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Mark Scheme (Results)

October 2020

Pearson Edexcel International Advanced Level In Biology (WBI04/01) Paper 1: 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.

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Question Number	Answer	Additional Guidance	Mark
1(a)	1. **translation**; 2. it is a copy of the DNA (genetic) code; 3. it carries the genetic information to the ribosome / eq; 4. acts as a template to form sequence of amino acids / eq;	**2 PIECE TOGETHER** **NB** carries a copy of the DNA code to the ribosome = 2 marks **3 ACCEPT** idea that codons are (used) to line up the amino acids / tRNA binds with mRNA placing amino acids in sequence	**(3)**

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	The only correct answer is **B** hydrogen ***A*** *is incorrect because ester bonds join organic acids to organic alcohols* ***C*** *is incorrect because peptide bonds join amino acids together* ***D*** *is incorrect because phosphodiester bonds join a phosphate to a ribose sugar*		**(1)**

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Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	The only correct answer is **A** CCA ***B*** *is incorrect because T is not found in mRNA* ***C*** *is incorrect because T is not found in mRNA* ***D*** *is incorrect because UGG is complementary to ACC which is the amino acid binding site*		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(c)(i)	post-transcriptional modification / (pre / m)RNA splicing ;	**IGNORE** transcription	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(c)(ii)	The only correct answer is **C** nucleus ***A*** *is incorrect because rRNA is made in the nucleus* ***B*** *is incorrect because post-translational modification occurs in the Golgi apparatus* ***D*** *is incorrect because translation occurs on the rER*		**(1)**

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Question Number	Answer	Additional Guidance	Mark
1(c)(iii)	The only correct answer is **C** RNA polymerase ***A*** *is incorrect because DNA polymerase is involved with synthesising DNA* ***B*** *is incorrect because reverse transcriptase is involved in the synthesis of DNA from RNA* ***D*** *is incorrect because spliceosome breaks phosphodiester bonds in mRNA*		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(c)(iv)	The only correct answer is **D** spliceosome ***A*** *is incorrect because integrase joins DNA to DNA* ***B*** *is incorrect because reverse transcriptase is involved in the synthesis of DNA from RNA* ***C*** *is incorrect because RNA polymerase is involved with synthesising RNA*		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(c)(v)	introns (and some exons) ;		**(1)**

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Question Number	Answer	Additional Guidance	Mark
2(a)	1. (climax) {final stage of / end of / after / eq} succession ; 2. (community) {populations / species / biodiversity / eq} remain stable / eq ;	**2 IGNORE** NPP	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)	1. {lichens / pioneer species} break rock down (into soil) / eq ; 2. {small plants / grass} (decompose) {adding nutrients / adding humus} (to the soil); 3. {larger plants / bushes} (decompose) increasing the {depth of / nutrients in} the soil / eq ; 4. idea that trees (and large plants) appear last ;	**2 ACCEPT** lichens / pioneer species **3 ACCEPT** small plants / grasses if lichens / pioneer species given in mp 2 **ACCEPT** a correct description of the sequence of events (3) with no explanation for 1 mark, if no other marks awarded	**(3)**

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Question Number	Answer	Additional Guidance	Mark
2(c)	1. herbivores would eat the {pioneer species / mosses /grass / (small) plants} ; 2. so there would be {smaller / fewer / less growth of} plants ; 3. therefore the soil will not be improved / eq ; 4. herbivores would eat the shoots of the {bushes / larger plants } ; 5. so there would be fewer {bushes / larger plants / trees} ; 6. idea that a different climax community would be reached ;	**3 ACCEPT** herbivore faeces will improve the soil **5 ACCEPT** no trees **6 ACCEPT** {climax community / stage 3} will take longer stay in stage 2 longer **IGNORE** no climax community would be reached	**(4)**

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Question Number	Answer	Additional Guidance	Mark
3(a)	a virus is inside a {cell / tissue} ;	**ACCEPT** virus enters a cell / tissue	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)	1. idea of no interferon production whilst viruses {find / attach / penetrate / eq} host cells ; 2. increase in interferon production because {infected host cells produce interferon / more cells become infected / eq} ; 3. idea that interferon production falls as viral {replication / penetration into host cells / eq} is prevented ; 4. idea that interferon production falls as virus particles are destroyed by {immune system / phagocytes};	**1 ACCEPT** idea of a delay whilst interferons are actually being synthesised **4 DO NOT ACCEPT** killed	**(3)**

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Question Number	Answer	Mark
3(c)		**(3)**

Role	Non-specific response only	Immune response only	Both the non-specific response and the immune response	Not in either type of response
phagocytosis	☒	☒	**X**	☒
destruction of pathogen	☒	☒	**X**	☒
antigen presentation	☒	**X**	☒	☒

