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Mark Scheme (Results)

January 2014

International Advanced Level
Biology (WBI02)

Unit 2: Development, Plants and the Environment

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

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Question Number	Answer	Mark
1(a)	B ;	(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	1. mitochondrion has { double membrane / envelope } and Golgi apparatus has single membrane ; 2. { cristae / stalked particles / ribosomes / matrix /(circular) DNA } inside mitochondrion and Golgi do not ; 3. Golgi surrounded by (secretory) vesicles and mitochondria do not ; 4. Golgi made of { cisternae / flattened sacs / eq } and mitochondria { rod-shaped / eq } ;	ACCEPT reference to 'organelle P' instead of Golgi apparatus, but not if referring to rER	(3)

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	{ these organelles / membrane bound organelles } found only in eukaryotic cells ;	ACCEPT converse argument, e.g. prokaryotic cells have no membrane-bound organelles	(1)

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Question Number	Answer	Additional Guidance	Mark
1(c)	ribosomes / glycogen granule / starch granule / lipid droplets / cytoskeleton /eq ;	DO NOT ACCEPT reference to ribosomes if linked to rER , ignore reference to size of ribosomes	(1)

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Question Number	Answer	Mark
2(a)(i)	D ;	(1)

Question Number	Answer	Mark
2(a)(ii)	A ;	(1)

Question Number	Answer	Mark
2(a)(iii)	B ;	(1)

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Question Number	Answer	Additional Guidance	Mark
2(b)(i)	provide (a store of) energy / used in synthesis of other correctly named molecules / eq ;	DO NOT ACCEPT 'food store'	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	1. (it is a) secretory vesicle / lysosome ; 2. (cortical granules) { move to / fuse with } egg cell membrane / eq ; 3. { enzyme / chemical } released / exocytosis; 4. reference to the cortical reaction / change to zona pellucida ; 5. idea of preventing polyspermy ;	4. ACCEPT formation of fertilisation membrane	(3)

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Question Number	Answer	Additional Guidance	Mark
2(c)	1. general description of feature of a nucleus, e.g. nuclear pores, nucleolus, double membrane ; 2. both { haploid / contain one set of chromosomes / contain 23 chromosomes } ; 3. both produced by meiosis ;		(2)

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Question Number	Answer	Additional Guidance	Mark
3(a)(i)	1. (controls) growth of organism / replace (dead) cells / repair damaged tissues ; 2. increase in cell numbers / production of new cells / eq ; 3. asexual reproduction /production of { clones / genetically identical cells } / eq ; 4. reference to synthesis of { new cytoplasm / new organelles / DNA replication } ;	NOT repair damaged cells	(3)

Question Number	Answer	Mark
3(a)(ii)	D S phase ;	(1)

Question Number	Answer	Additional Guidance	Mark
3(a)(iii)	mitosis ;		(1)

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Question Number	Answer	Additional Guidance	Mark
3(b)	1. idea of correct stimulus e.g. chemical ; 2. (stimulus) { activates some genes / inactivates genes } / eq ; 3. { transcription / mRNA produced } at active genes / eq ; 4. translation of mRNA produces { protein /polypeptide } ; 5. idea that this protein either permanently modifies cell or determines { cell structure / function } ;	ACCEPT reference to genes being switched on – ignore references to genes being switched off	(4)

Question Number	Answer	Additional Guidance	Mark
3(c)(i)	1. idea that cells can divide ; 2. these cells are { undifferentiated / unspecialised } / these cells can undergo { differentiation / specialisation } ; 3. idea that they give rise to { most cell types / all cell types except extra-embryonic tissues } ;	cell types, not tissues or organs.	(2)

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Question Number	Answer	Additional Guidance	Mark
3(c)(ii)	1. idea of pluripotent stem cells giving rise to tissues ; 2. idea of (organs) made up of { groups of / several / different } tissues ;		(2)

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Question Number	Answer	Mark
4(a)(i)	B ;	(1)

Question Number	Answer	Mark
4(a)(ii)	C ;	(1)

Question Number	Answer	Additional Guidance	Mark
4(b)	1. cellulose is a renewable { resource / eq } / biofuel comes from a renewable { resource / eq } ; 2. plants can be re-grown / eq ; 3. fossil fuels are non-renewable resources / eq ; 4. idea that fossil fuels will run out ;	IGNORE carbon neutral	(3)

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Question Number	Answer	Additional Guidance	Mark
4(c)	1. xylem / sclerenchyma ; 2. (cell) walls contain cellulose ; 3. idea of lignification of walls ;	Mps 2 and 3 can still be given if incorrect tissue identified ACCEPT phonetic spellings of sclerenchyma	(3)

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Question Number	Answer	Additional Guidance	Mark
5* (a)	(QWC - Take into account quality of written communication when awarding the following points) 1. idea of genetic variation in (moth) population ; 2. mutation as a source of genetic variation ; 3. relevant selection pressure described, i.e. predation ; 4. idea of selection { for the dark forms / against the light forms } ; 5. dark forms (survive to) breed / eq ; 6. pass on { beneficial allele(s) / eq} to offspring / eq ; 7. change in allele frequency over generations ;	QWC emphasis is clarity of expression ACCEPT reference to A for light moths and B for dark moth IGNORE genes	(4)

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Question Number	Answer	Additional Guidance	Mark
5(b)	1. { little change / slight decrease / change of 7% / eq } (of melanic moths) from 1960 to 1970 ; 2. idea of { rapid / steep / greater / 47% /eq } decrease (of melanic moths) from 1980 to 1990 ; 3. increase in proportion of light forms after 1980 / decrease in darker forms (due to predation) / eq ; 4. description of an appropriate change in the environment, e.g. less pollution or less smoke ;		(3)

