



GCE MARKING SCHEME

SUMMER 2016

**BIOLOGY - BY5
1075/01**

INTRODUCTION

This marking scheme was used by WJEC for the 2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

GCE BIOLOGY - BY5
SUMMER 2016 MARK SCHEME

Question			Marking details	Marks Available
1	(a)	(i)	I (Biodiversity is) the {variety/ number of} <u>species</u> on {earth/in an ecosystem/ in an area}; NOT variation	1
			II (monoculture is) {growing/planting/producing} one {species/ plant/crop} (in large area);	1
		(ii)	reduces (bio)diversity; {destroys/takes up/reduces} habitat/deforestation or description of; Accept reference to interspecific competition/effect on food web	2
	(b)	(i)	the {mass/amount/volume/level} of carbon (dioxide) attributable to the actions of an {individual / product/ service} over a period of {time/ one year/lifetime}/ total CO ₂ released in the production of bananas from field to shelf;	1
		(ii)	Greater distance to transport the bananas; ORA vehicles {burn/use} more fuel; ORA	2
	(c)	(i)	Any two from: <ul style="list-style-type: none"> • One train carries more bananas than a truck; • trains take a more direct route; • less fuel burnt; • trains could use renewable electricity; 	2
		(ii)	Less Greenhouse {effect/gases} / less CO ₂ / global warming / climate change; NOT ref to ozone/ prevent global warming	1
	Question 1 total			[10]

Question		Marking details	Marks Available									
2	(a)	(i) Meiosis; correct spelling only	1									
		(ii) Anther / ovary / ovule / pollen mother cell/ pollen / pollen sac / embryo sac / megaspore / microspore;	1									
		(iii) 1-E , 2- C , 3- D , 4- F , 5- A , 6- B 0/1/2 correct = 0 marks 3/4 correct = 1 mark 5 correct = 2 marks	2									
		(iv) 6	1									
	(b)	(i) Both required for 1 mark A metaphase II C metaphase I	1									
		(ii) Any two from: <table border="1" data-bbox="416 1070 1241 1429"> <thead> <tr> <th>C/metaphase I</th> <th>A/metaphase II</th> </tr> </thead> <tbody> <tr> <td>pairing of chromosomes/ bivalent</td> <td>chromosomes not paired/ no bivalent</td> </tr> <tr> <td>centromeres not on equator</td> <td>centromeres on equator</td> </tr> <tr> <td>chromosomes either side of equator</td> <td>chromosomes on equator</td> </tr> <tr> <td>chiasma present</td> <td>no chiasma</td> </tr> </tbody> </table> Comparison needed for each mark Ignore references to numbers of chromosomes/ haploid/ diploid	C/metaphase I	A/metaphase II	pairing of chromosomes/ bivalent	chromosomes not paired/ no bivalent	centromeres not on equator	centromeres on equator	chromosomes either side of equator	chromosomes on equator	chiasma present	no chiasma
	C/metaphase I	A/metaphase II										
pairing of chromosomes/ bivalent	chromosomes not paired/ no bivalent											
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chromosomes either side of equator	chromosomes on equator											
chiasma present	no chiasma											
(c)	Crossing over; {Independent/random} {assortment/ segregation};	2										
Question 2 total			[10]									

Question		Marking details	Marks Available
3	(a)	(i) AaEe x AaEe; AE Ae aE ae; correct completion of punnet square;	3
		(ii) 9:3:4	1
	(b)	(i) 144,48,64	1
		(ii) 0.27/0.273/0.26 ECF	1
		(iii) In 0.05 column 5.99 circled	1
		(iv) Accept because <ul style="list-style-type: none"> • {calculated chi squared value/0.27 / it} {is less than / to the left of} {critical value/5.99} • probability lies between 80-90% / 0.8-0.9 • it is above the 5%/ 0.05 probability level ; ECF 	1
	(c)	(i) Gene pool;	1
		(ii) Greater; ORA (less in hedgerow)	1
		(iii) A. E gives plants a {survival/ selective} advantage/ prevents cattle grazing them; B. Plants with (allele) E more likely to survive and <u>pass on</u> (allele) E to next generation/ correct ref to {cloning/ asexual reproduction}; C. (allele) E becomes more frequent in {next generation/ gene pool/ population over time}; D. Natural selection/ ref to selective pressure; Ref to gene = neutral	4

Question			Marking details	Marks Available
3	(c)	(iv)	Any two from: <ul style="list-style-type: none"> • If plants become isolated/ ref to allopatric/sympatric speciation/lack of gene flow; • They may be acted on by different selection pressures; • (they will develop further) differences which prevent interbreeding/example; 	2
			Question 3 Total	[16]

Question			Marking details	Marks Available
4	(a)	(i)	(Its nucleic acid is) RNA; does not have to be transcribed/only need ribosomes/only translation needs to take place;	2
		(ii)	Ribosomes/ Golgi;	1
		(iii)	Any four from: A. RNA {attaches/ binds/ joins} to ribosomes; B. {codon / 3 bases} codes for one amino acid; C. tRNA brings specific amino acid D. attaches via anticodon/codon-anticodon complex/ complementary base pairing; E. amino acid joined by peptide bond formation;	4
	(b)	(i)	Ile,Lys,Lys,Ile	1
		(ii)	UAA,AAA,AAA,UAC	1
		(iii)	STOP (ignore anything after stop)	1
		(iv)	{Unchanged gene/original gene/ unchanged glycoprotein/ it} has stop codon/ ORA; so no further amino acids are added/ so translation stops/ ORA;	2
	(c)		Drawing shows correct phospholipid bilayer with protein molecule all the way across; any two labels for 1 mark from; <ul style="list-style-type: none"> • protein • {hydrophilic/phosphate} heads • {hydrophobic/fatty acid} tails (or phospholipid if heads and tails not mentioned) • cholesterol • {carbohydrate chain/glycocalyx/glycoprotein} 	2

