Pearson Edexcel

Mark Scheme (Result)

October 2019

Pearson Edexcel International Advanced Level
In Biology (WBI04) Paper 01
The Natural Environment and Species Survival

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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	Additional Guidance	Mark
1(a)(i)	**C** glucose and glucose ***A*** *is incorrect because maltose does not contain fructose* ***B*** *is incorrect because sucrose is made of fructose and glucose* ***D*** *is incorrect because maltose does not contain galactose*		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	**D** sucrose ***A*** *is incorrect because amylose is not transported in the phloem* ***B*** *is incorrect because glucose is not transported in the phloem* ***C*** *is incorrect because plants do not contain lactose*		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	**B** 2 ***A*** *is incorrect because amylose and starch are both made of α glucose and found in plant cells. Cellulose is made of β glucose and glycogen is not found in plant cells.* ***C*** *is incorrect because amylose and starch are both made of α glucose and found in plant cells. Cellulose is made of β glucose and glycogen is not found in plant cells.* ***D*** *is incorrect because amylose and starch are both made of α glucose and found in plant cells. Cellulose is made of β glucose and glycogen is not found in plant cells.*		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(b)	1. GALP is used to produce {glucose / (simple) sugars / hexose}; 2. {glucose / GALP/ (simple) sugars / hexose} is used to make glycerol / GP used to make fatty acids; 3. fatty acids and glycerol joined by ester bonds; 4. reference to condensation reactions (forming ester bonds between fatty acids and glycerol); 5. idea that enzymes are involved (in lipid synthesis); 6. idea that glucose is a source of {energy / ATP} (for lipid synthesis;	**2 IGNORE** {glucose / GALP} used to make fatty acids / GP used to make glycerol **4 ACCEPT** esterification	**(4)**

Question Number	Answer	Additional Guidance	Mark
2(a)	1. idea that pollen tube nucleus forms the pollen tube; 2. idea that the generative nucleus divides to produce the two male {nuclei / gametes}; 3. idea that one (male) {nucleus / gamete} fertilises the {female gamete / female nucleus / egg cell / egg nucleus / egg cell nucleus}; 4. idea that one (male) {nucleus / gamete} fertilises the {(two) polar nuclei / diploid (endosperm) nucleus / fusion nucleus};	**2 ACCEPT** sperm nucleus **3 DO NOT ACCEPT** generative nucleus **IGNORE** ovum / egg unqualified **4 DO NOT ACCEPT** generative nucleus / polar bodies	

		NB ACCEPT double fertilisation **OR** to produce (diploid) zygote and (triploid) endosperm if no other marks awarded for 1 mark	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	1. idea that pollen can be used to identify the plants; 2. idea that different plants grow at different temperatures; 3. idea that {carbon dating / depth of peat} indicates how many years ago the plants were growing;	**2 ACCEPT** idea of knowing what temperature a particular plant grows at	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	1. idea of isolating DNA sample from the pollen; 2. reference to use of (gel) electrophoresis; 3. idea of matching the pollen {DNA profile / bands} to {DNA profile / bands} of known {pollen / plants};	**2 ACCEPT** detail of gel electrophoresis that include applying a current to a gel **3 IGNORE** fragments	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(c)	1. idea that before about 2000 years ago the people did not grow wheat; 2. idea that people {hunted wildlife / ate berries / eq}; 3. idea that humans chopped trees down (about 2000 years ago); 4. (trees cut down) to grow wheat / for agriculture; 5. more wheat grown as {population / agriculture} increased / eq; 6. idea that (1000 years ago) weeds started to grow because {wheat was not grown so much / land was no longer used / fertilisers used / outcompeted wheat / eq};	**1 ACCEPT** wheat started to be grown about 2000 years ago **3 ACCEPT** deforestation	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(a)	**Award in any order:** • Bacteria • Archaea • Eukarya	**NB All 3 correct = 2 marks** **1 or 2 correct = 1 mark** **ACCEPT** phonetic spellings **IGNORE** prokaryota eukaryotes / eukaryotic bacterium **DO NOT ACCEPT** fungi protoctista / protoctists animals plants viruses **ACCEPT** Eukaryota	**(2)**

