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Mark Scheme (Results)

October 2016

Pearson Edexcel
International Advanced Level
in Biology (WBI01) Paper 01

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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)(i)	**1. The only correct answer is C** **A** is not correct as the atrioventricular valve would be open **B** in not correct because the value positions are back to front **D** is not correct as the semilunar valve would be closed	**(1)**

Question Number	Answer	Mark
1(a)(ii)	**1. The only correct answer is D** **A** is not correct as the pressure at the end of systole is lower than in the middle. **B** is not correct as the pressure at the start of systole is lower than in the middle. **C** is not correct as the pressure during diastole will be lower	**(1)**

Question Number	Answer	Mark
1(a)(iii)	**1. The only correct answer is D** **A** is not correct because the aorta will have a low concentration of carbon dioxide **B** is not correct because the aorta will have a low concentration of carbon dioxide and the vena cava a high concentration **C** is not correct because the aortathe pulmonary artery will have a high concentration of carbon dioxide	**(1)**

Question Number	Answer		Mark
1(b)(i)	correct mean diameter ;	Accept a value between 36 to 37 mm	**(1)**

Question Number	Acceptable Answers	Additional Guidance	Mark
1(b)(ii)	1. radius calculated ; 2. area calculated ;	Accept a value between 18 and 18.5 mm Accept a value between 1017.4 and 1074.7 Accept: consequential error, for both marks, if radius used is half value calculated for 1(b)(i).	**(2)**

Question Number	Acceptable Answers	Additional Guidance	Mark
1(b)(iii)	1. smooth (endothelium) lining to reduce friction (between wall and blood) / eq ; 2. (thick) elastic wall to allow stretch and recoil /eq ; 3. collagen layer to { provide strength / withstand high blood pressure } / eq ; 4. (smooth) muscle in wall to enable artery to change diameter / eq ;	Each structural point should be linked to function Accept: elastic fibres to allow stretch and recoil Accept: 'thick wall to withstand pressure / prevent bursting' Ignore reference to changing shape	**(3)**

Question Number	Acceptable Answers	Additional Guidance	Mark
1(c)	1. mammals have a large volume to surface area ratio ; 2. mammals have { high nutrient / oxygen } requirement ; 3. heart and circulation provides a { bulk / mass } transport system ; 4. that overcomes the limitations of diffusion ;	 Accept: Need to remove large quantities of {waste / heat / CO_2} Accept: 'diffusion by itself is insufficient'	**(4)**

(Total for Question 1 = 13 marks)

Question Number	Acceptable Answers	Additional Guidance	Mark
2(a)	1. both correct readings from graph: 240 and 100 2. correct calculation (240 -100)/240 x 100 = 58.3 %	Correct answer gains both marks Accept 58 %	**(2)**

Question Number	Acceptable Answers	Additional Guidance	Mark
2(b)	1. suitable comment on practical procedure ; 2. use of concentrations of permethrin between {0 and 1500 μmol dm^{-3} } ; 3. hearts observed under a microscope ; 4. description of method of determining heart rate ; 5. reference to repeating at each concentration (to find mean) ;	e.g. *Daphnia* immobilised / allowed to acclimatise / of same size selected Accept: any reasonable time period 15 to 60 seconds e.g. heart beats counted for 30 seconds then multiplied by 2 ;	**(3)**

Question Number	Acceptable Answers	Additional Guidance	Mark
2(c)	1. *Daphnia* are invertebrates ; 2. *Daphnia* { are transparent / heart can be seen } ; 3. using { vertebrates / animals with more developed nervous system } is unethical as they feel pain ; 4. *Daphnia* are {cheap / easily obtained} ;	 Accept converse Ignore reference to abundance	**(2)**

(Total for Question 2 = 7 marks)

Question Number	Acceptable Answers	Additional Guidance	Mark
3(a)(i)	1. idea that because they are genetically similar obesity is due to the environment ; 2. higher calorie intake ; 3. less physically active / eq ;	Accept: eat more food / eat more of a named food type Ignore more food available	**(2)**

Question Number	Acceptable Answers	Additional Guidance	Mark
3(a)(ii)	Any two from: 1. diet ; 2. age ; 3. high blood pressure / hypertension ; 4. smoking ; 5. inactivity / lack of exercise ; 6. menopause ;	Mark the first response in each numbered answer line. Do not accept: genetic differences, difference in gender, being overweight or obesity Ignore: unqualified life style choices MP1 accept: high salt intake / high alcohol intake	**(2)**

Question Number	Acceptable Answers	Additional Guidance	Mark
3(b)	**1. The only correct answer is C** **A** is not correct because the calculation gives a value of 25.7 **B** is not correct because the calculation gives a value of 25.7 **D** is not correct because the calculation gives a value of 25.7		**(1)**