Question		Marking details	Marks Available
(d)	(i)	Restriction (endonuclease enzyme)/ECOR1/	1
	(ii)	(Tobacco Mosaic) Virus/ TMV	1
	(iii)	(DNA) Ligase	1
	(iv)	Plasmids	1
	(v)	{Bacteria/ product} produced more {quickly/cheaply} / light not needed/ less space needed/ reproduce asexually so always clone the gene;	1
(e)	(i)	They would have died anyway;	1
	(ii)	The Americans had no more right to treatment than the Africans/owtte; Accept mouse {welfare/ rights}	1
Question 4 Total			[21]

Question		Marking details	Marks Available	
5	(a)	(i) Position in a food chain; Accept feeding level	1	
		(ii) $C_h = R_h + E_h + P_h /$ $P_h = C_h - R_h - E_h /$ $P_h = C_h - (R_h + E_h);$ Accept P_p for C_h Accept C_c for P_h	1	
	(b)	(i) $\text{kJ m}^{-2} \text{ week}^{-1} / \text{kJ hectare}^{-1} \text{ year}^{-1}$ [any energy unit / area unit/time unit] (allow / or per or $^{-1}$)	1	
		(ii) I $(\frac{950+2500+1050}{450000}) \times 100 = 1.0\%$ 2 for correct answer 1 if correct workings wrong answer or no units II $2500-1250-450 = 800$ 2 for correct answer, 1 if correct workings wrong answer	2	
	(c)	(i) (Biomass of producers includes) {wood/ cellulose/ligno-cellulose}/biomass includes {bones/teeth/fur}; Which is inedible/ not {eaten/digested} by herbivores;	2	
		(ii) All (of the dead organic material) is {broken down/ digested/ used in respiration/ owtte}.	1	
		(iii) Rate of decomposition will be less/owtte; (Acidic conditions) {prevent/slow} growth of bacteria and fungi/ {inactivate/ denature/away from optimum pH} enzymes; Accept: rate of decomposition will increase because the enzymes have low optimum pH = 2 marks	2	
		(iv) No , because not <u>all</u> of the dead organic matter is {decomposed/ broken down} / owtte;	1	
	Question 5 Total			[13]

Question		Marking details	Marks Available	
6	(a)	A	Correctly labelled drawing: including any three from: Seed coat/testa, plumule, radicle (or embryo plant), cotyledon/ seed leaf, embryo, micropyle;	1
		B	Testa protects (embryo)/ reference to waterproofing/ from integuments;	1
		C	Cotyledon food store/ replaces endosperm as a food store;	1
		D	{Embryo/ radicle/plumule} = the (developing) {plant/root/shoot}/ {from zygote/ or description of};	1
		E	Micropyle - water enters/ is retained from the ovule;	1
		F	Maize has one cotyledon/ seed leaf;	1
		G	Maize has {aleurone/protein layer/endosperm} (broad bean does not);	1
		H	Pericarp/ fruit wall and testa fused in maize	1
		I	Maize is a fruit broad bean is a seed	1
		J	Water and oxygen (are essential for germination); both for 1 mark	1
		K	(A suitable) temperature (is essential for germination)	1
			water is needed to:	1
			Two from: rehydrate (embryo) cells/ synthesise enzymes/water	1
		L	causes seed to swell and burst testa / to transport enzymes / mobilise enzymes / as a reactant in the digestion of starch / to transport digested food (from food store to embryo);	
M				
N	oxygen is needed for respiration/ ATP production	1		
O	suitable temperature is needed for: for adequate reaction rates / reference to enzyme optimum temperatures	1		
Question Total			[10]	

Question		Marking details	Marks Available	
6	(b)	A	<i>Spermatogenesis</i> Occurs in seminiferous tubules; NOT seminal tubules/ seminiferous vesicles	
		B	{Germinal epithelium/germ cells} divides by mitosis;	
		C	Forms (diploid/2n) spermatogonia / ium;	
		D	Spermatogonia form primary spermatocytes;	
		E	Meiosis I occurs producing { <u>haploid/n</u> } / or description of;	
		F	secondary spermatocytes;	
		G	Meiosis II forms spermatids;	
		H	{ <u>differentiate/ mature</u> } into spermatozoa;	
		I	Nourished by {Sertoli/ nurse} cells/ protects them from the immune system;	
			<i>Comparison needed for any mark point J-O to be awarded</i>	
		J	Polar bodies form in oogenesis but not spermatogenesis/ four functional spermatozoa are formed from each spermatogonia only one functional ovum/ OWTTE;	
		K	process begins at puberty for sperm but prior to birth for ova	
		L	meiosis is completed as one process for sperm but is suspended in oogenesis	
		M	at fertilisation meiosis has been completed for sperm but the second meiotic division is completed after fertilisation for ova	
		N	{Differentiation/ maturation} occurs at primary oocyte stage oogenesis - maturation occurs at formation of spermatozoa	
O	Spermatozoa are nourished by {Sertoli / nurse} cells while developing oocytes are nourished by {follicle/ granulosa cells/ cumulus/ corona radiate/ theca}			
	Any 10 from 15			
		Question total	[10]	