Question Number	Answer	Additional Guidance	Mark

3(b)(i)	because viruses are {non-living / not living / not composed of cells} ;	**DO NOT ACCEPT** dead / non-living cells **IGNORE** not alive / list of organelles	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	1. idea that viruses are not composed of many {proteins / (poly)peptides / (protein) components}; 2. credit named type of viral protein (coded for by these genes); 3. idea that viruses use the host cell's {proteins / enzymes};	**1 ACCEPT** {simple / not complex} structure **2** e.g. protein coat, glycoproteins, receptor (molecules), capsid, capsomere, reverse transcriptase, integrase **IGNORE** energy / amino acids **DO NOT ACCEPT** a non-protein molecule	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(c)(i)	**B** molecular phylogeny *A is incorrect because dendrochronology studies tree growth rings* *C is incorrect because proteomics studies proteins*		

	D is incorrect because topography studies physical features of an area		**(1)**

Question Number	Answer	Additional Guidance	Mark
3(c)(ii)	1. {binds to / brings / eq} **specific** amino acid / eq; 2. carries this amino acid to the {ribosome / mRNA}; 3. idea that tRNA binds to {mRNA / codon}; 4. {holds amino acid in place / amino acid lined up / eq} **and** a peptide bond formed (between adjacent amino acids);	**1 DO NOT ACCEPT** specific amino acids **3 ACCEPT** anticodon binds to mRNA **4 ACCEPT** tRNA detaches once peptide bond has formed	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(c)(iii)	{explanation / idea / statement / view} based on {facts / observations / research / evidence / existing information};	**ACCEPT** has not been {disproved / confirmed}	

		IGNORE hypothesis / prediction / conclusion / comments / assumption / speculation	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(c)(iv)	• credit comment as to why not classed as a virus; • credit comment as to why not classed in a current domain;	**1** e.g. viruses do not have tRNA, may be able to carry our protein synthesis, viruses do not have cell features, presence of tRNA suggests they might be living **2** non-living, no actual cell structure, cannot reproduce without a host cell	**(2)**

Question	Answer	Mark

Number		
4(a)	<table><tr><th rowspan="2">Feature</th><th colspan="4">Artificial immunity</th></tr><tr><th>active only</th><th>passive only</th><th>both active and passive</th><th>not true</th></tr><tr><td>antigen-specific</td><td>☒</td><td>☒</td><td>**X**</td><td>☒</td></tr><tr><td>provides long-term immunity</td><td>**X**</td><td>☒</td><td>☒</td><td>☒</td></tr><tr><td>antibodies injected</td><td>☒</td><td>**X**</td><td>☒</td><td>☒</td></tr></table>	**(3)**

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	1. idea that this is the first infection, so no memory cells present; 2. idea of time taken for {macrophages / phagocyte} to {bind / engulf /	**NB** answer must be linked with a {time delay / many-staged process / slow process} for max 4 marks to be awarded	

	process / eq} virus; 3. idea of time taken for presentation of antigen (by macrophages) to T helper cells; 4. idea of time needed for T helper cells to {activate / stimulate} B cells; 5. idea that B cells (need to) **differentiate** into plasma cells; 6. idea that plasma cells (need to) {synthesise / produce / make} antibody;	**4 ACCEPT** cause B cells to {divide / proliferate} **IGNORE** activate T killer cells	**(4)**

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	antibody {broken down / excreted / engulfed (by phagocyte) / eq} ;	**IGNORE** how or where the antibodies are broken down	**(1)**

