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Mark Scheme (Results)

Summer 2016

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)	**B** metaphase	(1)

Question Number	Answer	Additional Guidance	Mark
1(b)	1. anaphase ; 2. spindle fibres are {contracting / shortening /eq} ; 3. (causing the) centromeres to {split / divide / break / eq} ; 4. the chromatids are {separated / pulled apart /eq} ; 5. to {(opposite) ends of the cell / poles / each centriole / eq} ;	**4 DO NOT ACCEPT** chromosomes **5 ACCEPT** chromosomes / chromatids	(4)

Question Number	Answer	Additional Guidance	Mark
1(c)	1. totipotent cells are {undifferentiated / unspecialised} (cells) ; 2. idea that totipotent cells can give rise to {all / any / eq} cell type ;	**2 ACCEPT** embryonic AND extra-embryonic tissues	(2)

Question Number	Answer	Additional Guidance	Mark
2(a)	Any two of: 1. Golgi (apparatus / body / complex) ; 2. lysosome ; 3. vesicle ; 4. rough endoplasmic reticulum / rER ; 5. smooth endoplasmic reticulum / sER ; 6. vacuole ;	**DO NOT ACCEPT** any other structure **1 ACCEPT** dictyosome **ACCEPT** endoplasmic reticulum / ER for one mark only	**(2)**

Question Number	Answer	Mark
2(b)(i)	**A** amyloplasts	**(1)**

Question Number	Answer	Mark
2(b)(ii)	**C** pits	**(1)**

Question Number	Answer	Additional Guidance	Mark
*2(b)(iii)	**(QWC – Spelling of technical terms *(shown in italics)* must be correct and the answer must be organised in a logical sequence)** **Similarities:** 1. both consist are {*polysaccharides* / *glucose polymers*} ; 2. both have 1-4 *glycosidic* bonds ; **Differences:** 3. *starch* consists of *α glucose* but *cellulose* consists of *β glucose* ; 4. *starch* composed of *amylose* and *amylopectin* (but *cellulose* is not) ; 5. idea of {*branching* / *1-6 bonds* / *helix* / eq} in *starch* but {*straight chains* / *no branching* / *no 1-6 bonds* / eq} in *cellulose* ; 6. all {*monomers* / *glucose*} same {orientation / eq} in *starch* but every other one is {inverted / eq} in *cellulose* ;	**QWC Emphasis is on spelling** **PIECE TOGETHER** **1 ACCEPT** made from the monomer glucose	**(4)**

Question Number	Answer	Additional Guidance	Mark
Q2(c)(i)	1. idea that one (haploid) male {gamete / nucleus } fuses with (haploid) {egg cell / egg nucleus / female gamete / female nucleus} ; 2. to produce a {diploid / 2n} {zygote / embryo} ; 3. idea that one (haploid) male {gamete / nucleus} fuses with {two polar nuclei / diploid endosperm nucleus / fusion nucleus} ; 4. to produce a {triploid / 3n} endosperm (nucleus) ;	**1 ACCEPT** sperm nucleus **DO NOT ACCEPT** generative nucleus **IGNORE** ovum / egg unqualified **3 ACCEPT** sperm nucleus **DO NOT ACCEPT** generative nucleus / polar bodies	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	1. interphase / G1 / growth phase 1 / G2 / growth phase 2;	**ACCEPT** S (phase)	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(a)	1. idea of producing { genetic variation / genetically varied offspring / eq } ; **OR** idea of combining { genes / alleles / chromosomes } from two parents ; 2. the diploid number (of chromosomes) is restored / eq ;	**1 ACCEPT** genetic diversity	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	zona pellucida ;		**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	1. acrosome {contains / produces} { acrosin / enzymes } ; 2. idea that if the acrosome was damaged the {follicle cells would not be moved / digestion through zona pellucida would not occur / eq} ; 3. sperm cannot {penetrate the zona pellucida / reach the secondary oocyte / fuse with seconday oocyte membrane} ; 4. nucleus (of sperm) cannot enter seconday oocyte / eq ;	**NB** At least **ONE** mark point must be in the context of what cannot happen, for three marks to be awarded **2 ACCEPT** jelly layer **3 ACCEPT** jelly layer egg cell **4 ACCEPT** egg cell	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(c)	1. reference to cortical reaction ; 2. cortical granules fuse with secondary oocyte membrane / eq ; 3. cortical granules are released / eq ; 4. zona pellucida {becomes impenetrable / thickens / hardens / eq } ;	**2 ACCEPT** egg cell there will be a change in charge of the seconday oocyte membrane **4 ACCEPT** jelly layer for z. p. **ACCEPT** fertilisation membrane will form	**(3)**