Question Number	Answer	Additional Guidance	Mark
5(c)	1. more than one gene (for a characteristic) / eq ; 2. on more than one locus ; 3. idea of continuous variation ; 4. idea of cumulative effect of genes ;		(2)

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Question Number	Answer	Additional Guidance	Mark
6(a)(i)	(0.12 x 244 800 ÷ 10 000) / 2.94 / 2.9 ; 3 ;	2.94 achieves only 1 mark because there cannot be fractions of a species	(2)

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	1. greater (biodiversity) in California / 6 more species / eq ; 2. correct manipulation of data e.g. 0.7 more species per 10 000 km^2 or 44.3% less in Texas ;		(2)

Question Number	Answer	Additional Guidance	Mark
6(a)(iii)	1. number of species ; 2. in a { particular area / region / eq } ;	NOT variety of species NOT habitat, environment or community	(2)

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Question Number	Answer	Additional Guidance	Mark
6(b)(i)	idea that species only found in one specific location (in the wild) ;	NOT habitat	(1)

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	1. the { role / position / function / eq } (of a species / organism) ; 2. within its { ecosystem /habitat / environment / eq } ; 3. idea of how organism or species { exploits resources /interacts with its environment / eq } ;		(2)

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Question Number	Answer	Additional Guidance	Mark
6(b)(iii)	1. { brown / *Hoplodactylus* } geckos live on the ground (and in trees) and { green/*Naultinus* } geckos live only in trees / eq ; 2. idea of being { active / feeding } at different times of the day ; 3. reference to { different sources of food / not competing for food } ; 4. idea of physical adaptations to survive e.g. camouflage ;	NOT intraspecific competition	(3)

Question Number	Answer	Additional Guidance	Mark
7(a)	1. description of sunlight as the environmental factor ; 2. an increase in MSH increases production of { melanosomes /melanin } / eq ; 3. phenotype described e.g. amount of melanin in skin or darkness of skin ;		(3)

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Question Number	Answer	Additional Guidance	Mark
7(b)(i)	(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. (tyrosinase) { enters /travels through / folded into 3-D shape / *secondary* or *tertiary* structure } in rER ; 2. idea of tyrosinase being packaged into (transport) *vesicles* by the rER ; 3. *vesicles* { move to / transported to / fuse with / eq } the *Golgi* apparatus / *vesicles* fuse to form the *Golgi apparatus* ; 4. idea of *enzyme* { modified / activated } in *Golgi apparatus* ; 5. detail of *modification* e.g. addition of carbohydrate (chains) / *glycosylation* / *glycoprotein* formed ; 6. idea of *enzyme* being transferred in *vesicles* from the *Golgi apparatus* to the melanosome ; 7. { *vesicles* / *lysosomes*} (containing *tyrosinase*) fuse with (*membrane* of) *melanosome* ;	QWC emphasis is on spelling of technical terms ACCEPT RER IGNORE secretory vesicles in this context – therefore not exocytosis or fusing with cell surface membrane	(5)

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Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	1. (transport) vesicles from rER / (secretory) vesicles from Golgi apparatus ; 2. (vesicles) fusing with cell (surface) membrane ; 3. reference to exocytosis ;		(2)

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Question Number	Answer	Additional Guidance	Mark
8(a)(i)	1. idea of covering plate (with a lid) / { oxygen / air } allowed to enter / anaerobic conditions prevented ; 2. prevents { contamination / growth of anaerobic bacteria} / eq ;	IGNORE references to sterilising the Petri dish	(2)

Question Number	Answer	Additional Guidance	Mark
8(a)(ii)	1. 25 - 30°C ; 2. higher temperatures may encourage growth of bacteria that are { pathogenic / harmful to humans } / could denature the enzymes /eq ; 3. optimum temperature for { growth of bacteria / enzyme activity } ;	ACCEPT up to 40°C if the context is enzyme activity	(2)

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Question Number	Answer	Additional Guidance	Mark
8(b)(i)	1. reference to zone of inhibition / no bacteria present in clear zones ; 2. extract { prevents growth of bacteria / kills bacteria / eq } ; 3. extract diffused (into the agar) / eq ; OR 4. idea of assessing effectiveness of extracts ; 5. reference to { measurement of zone /comparison of size of zones } ; 6. idea of size of zone of inhibition indicating degree of inhibition of bacterial growth ;		(2)

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Question Number	Answer	Additional Guidance	Mark
8(b)(ii)	1. apple most effective against A / bacterial species A most affected by apple /eq ; 2. guava is most effective against B and C / bacterial species B and C most affected by guava /eq ; 3. orange more effective against A and C than pomegranate / pomegranate more effective than orange against bacterial species B ; 4. bacterial species A least affected by guava /eq ; 5. bacterial species B least affected by apple /eq ; 6. bacterial species C least affected by apple and pomegranate /eq ;	ACCEPT reference to 'largest clear zone' as implying most effective	(3)

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Question Number	Answer	Additional Guidance	Mark
8(c)	1. extracts made using fruit of the same { mass / age } / extracts have same concentration of fruit ;		
	2. extracts made using same solvent / eq ;	ACCEPT suitable named solvent e.g. ethanol	
	3. same volume of extract tested on the bacteria / same diameter of wells in agar / same size paper discs ;		
	4. idea of same (range of) species of bacteria used ;		
	5. incubated at the same temperature and for the same length of time / reference to a sensible temperature 25-30°C and appropriate time e.g. 24h to one week ;	ACCEPT 20-40 °C as this could be used in microbiology labs although not in schools	
	6. zones of inhibition measured / eq ;		
	7. replication qualified e.g. { repeats for each fruit extract / repeat the experiment / repeats to calculate mean } ;		
			(4)

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