Question Number	Answer	Additional Guidance	Mark

4(b)(iii)	1. antibody **P** increases sooner (than antibody **Q**) / eq**;** 2. antibody **P** increases faster (than antibody **Q**) / eq**;** 3. more antibody **P** (produced than antibody **Q**) / eq**;**	**DO NOT piece together** **ACCEPT converse throughout for antibody Q** **1 ACCEPT** less of a delay **3 ACCEPT** higher concentration / increases more	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(b)(iv)	1. primary (immune) response to virus **Q** but secondary (immune) response to virus **P**; 2. memory cells (for virus **P**) present; 3. idea that memory cells (quickly) result in presence of plasma cells; 4. idea that immune response is specific to {antigen / virus};	**1 PIECE TOGETHER** **2 ACCEPT** converse **4 ACCEPT** idea that there are many steps to produce antibodies to virus **Q**	**(3)**

Question Number	Answer	Additional Guidance	Mark
5(a)	1. idea that the (ambient) temperature {changes (during day) / is different (in different locations)}; 2. idea that (insect) {development / lifecycle / growth} depends on temperature; 3. idea that development time depends on {enzyme / metabolic} activity;	**NB** an answer that links temperature, development and enzymes correctly should be awarded both mp 2 and 3	**(3)**

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	1. (maximum length of time identified as) 159.5 (hours); 2. on 14th (September); 3. (18:00 on 20th September - 159.5 hours) = 02:30;	**3 NB** If mp 3 is given, mp 1 is also awarded even if not written down **ACCEPT** {17:00 / 5pm} if 145 hours is given for mp 1	**(3)**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	1. reliable as the table shows data for 23.3°C; 2. not reliable because large differences between min and max values; 3. not reliable as (ambient) temperature would have varied; 4. not reliable as we do not know how long person was dead before (blow fly) eggs were laid; 5. not reliable as we do not know how far into the prepupal stage; 6. idea that another named factor (beside ambient temperature) affects insect development;	**2 ACCEPT** idea that only the max value was used **6** e.g. body temperature, pH, water availability, oxygen availability	**(3)**

Question Number	Answer	Additional Guidance	Mark
5(c)	1. measuring body temperature (is not accurate) as it would have {levelled off / reached ambient temperature / eq}; 2. measuring extent of rigor (would not be accurate) as the muscles become stiff and then relax again; 3. extent of decomposition (not accurate) as it depends on {ambient temperature / presence of oxygen / presence of water / location}; 4. extent of decomposition (not accurate) as it depends on the {types / numbers} of decomposers that colonise the body;	**1 ACCEPT** algor mortis **2 ACCEPT** muscles do not stay stiff / rigor mortis does not last long / rigor mortis decreases	**(3)**

Question Number	Answer	Additional Guidance	Mark

6(a)	1 : 9.5 / 1 : 10 ;	**ACCEPT** 1 : 9.54 10 : 95 13 : 124 0.1 : 1 0.105 : 1 **IGNORE** correct fractions	**(1)**

Question Number	Answer	Additional Guidance	Mark

6(b)	1. increase in number of {wolves / moose} due to {birth / reproduction}; 2. (wolves increase) because there is more moose to {hunt / eat / eq}; 3. (moose increase) because there are fewer wolves to kill them / eq; 4. (wolves decrease) because wolves {starve / not healthy enough to find a mate / cannot produce milk to feed young / eq}; 5. (moose decrease) because more are being {killed / eaten / hunted / eq}; 6. idea that the changes are staggered as it takes time for animals to {die / give birth};	**1 ACCEPT** birth rate greater than death rate **2 ACCEPT** more food / more prey **3 ACCEPT** less predation / fewer predators **4 ACCEPT** dying due to lack of food	**(4)**

Question Number	Answer	Additional Guidance	Mark
***6(c)**	1. idea that salmon are easier to catch as {the moose can run away / salmon are smaller}; 2. (hunting salmon) requires less energy; 3. idea that wolf is less likely to get hurt; 4. as the moose have antlers / eq; 5. reduced competition between wolves; 6. because {hunting for salmon can be done by one wolf / there are a lot of salmon}; 7. idea that salmon contain more {energy / fat / protein} (per kg flesh); 8. and therefore, {not so much flesh is needed / wolves can eat less};	**QWC focussing on clarity of expression** **ACCEPT converse where appropriate** **4 ACCEPT** moose can kick **5 ACCEPT** therefore {more competition / less food to go around} **6 ACCEPT** moose are bigger so wolves need to hunt in packs	

