Mark Scheme (Results)

Summer 2017

Pearson Edexcel International Advanced Level
in Biology (WBI02) Paper 01
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.

Question Number	Answer	Mark
1(a)	**1. The only correct answer is C as the nucleus, nucleolus and mitochondrion are found in animal cells** ***A*** *is not correct because the nucleus, nucleolus and mitochondrion are found in animal cells* ***B*** *is not correct because the nucleus, nucleolus and mitochondrion are found in animal cells* ***D*** *is not correct because chloroplasts are not found in animal cells*	**(1)**

Question Number	Answer	Mark
1(b)		**(3)**

Feature	Plant cells	Prokaryotic cells	Plant cells and prokaryotic cells
cellulose cell wall	☒		
nucleus	☒		
ribosomes			☒

Only plant cells have cellulose cell walls. Prokaryotic cell walls are made of peptidoglycan.
Plant cells are eukaryotic cells so have a nucleus. Prokaryotic cells do not have a nucleus.
Ribosomes are found in both eukaryotic cells and prokaryotic cells, although their sizes are different.

Question Number	Answer	Additional guidance	Mark
1(c)	1. pores in the cell **wall** between (adjacent) cells / eq ; 2. idea that there is **cytoplasm** running through the plasmodesmata ;	**PIECE TOGETHER** e.g. “Areas where there is no cell wall and cytoplasm links two adjacent cells,” gains mp1 and 2. **1**. **ACCEPT** gaps /channels / canals / holes as eq to pores **1. ACCEPT** references to bridges only if in the context of cell wall **1. ACCEPT** descriptions of no cell wall present **1. NOT** pits **2. IGNORE** ref to symplast **2.ACCEPT** cytoplasm-filled channel / cytoplasmic bridge **ACCEPT** labelled diagram with the above points for 2 marks	**(2)**

Question Number	Answer	Additional guidance	Mark
2(a)	Acrosome(s) / acrosome cap/acrosomal cap ;	**ACCEPT** phonetic spellings **NOT** acrosome reaction	**(1)**

Question Number	Answer	Mark
2(b)	**1. The only correct answer is C because mitochondria are only found in the mid piece.** ***A*** *is not correct because the mitochondria are only found in the mid piece and therefore not in the acrosome as well* ***B*** *is not correct because the mitochondria are only found in the mid piece and therefore not in the nucleus as well* ***D*** *is not correct because the mitochondria are only found in the mid piece and therefore not in the flagellum as well*	**(1)**

Question Number	Answer	Mark
2(c)	**1. The only correct answer is D as the nucleus and mitochondria contain DNA** ***A*** *is not correct because the acrosome does not contain DNA* ***B*** *is not correct because the acrosome does not contain DNA* ***C*** *is not correct because both the nucleus and mitochondria contain DNA*	**(1)**

Question Number	Answer	Additional guidance	Mark
2(d)	1. allow movement (of the sperm) ; 2. to transfer (the male) { genetic material / DNA } ; 3. (from the cervix) to the ovum / eq ;	**1. ACCEPT** allows sperm to swim **3. ACCEPT** secondary oocyte /egg / egg cell as eq to ovum **3. NOT** ovule	**(2)**

Question Number	Answer	Additional guidance	Mark
***2(e)**	**(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)** 1. to produce *haploid* { cells /nuclei/gametes } ; 2. reference to *crossing over ;* 3. credit detail *of crossing over* ; 4. idea of (resulting in) exchange of *alleles* between *chromatids* ; 5. (crossing over leads to) formation of *recombinants ;* 6. reference to { *random / independent* } *assortment* ; 7. credit detail of *independent assortment* ; 8. idea of new combinations of *alleles* in the gametes ;	**Emphasis is on spelling of technical terms** **1. ACCEPT** halving the *chromosome* number in gametes **IGNORE** ref to 23 chromosomes unless with ref to humans **3.** e.g. formation of *chiasma / chiasmata* OR exchanging sections of *chromatids* OR description of breaking and rejoining **4. NOT** genes or chromosomes **5. ACCEPT** new combinations of *alleles* (on chromatids) **7.** e.g. { *homologous chromosomes* / *maternal* and *paternal chromosomes* } line up in different combinations	**(5)**