Question Number	Answer	Additional Guidance	Mark
4(a)	1. prokaryotic cells do not have { (membrane bound) organelles / named example of (membrane bound) organelle } ; 2. { small / 70S } ribosomes in prokaryotic cells ; 3. DNA not enclosed in {an envelope / a membrane / eq} in prokaryotic cells ; 4. {circular / loop} DNA in prokaryotic cells ;	**NB** It / they refer to prokaryotic cells **ACCEPT** converse statements for eukaryotic cells **IGNORE** plasmids throughout **1 ACCEPT** reference to other cell inclusion not found in prokaryotic cells **3 ACCEPT** DNA in {a nucleoid / cytoplasm} **4 ACCEPT** bacterial chromosome **ACCEPT** no histones / naked / eq	**(3)**

Question Number	Answer	Mark
4(b)(i)	**B** – domains	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	1. reference to molecular phylogeny ; 2. (Woese looked at) { DNA / RNA / nucleic acid / proteins / enzymes / ribosomes / membrane components / cell wall components / eq } ;		**(2)**

Question Number	Answer	Additional Guidance	Mark
4(b)(iii)	1. Bacteria in top box ; 2. Archaea and {Eukarya / Eukaryota / Eukaryotes} in middle and bottom box ;	**2 ACCEPT** in either of these boxes	**(2)**

Question Number	Answer	Mark
5(a)(i)	C	(1)

Question Number	Answer	Mark
5(a)(ii)	D	(1)

Question Number	Answer	Additional Guidance	Mark
5(a)(iii)	1. (secondary thickening) provides greater (tensile) strength ; 2. (secondary thickening) provides {extra rigidity / reduced flexibility / eq} ; 3. lignin provides {waterproofing / eq} ; 4. pits present for movement of water (into / out of xylem) ;		(3)

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	1. idea that { this is a renewable resource / more jute plants can be grown } ; 2. resource will be available to future generations ; **OR** is not finite (like oil) / will not run out / eq ; 3. idea that fibres are biodegradable ;	**1 IGNORE** the idea that jute can be reused	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	1. negative correlation / description of a decrease in tensile strength with an increase in relative humidity ; 2. idea of greatest change between 75% and 85% relative humidity **OR** smallest difference between 65% and 75% AND 85% and 95% ; 3. correct manipulation of data, e.g. 4 MPa difference between 75% and 85%, overall decrease of {8 MPa / 33 %} ;	**1 ACCEPT** converse	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(b)(iii)	Any two of: 1. temperature ; 2. length of fibre ; 3. { diameter / width / cross-sectional area / eq} of fibre ; 4. source of jute / eq ; 5. practical technique described	**IGNORE** any other variables given **4 ACCEPT** age / storage conditions **5** e.g. extraction method, time for retting, hanging weights carefully, clamping of fibre	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(a)	1. amino acids **/** proteins / nucleic acids / (organic) bases / DNA / ATP ; 2. idea of how this organic compound is used by the plant e.g. amino acids for the synthesis of proteins, proteins as enzymes, bases for synthesis of DNA, nucleic acids for cell division, ATP as an energy source ;	**1 ACCEPT** RNA, NAD, NADP, ADP, chlorophyll **2 IGNORE** refs to growth and repair	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	1. idea of role of {organism / species} in its { habitat / community / ecosystem / environment } ; 2. idea of providing {food / shelter} for {animals / herbivores} **OR** recycling nitrogen **OR** soil improvement;	**1 ACCEPT** relationship between organisms in a {habitat / eq} **IGNORE** exploits **2 ACCEPT** it is a producer	**(2)**