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Question Number	Answer	Additional Guidance	Mark
3(d)	1. T helper cells {activate / eq} {T killer cells / B cells} whereas T killer cells {destroy / eq} host-infected cells ; 2. T helper cells produce cytokines whereas T killer cells produce {perforins / chemicals / enzymes / eq} ; 3. T helper cells involved in the {humoral (and cell-mediated response) / eq} whereas T killer cells involved in (only) the {cell-mediated response / eq} ;	**ACCEPT** cytotoxic cells for T killer cells throughout and CD4 cells for T helper cells **1 PIECE TOGETHER** **2 PIECE TOGETHER** **IGNORE** T killer cells {produce / do not produce} cytokines **3 ACCEPT** T helper cells needed for antibody production (and destruction of host-infected cells) whereas T killer cells needed for destruction of host-infected cells (only)	**(3)**

Question Number	Answer	Additional Guidance	Mark
4(a)	1. pulmonary TB is greater than EPTB which is greater than multiple TB / eq ; 2. credit use of figures to support two types of TB ;	**1 ACCEPT** pulmonary is the highest and multiple the lowest **2 ACCEPT** eg PTB 80 – 85% EPTB 10 – 15% MTB 5 – 10 % but smaller than EPTB	**(2)**

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Question Number	Answer	Additional Guidance	Mark
4(b)(i)	1. because (easier to catch as) { breathed in / airborne disease / eq } ; 2. idea that people with pulmonary TB create aerosols containing TB ;	**1 ACCEPT** spreads in the air / droplet infection **2 ACCEPT** coughing	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	1. bacteria engulfed by macrophages / eq ; 2. macrophages cannot destroy them / eq ; 3. presence of {plaques / tubercles} (in lungs) / eq ; 4. (persistent) coughing / eq ; 5. which {reduces / destroys / eq} the gas exchange surface ; 6. less oxygen can enter blood / breathing problems / eq ; 7. if brain does not get enough oxygen person will die / opportunistic (lung) infections / eq;	**6 ACCEPT** shortness of breath **7 IGNORE** death due to other organ failure	**(4)**

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Question Number	Answer	Additional Guidance	Mark
4(c)	1. coughing can rupture blood vessels (in lungs) / eq ; 2. bacteria {enter / carried in} blood (stream) ; 3. bacteria {become lodged in / infect / eq} other {tissues / organs} ; 4. resulting in {cell / tissue} destruction (in other organs) / eq; 5. resulting in loss of function (and death) ;	**3 IGNORE** lungs **5 ACCEPT** organ failure **IGNORE** lung problems	**(3)**

Question Number	Answer	Additional Guidance	Mark
5(a)	1. idea that the animal will not {feel pain / itch / eq} ; 2. and therefore will not brush the tick off / eq ;	**1 ACCEPT** blood less likely to clot (if reduced inflammation) **2 ACCEPT** idea of longer blood flow	**(2)**

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Question Number	Answer	Additional Guidance	Mark
5(b)(i)	1. 10.9 ÷ 98 / 0.11 / eq; 2. 8.9 (kDa) ;	**1 ACCEPT** correctly rounded value of 0.111224489 **2 ACCEPT** 8.8 (if 0.11 used)	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	1. idea that the prediction used the mean molecular mass of an amino acid **;** 2. different {amino acids / R groups} have different masses **;** 3. E2 had been modified / eq **;**	**IGNORE** comments on E1 **3 ACCEPT** description that would increase mass	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(b)(iii)	1. using enzymes ; 2. to form peptide bonds ; 3. by condensation reactions ;	**1 ACCEPT** peptidyl transferase / ligase **DO NOT ACCEPT** incorrect enzymes **2 DO NOT ACCEPT** incorrectly named bonds **IGNORE** covalent bonds **3 ACCEPT** addition-elimination / polymerisation	**(2)**

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Question Number	Answer	Additional Guidance	Mark
5(c)	1. idea that CVD starts with damage to the endothelial cell lining ; 2. white blood cells arrive at the site due to the release of chemokines ; 3. idea that (evasins could) {prevent the inflammatory response / reduce the number of white blood cells at the site }; 4. idea that plaque {would not form / would not form as quickly} ; 5. therefore the (coronary) artery would not become blocked / eq; 6. so blood could still flow to the heart {muscle / cells / tissue} ; 7. and therefore the heart {muscle / cells / tissue} would still be supplied with {oxygen / glucose} ;	**NB** max 4 if no link to heart / account not in context of evasins **4 ACCEPT** atheroma **5 ACCEPT** will not become narrow	**(5)**

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Question Number	Answer	Additional Guidance	Mark
6(a)(i)	idea that some of the sightings were of groups of sharks ;	**ACCEPT** mistaken identity / loan sharks less likely to be spotted	**(1)**

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	1. credit idea relating to food availability ; 2. credit idea relating to the survey method ; 3. credit idea relating to predators / poaching ; 4. credit idea relating to disease ;	**2** eg time of year survey conducted, only count sharks on the surface, change in migratory patterns	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(a)(iii)	1. credit value in range 800 – 3200 ; 2. extrapolating / line of best fit ;		**(2)**