Question Number	Answer	Additional guidance	Mark
3(a)	Any **two** from: 1. reference to { sustainable / sustainability } ; 2. made from renewable materials / not made from non-renewable materials / eq ; 3. biodegradable / eq ;	**ACCEPT** converse statements **1.ACCEPT** they will not run out **2. IGNORE** plant-based plastics are renewable [i.e. answer has to have idea it is the plants rather than the plastics that are renewable] **2. ACCEPT** idea that more plants can be grown **2. ACCEPT** ref to plant-based plastics being carbon-neutral **3. ACCEPT** can be decomposed	**(2)**

Question Number	Answer	Additional guidance	Mark
3(b)		**ACCEPT** converse statements throughout	
	1. idea that sugar-based plastics cause more eutrophication ;		
	2. idea that corn-based plastics cause { less eutrophication than A / more than B } ;		
	3. idea that (both) plant-based plastics cause more damage to the ozone layer ;	**3. ACCEPT** sugar and corn	
	4. credit a named problem caused by { drilling for / transporting / refining } oil e.g. oil slicks ;		
	5. credit a named problem of growing plants for plastic e.g. habitat destruction, decreased food production ;	**5. IGNORE** ref to fertilisers	
	6. correct manipulation of figures to compare oil-based and plant-based plastics ;	E.g. corn based plastic is 0.4 less than plastic A for eutrophication	**(4)**

Question Number	Answer	Additional guidance	Mark
3(c)	1. nitrate (ions) are needed for { nucleic acids / DNA / RNA / amino acids / proteins / ATP / eq } ; 2. calcium (ions) are needed for { cell wall / cell wall matrix / calcium pectate /middle lamella/ eq } ; 3. magnesium (ions) needed for chlorophyll ;	**N.B. ACCEPT** any other named ion with correct use e.g. phosphate ions for { nucleic acids / DNA / RNA / ATP / eq } **ACCEPT** chemical symbols	**(3)**

Question Number	Answer	Additional guidance	Mark
3(d)	1. ultraviolet light is an environmental { factor / effect } / eq ; 2. idea that ultraviolet light { causes mutations / is a mutagen } ; 3. idea that DNA { replication / repair / eq } is affected ; 4. reference to { formation of an oncogene / tumour suppressor genes being affected } ; 5. idea that control of cell cycle is lost ;	**2. NOT** mutation in melanin **4. ACCEPT** named examples of alleles predisposing to skin cancer e.g. CDKN2A and CDK4 **5. ACCEPT** uncontrolled cell division	**(3)**

Question Number	Answer	Additional guidance	Mark
4(a)	1. they are { undifferentiated/unspecialised } (cells) 2. that { divide continuously/ have unlimited cell division } ; 3. idea that they can become any cell type ;	**2 ACCEPT** no Hayflick limit **3. ACCEPT** all cell types **3. ACCEPT** embryonic AND extra-embryonic tissues **3. ACCEPT** so that a whole organism can be made	**(2)**

Question Number	Answer	Additional guidance	Mark
4(b)	1. increase in cell number /eq ; 2. cells will be genetically identical /eq ; 3. idea of an increase in the cell organelles during interphase ; 4. DNA replication { during S-phase / interphase } ;	**3. ACCEPT** G1 G2 **4. ACCEPT** synthesis	**(3)**

Question Number	Answer	Additional guidance	Mark
4(c)	1. reference to differential gene expression ; 2. idea that some genes are { active / switched on / eq } ; 3. idea of { transcription / mRNA produced } at active genes ; 4. { proteins / polypeptides } produced (from this mRNA) / eq ; 5. idea that this protein (permanently) modifies cell **OR** idea that this protein determines { cell structure / function } ;	**3.** e.g. only active genes are transcribed	**(3)**

Question Number	Answer	Additional guidance	Mark
5(a)	1. lemurs are found **only** on Madagascar ; 2. reference to geographical isolation ; 3. idea that there were different conditions on Madagascar ; 4. reference to natural selection ; 5. resulting in formation of { new species / different species / new gene pools } ; 6. idea of adaptation to conditions ;	**3. ACCEPT** different selection pressures, or different conditions within Madagascar **5. ACCEPT** a reference to speciation **6.** e.g. adapted to different foods	**(3)**

Question Number	Answer	Additional guidance	Mark
5(b)(i)	1. values read from graph correctly : 23, 49, 20, 2 ; 2. values added together correctly / 94 ; 3. (94 ÷ 103) x 100 to give 91.26 / 91.3 / 91 (%) ;	CE applies throughout Correct answer alone gains three marks	**(3)**