Question Number	Answer	Mark
6(b)(ii)	**B** – anatomical and physiological	**(1)**

Question Number	Answer	Additional Guidance	Mark
6(b)(iii)	1. idea that low nitrates act as a selection pressure ; 2. genetic variation in population / (variation due to) mutation / eq ; 3. description of relevant feature for feeding on insects ; 4. less competition from other plants ; 5. idea of passing on carnivorous alleles; 6. change in allele frequency (over generations) / eq ;	**IGNORE** comments about drought and storing water **3** e.g. cup-shaped leaves, produce enzymes **IGNORE** carnivorous **6 DO NOT ACCEPT** genes	**(4)**

Question Number	Answer	Additional Guidance	Mark
6(c)	1. idea of using meristem cells ; 2. idea of using {agar / nutrient medium / eq} ; 3. idea that medium will contain low nitrate concentration ; 4. (agar contains) growth substances / hormones / eq ; 5. idea of using aseptic technique ;	**NB** a ref to seeds would only prevent mp 1 being awarded **1 ACCEPT** explant / description of explants / stem cells **5** e.g. sterile agar, work by a Bunsen, cover culture	**(4)**

Question Number	Answer	Additional Guidance	Mark
7(a)(i)	1. { difference between 8.9 and 17.6 / 8.7 }; 2. (divided by 5) = 1.74 / 1.7 ;	Correct answer = 2 marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(a)(ii)	1. idea that the {incidence / number of tumours} increases / eq ; 2. {radiation / eq} causes mutations / eq ; 3. in {proto-oncogenes / tumour suppressor genes / eq} / {resulting in oncogenes / eq } ; 4. idea that {cell division is affected / cell growth cannot be controlled} ; 5. idea that time is taken for cancer { to develop / to be detected } ;	**1 IGNORE** any manipulation of figures **3 ACCEPT** in DNA repair genes **IGNORE** (mutation in) oncogenes **4 ACCEPT** no Hayflick limit **5 ACCEPT** time for accumulation of radioactive material in {an organism / food chain} figures were manipulated time taken for mutations to build up	**(3)**

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	{number / variety / range} of species ;	**ACCEPT** species richness	**(1)**

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	1. measure species richness / description of counting number of species (in Pripyat); 2. idea of comparing values over time ;	**1 ACCEPT** idea of calculating diversity index	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(a)(i)	{ variety / number / eq} of alleles within a { gene pool / population / species } ;	**DO NOT ACCEPT** genes	**(1)**

Question Number	Answer	Additional Guidance	Mark
8(a)(ii)	1. inbreeding / mating with closely related individuals ; 2. genetic drift / reduced gene pool / {loss of / fewer } alleles in {gene pool / population} ;	**2 ALLOW** increased homozygosity	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(b)	1. polygenic inheritance / more than one gene codes for fur colour / eq ;		**(1)**

Question Number	Answer	Additional Guidance	Mark
8(c)(i)	1. koalas from south are longer by 5.3 cm than koalas from north ; 2. koalas from south are heavier by 4.5 kg than koalas from north ;	Only 1 mark for longer **and** heavier unqualified **1 ACCEPT** correct ratios, percentages (7.08%) **2 ACCEPT** correct ratios, percentages (43.69%)	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(c)(ii)	Any one from: 1. different named environmental factor ; 2. genetic differences / eq ; 3. disease ;	 e.g. predation, diet, temperature	**(1)**

Question Number	Answer	Additional Guidance	Mark
***8(d)**	* **(QWC– Spelling of technical terms must be correct and the answer must be organised in a logical sequence)** 1. (zoos) select koalas from {north and south / different areas in} Australia ; 2. inter-zoo exchange (of animals / semen) / eq ; 3. idea of use of {stud books / record keeping} (to select mates) ; 4. reference to { preventing / eq} inbreeding ; 5. idea of avoiding genetic drift ; 6. use of { IVF / AI / surrogates } ; 7. process for measuring genetic diversity described ;	**QWC emphasis is clarity of expression** **4 ACCEPT** promoting outbreeding 7 e.g. DNA profiling	**(5)**

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