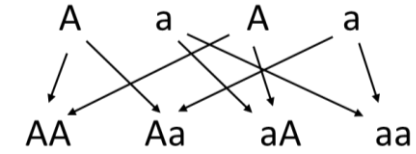
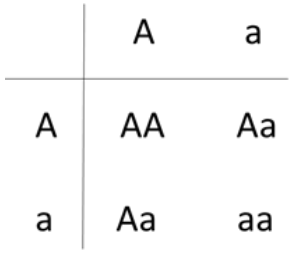
Question Number	Acceptable Answers	Additional Guidance	Mark
3(c)(i)	1. as BMI increases the incidence of CVD { increases / positive correlation } (for both men and women) ; 2. increase in BMI has a greater effect in men than in women; 3. correct use of figures ;	Figures that could be used: <table><tr><td colspan="2">Healthy</td><td colspan="2">Overweight</td><td colspan="2">Obese</td></tr><tr><td>men</td><td>women</td><td>men</td><td>women</td><td>men</td><td>women</td></tr><tr><td>125</td><td>105</td><td>200</td><td>120</td><td>265</td><td>125</td></tr></table>	**(2)**

Question Number	Acceptable Answers	Additional Guidance	Mark
3(c)(ii)	1. idea that height has an impact on body mass ; 2. BMI is related to both mass and height ; 3. idea of eliminating other variables ;	Accept controls for height	**(2)**

Question Number	Acceptable Answers	Additional Guidance	Mark
3(c)(iii)	to allow comparison between groups of different sizes / eq ;	Accept: so that the results can be compared	**(1)**

(Total for Question 3 = 10 marks)

Question Number	Answer	Mark
4(a)	**1. The only correct answer is C** **A** is not correct as gametes can have either of the parents alleles **B** is not correct as gametes only contain one copy of each allele **D** is not correct as the individual only has one copy of the recessive allele so the genotype is heterozygous	**(1)**

Question Number	Acceptable Answers	Additional Guidance	Mark
4(b)	1. identification of correct parental gametes ; 2. correct genotypes of offspring ; 3. correct probability of 0.5 /50% / ½ / 1 in 2 ;	e.g. diagrams for MP 1 and 2 ;;   	**(3)**

Question Number	Acceptable Answers	Additional Guidance	Mark
4(c)(i)	1. **amniocentesis** ; 2. amniotic fluid collected ; 3. between 14 - 20 weeks ; 4. via a needle through the wall of the abdomen ; 5. fetal cells are cultured for 2-3 weeks ; **OR** 6. **chorionic villus sampling** ; 7. tissue sample taken from the placenta / chorionic villus ; 8. between 10 – 14 week ; 9. using a syringe via the cervix ; 10. tissue extracted can be tested immediately ;	**Allow marking points from either 1 to 5 or 6 to 10.** Accept just 'CVS'	**(4)**

Question Number	Acceptable Answers	Additional Guidance	Mark
4(c)(ii)	1. suitable ethical issue ; 2. suitable social issue ;		**(2)**

(Total for Question 4 = 10 marks)

Question Number	Acceptable Answers	Additional Guidance	Mark
5(a)	1. { randomly arranged / scattered / eq } proteins (in the bilayer) ; 2. phospholipids forming the bilayer are free to move ;	Accept: glycoproteins lipoproteins in place of proteins Ignore: proteins are free to move	**(2)**

Question Number	Answer	Mark
5(b)	**1. The only correct answer is D** **A** is not correct as facilitated diffusion does not work against a concentration gradient **B** is not correct as active transport takes place in all cells not just animal cells **C** is not correct as facilitated diffusion does not require ATP	**(1)**

Question Number	Acceptable Answers	Additional Guidance	Mark
5(c)(i)	1. allows only certain {molecules / ions / substances } to move through ; 2. by diffusion ;		**(2)**

Question Number	Acceptable Answers	Additional Guidance	Mark
5(c)(ii)	1. initially solute concentration is higher inside the tube ; 2. { tube / membrane } is impermeable to { solute / sodium chloride ions / eq } ; 3. water moves in to the tube ; 4. by osmosis ; 5. eventually the solute concentration inside the tube is the same as that outside the tube ; 6. water diffuses into and out of the tube at the same rate / no net movement of water into the tube ; 7. pressure (in the tube) prevents further water intake ;	Accept converse arguments and correct use of water potential where appropriate. Accept: less permeable Do not accept no more diffusion of water / diffusion stops;	**(4)**

Question Number	Acceptable Answers	Additional Guidance	Mark
5(c)(iii)	1. idea of experimental error ; 2. due to (poor) drying technique ; 3. idea that the mass should not change (because there is no osmotic gradient);		**(2)**

(Total for Question 5 = 10 marks)

Question Number	Acceptable Answers	Additional Guidance	Mark
6(a)	change in the { DNA / base sequence } ;	Accept answers that make reference to changes in chromosome number or structure Ignore named examples of types of mutation e.g. point mutation	**(1)**