	9. (more) fat used for insulation / eq;	**9 ACCEPT** more energy for insulation / eq	**(6)**

Question Number	Answer	Additional Guidance	Mark
7(a)	endemic (species) / endemism;		**(1)**

Question Number	Answer	Additional Guidance	Mark
7(b)	1. to {hide them from / stop them being eaten by} predators; 2. to prevent damage when they fall from the trees; 3. to provide food (for the insect) when it hatches; 4. to reduce water loss (from the egg / newly hatched insect);	**1 ACCEPT** animals that eat the eggs protects from predators **2 ACCEPT** idea of cushioning the fall	**(2)**

Question Number	Answer	Additional Guidance	Mark
***7(c)**	1. reference to natural selection (of weevils); 2. idea that longer necks might have resulted from a mutation; 3. idea that length of neck is variable; 4. {strength / courtship display} is the selection pressure; 5. (male) weevils with a longer neck are more likely to {knock others off the tree / hurt others / kill others / eq}; 6. (male) weevils with a longer neck {attract / mate with / eq} the female;	**QWC focussing on logical sequence** **3 PIECE TOGETHER** **ACCEPT** idea that neck length in an example of polygenic inheritance **5 ACCEPT** converse for short necked weevils **6 ACCEPT** converse for short necked weevils	

	7. passing on the (long neck) alleles; 8. idea that the (long neck) allele frequency increases (with time);		**(6)**

Question Number	Answer	Additional Guidance	Mark
7(d)	1. due to reproductive isolation; 2. idea that they can no longer breed with other weevils; 3. due to differences in courtship display; 4. (cannot interbreed) due to short-necked giraffe weevils being on the forest floor;	**2 ACCEPT** no longer produce fertile offspring	**(3)**

Question	Answer	Additional Guidance	Mark

Number			
8(a)	1. abundance is the number of a particular organism / eq; 2. distribution is where the organism is found / eq;	**1 ACCEPT** how many / how much / quantity / percentage / population / population size **IGNORE** amount / density / number of species **2 ACCEPT** located / place found / area found **IGNORE** spread	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(b)	1. decomposition by {microorganisms / bacteria / fungi} / eq; 2. enzymes (produced by microorganisms) break down organic matter / eq; 3. {glucose / (simple) sugars} used for respiration (by	**1 IGNORE** algae **2 ACCEPT** named enzyme breaking down named organic molecule	

	microorganisms); 4. anaerobic {conditions / respiration} result in methane being produced (by microorganisms);	**4 IGNORE** carbon dioxide	**(3)**

Question Number	Answer	Additional Guidance	Mark
8(c)	1. methane is a greenhouse gas; 2. resulting in the increase in temperature of the (Earth's) {atmosphere / surface / water}; 3. increase in abundance due to increased {growth / development / NPP / biomass / GALP} (in warmer conditions); 4. as increased {enzyme activity / RUBISCO / photosynthesis / eq} (in warmer conditions); 5. increase in distribution as colder areas will become warmer;	**1 ACCEPT** methane traps {infra-red radiation / heat energy / eq} **2 IGNORE** global temperatures **3 IGNORE** distribution	**(4)**

Question Number	Answer	Additional Guidance	Mark
8(d)			

	1. bacteria are cultured {on agar / in a broth / eq}; 2. credit method of applying extract; 3. {mass / concentration / volume} of plant material kept the same; 4. incubate for stated length of time (24 hours to 2 weeks) at stated temperature (20°C to 35°C); 5. credit method of {comparing / measuring} effect of extracts;	**2** e.g. discs soaked in extract on agar / add extract to {broth / wells in agar} **4** Piece together **5** e.g. zones of inhibition, turbidity of broth	**(4)**

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