in;	1
	(b)	(i) W = Oogonium/ oogonia; X = primary oocyte; Y = Secondary oocyte; Z = (first) Polar body; <i>reject nucleus accept polar cell</i>	4
		(ii) Mitosis;	1
		(iii) Correct number of chromosomes in each; X = 4 Y =2 Cell X Prophase 1 drawn correctly; chromosomes inside nuclear membrane, not on equator Cell Y Metaphase 2 drawn correctly; must be clearly on equator	3
	(c)	Polar bodies produced/ reduction in genetic material at each stage of meiosis; ecf from bi – accept polar nucleus if used in bi Functional gamete retains (most of) the cytoplasm; (Cytoplasm) acts as a food store for zygote/ provide mitochondria for zygote; needed until implantation takes place/ obtained from placenta;	2
	Question 4 Total		[15]

Question			Marking details	Marks Available
5.	(a)	(i)	repeat experiments; Same area of grassland used for each test/ Same grass covering/ sludge injected to same depth/ Same {volume / mass/ concentration} of sludge/ same sludge applied/ Same soil {type/ gradient/ aspect/ exposure}/ same soil nitrate concentration/ same time of year; NOT temperature/ pH	2
		(ii)	increase in rainfall increases {leaching/ nitrate concentration in soil water}; greater effect on injected sludge with increased rainfall/ ORA; only a small effect at low rainfall;	2 max
		(iii)	apply (to surface) when {dry / little rainfall/ rainfall is less than [any figure less than 120]};	1
	(b)	Algal growth/ algal bloom/ overgrowth of plant; Less <u>light</u> , so {algae/ plants} <u>die</u> ; { <u>Bacteria/ saprobionts/ saprotrophs/ fungi</u> } <u>decompose</u> { <u>plants/ organic material</u> } (and increase in number); (Reject decomposers) Using up <u>oxygen</u> in <u>respiration</u> ;	3 max	
(c)	Leguminous plants/ any named leguminous plant; Rhizobium/ nitrogen fixing bacteria (in root nodules); <i>Reject nitrate fixing Azotobacter</i> Convert nitrogen (gas) into ammonium/ ammonia/ amino acids; Plants {left to decay/ ploughed in};	3		
Question 5 Total				[11]

Question		Marking details	Marks Available
6.	(a)	Rate of Conversion of light energy into chemical energy (by producers /by photosynthesis); <i>Accept rate at which {products/ organic materials} are formed/ produced</i>	1
	(b)	(net primary production) decreases; More {carbohydrate/ glucose} is {broken down/ used by} respiration (than is produced by photosynthesis);	2
	(c)	(i) (heat lost in) respiration; Excretion; egestion/not all parts of the material are digestible; not all parts eaten;	Max 2
		(ii) Herbivores: {difficult to digest/ less efficient at digesting} cellulose/ have more {indigestible/ fibrous} material (in diet)/ ; <i>Reject cannot digest cellulose</i> Carnivores:{easily digest/ more efficient at digesting } {protein/ fat}; More { <u>egested</u> material/ faeces} (lost) by herbivores/ less { <u>egested</u> material/ faeces} lost by carnivores;	Max 2
	(d)	Productivity of producers higher/ primary productivity higher; Secondary productivity higher/ more energy stored in consumers; {Less energy {used/wasted} /respiratory rate is lower} + qualification eg.in cold blooded animals/ buoyancy; Higher {temperature/ light} higher rate of photosynthesis;	Max 1
Question 6 Total			[8]

Question		Marking details	Marks Available
7.	(a)	<p>A. {nucleotide/ base} sequence of DNA contains code for {primary structure of polypeptide/ amino acid sequence};</p> <p>B. Triplet base hypothesis/ 3 bases = 1 amino acid/ triplet code;</p> <p>C. transcription;</p> <p>D. RNA polymerase links to DNA;</p> <p>E. DNA unwinds / unzips;</p> <p>F. (One of) DNA strands acts as {coding/ template/ sense} strand;</p> <p>G. {mRNA } synthesised;</p> <p>H. complementary base pairing + detail of A-U C-G;</p> <p>I. mRNA leaves nucleus through a <u>nuclear pore</u>;</p> <p>J. translation;</p> <p>K. mRNA {held by/ attaches to} a ribosome/ ribosome moves along mRNA molecule;</p> <p>L. Two tRNA binding sites on each ribosome;</p> <p>M. each tRNA has its own specific amino acid;</p> <p>N. tRNA molecules bind to codon on mRNA via an anticodon;</p> <p>O. peptide bond formed between amino acids on adjacent tRNA;</p> <p>P. Reference to ATP use {in Amino acid activation/ formation of peptide bonds};</p>	

Question	Marking details	Marks Available
(b)	<p>A. Asexually produced and genetically identical;</p> <p>B. Artificial, cuttings ;</p> <p>C. micropropagation;</p> <p>D. meristem removed;</p> <p>E. meristem is {able to differentiate/ give rise to different cell types/ totipotent}</p> <p>F. cut into <u>small</u> pieces/ explants;</p> <p>G. Culture under sterile conditions;</p> <p>H. On a nutrient {medium/ agar jelly};</p> <p>I. (Cells divide to form a) Callus ;</p> <p>J. Callus divided and {allowed to differentiate into a plantlet/ treated with plant growth substances to promote root and/or shoot growth};</p> <p><i>Max 8</i></p> <p>Advantages,</p> <p>K. speed of production;</p> <p>L. Production of large numbers;</p> <p>M. {Identical/ desired} line/ crop uniform/ disease free;</p> <p>Disadvantages</p> <p>N. Must maintain sterile conditons to avoid introduction of pathogens;</p> <p>O. Genetic instability/ increased mutation rate;</p> <p>P. loss of <u>genetic</u> variation/ reduction gene pool/ all susceptible to same diseases;</p> <p><i>Candidates must attempt an advantage and a disadvantage in order to be awarded full marks.</i></p> <p>Question 8 Total</p>	<p>[10]</p>