Question Number	Acceptable Answers	Additional Guidance	Mark
6(b)(i)	1. change in primary sequence of CFTR protein ;		
	2. CFTR folds to produce non-functioning protein ;	Accept: incorrect folding of CFTR	
	3. chloride ions cannot diffuse out of the cell ;	Accept: water moves into the cells from the mucus	
	4. water does not diffuse out of the cell ;		
	5. mucus is thick / eq ;	Ignore mucus is more sticky	
	6. reducing diffusion (of gases) ;	Accept: reducing ventilation / blocking airways	**(4)**

Question Number	Acceptable Answers	Additional Guidance	Mark
6(b)(ii)	1. (double stranded) DNA uncoiled by helicase ; 2. strand of mRNA is copied from / RNA nucleotides line up along ; 3. {template / antisense } strand of DNA ; 4. correct reference to complimentary base pairing ; 5. RNA nucleotides are joined together by RNA polymerase;		**(3)**

Question Number	Acceptable Answers	Additional Guidance	Mark
6(c)	1. isolate normal CFTR gene / functioning CFTR gene ; 2. insert the CFTR gene into a vector ; 3. named relevant vector e.g. harmless virus or liposome ; 4. method of delivering the vector to cells lining the respiratory system ;	Must make reference to the CFTR gene Accept 'virus' Ignore 'plasmid' e.g. 'spray up nose' or 'use an inhaler'	**(3)**

(Total for Question 6 = 11 marks)

Question Number	Acceptable Answers	Additional Guidance	Mark
***7(a) QWC**	Take into account quality of written communication when awarding the following points. 1. tissues damaged (during surgery) ; 2. stimulate platelets ; 3. to release thromboplastin ; 4. starting the clotting cascade ; 5. and resulting in the production of blood clots ; 6. blood clots could block blood vessels ; 7. resulting in tissues being deprived of {oxygen / nutrients / blood } ;	QWC emphasis is logical sequence. Accept reasonable description of clotting cascade for MP4 and 5	**(5)**

Question Number	Acceptable Answers	Additional Guidance	Mark
7(b)(i)	increasing the concentration of METHRO II decreases { clotting / thrombophilic events } / negative correlation ;	Accept 'dose' for 'concentration'	**(1)**

Question Number	Acceptable Answers	Additional Guidance	Mark
7(b)(ii)	1. higher concentrations (of METHRO II) would cause an big increase in the risk of bleeding ; 2. higher concentrations (of METHRO II) would cause a relatively small decrease in the risk of clotting ; 3. credit appropriate use of data ;	Accept: 'a compromise dose' if neither MP1 or MP2 awarded. Comparison of increase in bleeding with decrease in clotting when dose is increased from 1.5 to 2.3 a.u. **or** Comparison of decrease in bleeding with increase in clotting when dose is decreased from 1.5 to 1 a.u.	**(2)**

(Total for Question 7 = 8 marks)

Question Number	Answer	Mark
8(a)(i)	**1. The only correct answer is D** **A** is not correct as it is the same sequence as the copied strand and is not a complementary strand **B** is not correct as uracil (U) is used in place of thymine (T) in the synthesis of RNA **C** is not correct as uracil (U) is used in place of thymine and not in place of adenine (A) in the synthesis of RNA	**(1)**

Question Number	Answer	Mark
8(a)(ii)	**1. The only correct answer is C** **A** is not correct as Deoxyribose is used in DNA, not mRNA **B** is not correct as glucose is a sugar but it is not used to form mRNA **D** is not correct as sucrose is a sugar but is found in some foods and is not used to form mRNA	**(1)**

Question Number	Acceptable Answers	Additional Guidance	Mark
8(b)	1. only four bases ; 2. need to code for 20 / more than 16 amino acids ; 3. three bases is the minimum number that provides sufficient combinations to code for each amino acid ;	Accept idea that 2 bases would give only 16 possibilities	**(3)**

Question Number	Acceptable Answers	Additional Guidance	Mark
***8(c) QWC**	Take into account quality of written communication when awarding the following points. Clarity of expression. 1. (Meselson and Stahl's experiment was designed) to distinguish between different types of replication; 2. at the start of the experiment cells were grown in (medium with) { heavy nitrogen / ^{15}N } ; 3. only a heavy DNA band was observed ; 4. the cells were then transferred to (medium with) { light nitrogen / ^{14}N } ; 5. after one round of replication an intermediate DNA band was observed ; 6. after two rounds of replication intermediate and light bands were observed ; 7. showing that replication was { semiconservative / one strand of original DNA and one strand of newly synthesised DNA } ;	Accept named types e.g between semiconservative and conservative replication Accept annotated drawing of results for MP3, 5 and 6 Accept generation in place of round of replication	**(5)**

(Total for Question 8 = 10 marks)