Question Number	Answer	Additional guidance	Mark
5(b)(ii)	1. number of threatened species has increased between 2008 and 2012 / eq ; 2. has increased by 47 / has increased by 100% / has doubled ; 3. more species of lemur classified as { critically endangered / endangered / vulnerable } ; 4. fewer species of lemur are **near threatened** ;	**ACCEPT** converse statements if in context of 2008 **1. ACCEPT** the threat of extinction has increased **2. ACCEPT** CE from (b)(i) **3. ACCEPT** all categories except near threatened have increased **4. NOT** threat of extinction decreases **4. NOT** just “threatened”	**(4)**

Question Number	Answer	Additional guidance	Mark
5(b)(iii)	Any **two** from: 1. decrease in { habitat / food / eq } ; 2. idea of increased problems due to low genetic diversity ; 3. increase in hunting / predation / eq ; 4. increased risk of disease ; 5. increase in pollution ; 6. idea that the reduced number of lemurs in the near threatened category is due to { conservation / becoming more threatened } ;	**1. ACCEPT** increase in competition for food/eq **6.ACCEPT** idea of reintroduction from captive breeding programmes	**(2)**

Question Number	Answer	Additional guidance	Mark
6(a)(i)	1. no effect until a concentration of greater than 20% / eq ; 2. increase in number of bacteria killed between 20% and 80% / eq ; 3. concentration { equal to / higher than / eq } 80% killed all the bacteria / eq ;	**1. ACCEPT** no effect { below 20% / from 0 to 20% } **2. ACCEPT** pieced together statements between 20%/40% and 40%/80% **3. IGNORE** graph levels off between 80-100% **3. NOT** there is no effect from 80 – 100%	**(2)**

Question Number	Answer	Additional guidance	Mark
***6(a)(ii)**	**(*QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)** 1. preparation of discs e.g. soaking discs in garlic extract ; 2. using { different / range of concentrations } ; 3. idea of using several different types of bacteria at each concentration ; 4. idea that a lawn of bacteria is created { on / within } (different) agar ; 5. idea of { placing discs onto lawn / agar / putting garlic extract into well } ; 6. idea of incubating cultures ; 7. idea of measuring { diameter / area } of { clear zones / eq } ; 8. reference to aseptic technique / credit description of aseptic technique e.g. work beside a Bunsen burner /using sterile equipment ;	**Emphasis is on clarity of expression** **1. ACCEPT** set volume of garlic solution added to culture if alternative method described **2. ACCEPT** stated values e.g. 20% - 80% extract **4. ACCEPT** making a suspension of bacteria if alternative method described **5. ACCEPT** bacteria and garlic extract are mixed together if alternative method described **6. ACCEPT** leave for 24h (at least) **7.** e.g. ruler to measure clear zone **7. ACCEPT** details of determining number of bacteria killed if alternative method described	**(6)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr><td>6(b)</td><td>Any two from:

<table>
<tr><th>Withering</th><th>Contemporary methods</th></tr>
<tr><td>whole garlic extract</td><td>isolated active ingredient / eq</td></tr>
<tr><td>{ not tested on animals / tested on humans }</td><td>{ tested on animals / animals and humans }</td></tr>
<tr><td>{ not tested on healthy people / (only) tested on patients / eq }</td><td>{ tested on healthy people / tested on healthy people and patients / eq }</td></tr>
<tr><td>no { placebo / double blind trial }</td><td>uses { placebo / double blind trial }</td></tr>
<tr><td>small sample size</td><td>large sample size</td></tr>
<tr><td>didn't know the dose</td><td>dose worked out</td></tr>
<tr><td>no licence / control</td><td>licence needed</td></tr>
</table>
; ; ; ; ; ;</td><td>Must be comparative throughout</td><td>(2)</td></tr>
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Question Number	Answer	Additional guidance	Mark
7(a)	**B** ribosome | rough endoplasmic reticulum | Golgi apparatus *Polypeptide chains are synthesised on the ribosome and then move through the cytoplasm in the RER to the Golgi apparatus where they are modified. Therefore any other sequence is incorrect.*		**(1)**

Question Number	Answer	Additional guidance	Mark
7(b)	1. idea that this is where { protein / polypeptide } synthesis occurs ; 2. using radioactive amino acids ;	**1. ACCEPT** translation **2. ACCEPT** idea of radioactive amino acids being transported to { P / ribosome }	**(2)**