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Question Number	Answer	Additional Guidance	Mark
6(b)(i)	1. idea of collecting DNA samples from each shark ; 2. idea of tagging the sharks when DNA is collected ; 3. PCR used ; 4. idea of using (gel) electrophoresis ; 5. idea of counting different banding patterns ; 6. by comparing {number / width / position / eq} of bands ; 7. extent of the different banding patterns indicates genetic diversity / eq ;	**1 ACCEPT** stated source of sample (of DNA) **4 ACCEPT** a description that includes gel and electric current **5 ACCEPT** idea that each different pattern represents one shark **7 ACCEPT** the more similar the bands, the less diverse	**(4)**

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Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	1. idea that if the species is endangered then there is a risk of inbreeding ; 2. inbreeding reduces the genetic diversity ; 3. so (inbred) animals are susceptible to disease / eq; 4. so numbers could be reduced further / risk of extinction / eq ;	**3 ACCEPT** converse	**(3)**

Question Number	Answer	Additional Guidance	Mark
7(a)	1. 480 - 20 / 460 (mg) ; 2. (460 ÷ 120 =) 3.8 / 3.83 (mg) ;	**2** CE from mp 1	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(b)	1. 5 × 1000 ÷ 120 / 41.67 (mg) ; 2. (3.83 × 100 ÷ 41.67 =) 9 / 9.19 / 9.2 (%)	**2** CE from 7(a) CE from mp 1 if dp in wrong place	**(2)**

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Question Number	Answer	Additional Guidance	Mark
7(c)(i)	1. idea of loss of mass in faeces ; 2. idea of loss of mass in urine ; 3. idea of loss of mass in eggs laid ; 4. idea of loss of mass due to {respiration/ movement} ; 5. resulting in {heat loss / water vapour production / eq} ; 6. loss of skin / moulting / ecdysis ;	**1 ACCEPT** not fully digested **NB ACCEPT** excretion if neither mp 1 or 2 awarded **4 ACCEPT** used for	**(2)**

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Question Number	Answer	Additional Guidance	Mark
***7(c)(ii)**	1. idea of starting with {eggs / young insects} ; 2. idea of measuring the starting and finishing mass of each stick insect (for each time period) ; 3. idea of measuring the starting and finishing mass of the leaves (for each time period ; 4. idea of collecting eggs and recording their mass ; 5. idea of collecting faeces and recording their mass ; 6. credit method of measuring {urine / water vapour} produced ; 7. idea of recording temperature rise in tank ; 8. idea of using several stick insects and calculating a mean for {their mass increase / the mass of leaves eaten} ; 9. credit control of variable relating to stick insects ;	**QWC focussing on clarity of response** **2 ACCEPT** calculating the increase / change **NB** piece together **3 ACCEPT** calculating the decrease / change **NB** piece together **9** e.g. sex, species , age	**(6)**

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Question Number	Answer	Additional Guidance	Mark
8(a)(i)	1. longer day length means more (sun)light ; 2. more light (energy) {the faster the / more} light-dependent reactions ; 3. producing more {ATP / NADPH} (for the light-independent reactions) 4. high humidity reduces water loss (from the bamboo) ; 5. more water available for photolysis ; 6. {enzymes / named enzymes} will work faster in higher temperatures ; 7. therefore {light-independent reactions / eq} will be {faster / more} ; 8. producing {more GALP / GALP faster} ; 9. so bamboo will be able to produce more biomass / eq ;	**QWC focussing on logical sequence** **NB** the account must be comparative for full marks to be awarded, although not every mp has to be comparative **6 ACCEPT** description	**(6)**

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Question Number	Answer	Additional Guidance	Mark
8(a)(ii)	1. because removing more carbon dioxide (from the atmosphere than a slower growing plant) ; 2. less carbon dioxide (in the atmosphere) will reduce {global warming / climate change} ; 3. therefore less {infra red radiation / eq} will be trapped (by the carbon dioxide) / eq ;	**NB** the account must be comparative and related to bamboo for full marks to be awarded, although not every mp has to be comparative	**(3)**

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Question Number	Answer	Additional Guidance	Mark
8(b)	1. reference to **behavioural adaptation** ; 2. laying more than one egg means tadpoles would starve when they hatch / eq ; 3. laying unfertilised eggs provides food for the tadpole / eq ; 4. laying more unfertilised eggs reduces the chance of the fertilised one being eaten / eq ; 5. avoiding laying egg in pool already containing egg reduces competition for limited food / eq ; 6. avoiding laying egg in pool already containing egg means that the new egg will not be eaten by the tadpole that will hatch first / eq ; 7. {egg / tadpole} will be hidden from predators / eq ; 8. idea that pool of water in bamboo is less likely to dry up so {egg / tadpole} will be less likely to dehydrate ;	**2 ACCEPT** only lay one (fertilised) egg as food is low	**(4)**

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