Question Number	Answer	Additional guidance	Mark
7(c)(i)	1. it increases between 10 and 20 minutes ; 2. it decreases after 20 minutes ;	**1. ACCEPT** between 5 and 20 minutes **2. ACCEPT** between 20 and 40 minutes	**(2)**

Question Number	Answer	Additional guidance	Mark
7(c)(ii)	1. idea that { proteins / polypeptides } { enter / are in / move through } Q 2. idea that { proteins / polypeptides } are { packaged in vesicles / transported to R / transported to Golgi apparatus } ;	**ACCEPT** { RER / eq } as alternative to Q throughout **2. ACCEPT** enter as eq to transported	**(2)**

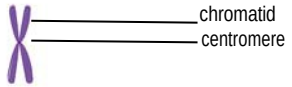
Question Number	Answer	Additional guidance	Mark
7(d)(i)	1. idea that some of the proteins are { for intracellular use / synthesised on free ribosomes } ; 2. idea that some of the proteins { are still in vesicles / remain in the RER / Q } ; 3. idea that some { amino acids / proteins } were in the cytoplasm ; 4. idea of radioactive decay ;	**ACCEPT** polypeptides as eq to proteins throughout answer **1. ACCEPT** idea that not all proteins need modification **1. ACCEPT** some proteins are made { in mitochondria / on mitochondrial ribosomes } **2. ACCEPT** some vesicles have not reached the Golgi / R	**(2)**

Question Number	Answer	Additional guidance	Mark
7(d)(ii)	1. levels will decrease / eq ; 2. as proteins { move into vesicles / move into lysosome / are secreted from cell / are removed by exocytosis } ;	**1. ACCEPT** stated values below 20 e.g. zero / 5 **2. ACCEPT** due to radioactive decay /eq **2. ACCEPT** non–radioactive amino acids now being used	**(2)**

Question Number	Answer	Mark
8(a)	**1. The only correct answer is B as the zygote is diploid and the fertilised endosperm nucleus is triploid** ***A*** *is not correct because the endosperm nucleus is triploid* ***C*** *is not correct because the zygote is diploid and the fertilised endosperm nucleus is triploid* ***D*** *is not correct because the zygote is diploid*	**(1)**

Question Number	Answer	Additional guidance	**Mark**
8(b)(i)	1. idea of preventing contamination of cultures ; 2. { bacteria / eq } could use the { nutrients / oxygen / eq } ; 3. { bacteria / eq } could cause disease of plants /explants /eq ; 4. { bacteria / eq } could be { harmful / pathogenic / eq } to humans ;	**1. ACCEPT** to prevent infection of plants **1. ACCEPT** to prevent growth of bacteria / fungi / microorganisms **2. ACCEPT** compete for nutrients / oxygen / other named nutrient **IGNORE** food / resources **3.ACCEPT** { bacteria / eq } could produce chemicals/toxins that could poison the plants	**(3)**

Question Number	Answer	Additional guidance	Mark
8(b)(ii)	1. idea that {stem / meristem / totipotent } cells were needed ; 2. as they are capable of {dividing / differentiating /eq } ; 3. an example of a suitable named part of the plant stated ;	**1. IGNORE** undifferentiated cells needed **2. ACCEPT** undergoing mitosis as eq **2. ACCEPT** differentiated cells would not divide **3.** e.g. shoot tips or root tips	**(2)**

Question Number	Answer	Additional guidance	Mark
8(b)(iii)	1. chromosome drawn showing two chromatids ; 2. one/both of the chromatids labelled correctly ; 3. centromere labelled correctly ;	 **1. ACCEPT** simple line drawings and **IGNORE** any drawings of nuclear spindle. **1. IGNORE** labels when assessing mp1 **2. and 3. ACCEPT** phonetic spellings **2. and 3. IGNORE** any other labels	**(3)**

Question Number	Answer	Additional guidance	Mark
8(c)	1. idea of { preserving / storing / eq } seeds ; 2. in large numbers to maintain { genetic diversity / gene pool } ; 3. idea of growing seeds to { produce more plants / obtain more seeds } ; 4. idea that these plants / seeds could be { planted in the wild / natural habitat } ;	**2. IGNORE** increasing { genetic diversity / gene pool } **4. ACCEPT** idea of when environmental conditions are right	**(2)**