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Mark Scheme (Results)

Summer 2014

GCE Biology (WBI01)
Paper 01

Unit 1: Lifestyle, Transport, Genes and Health

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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.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

  i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
  ii) select and use a form and style of writing appropriate to purpose and to complex subject matter
  iii) organise information clearly and coherently, using specialist vocabulary when appropriate

Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean ACCEPTing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:
- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.
( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.
Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.
ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

Quality of Written Communication
Questions which involve the writing of continuous prose will expect candidates to:
- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.
Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

NB "reference to" in the mark scheme means this term is expected and used correctly in an appropriate context

Question Number	Answer	Mark
1(a)(i)	A ;	(1)

Question Number	Answer	Mark
1(a)(ii)	B ;	(1)

Question Number	Answer	Mark
1(a)(iii)	A ;	(1)

Question Number	Answer	Mark
1(a)(iv)	C ;	(1)

Question Number	Answer	Mark
1(a)(v)	box drawn round complete mononucleotide ; Note: there are several areas on the diagram that would be correct.	(1)

Question Number	Answer	Additional guidance	Mark
1(b)	1. reference to semi-conservative replication ; 2. DNA molecule unwinds / strands separate / eq ; 3. (mono)nucleotides line up along (both) strands / eq ; 4. reference to complementary pairing (between bases) ; 5. reference to hydrogen bonds (between bases) ; 6. idea of formation of phosphodiester bonds (between adjacent mononucleotides) ; 7. correct name of an enzyme involved e.g. DNA polymerase ;	Max 2 marks for mRNA synthesis from Mps 2, 4, 5 and 6 2. ACCEPT unzips, unravels 4. NOT simple statement that A pairs with T and G pairs with C 6. ACCEPT sugar phosphate backbone forms 7. ACCEPT DNA helicase or helicase or ligase **NOT** unqualified polymerase	**(5)**

Question Number	Answer	Additional guidance	Mark
2(a)(i)	<table><tr><th>Stage of cardiac cycle</th><th>Name of stage</th><th>Time taken /s</th></tr><tr><td>Contraction of the atria</td><td>(atrial) systole</td><td>0.1</td></tr><tr><td>Contraction of the ventricles</td><td>(ventricular) systole ;</td><td>0.3</td></tr><tr><td>Relaxation of both atria and ventricles</td><td>diastole ;</td><td>0.4</td></tr></table>	} both systole correct for first mark ACCEPT atrial and ventricular **diastole** or **diastole** of atria and ventricle	**(2)**

Question Number	Answer	Additional guidance	Mark
2(a)(ii)	60 ÷ 0.8 ; 75 ;	75 gains both marks	**(2)**

Question Number	Answer	Additional guidance	Mark
2(b)(i)	16 kPa ;	ACCEPT any figure from 15.9 kPa to 16.1 kPa to 1 or 2 decimal places Units required ACCEPT KPa for units Do not ACCEPT 16 without units	**(1)**

Question Number	Answer	Additional guidance	Mark
2(b)(ii)	1. pressure in ventricle increases / eq ; 2. {to higher than / above / greater than / eq} pressure in atrium ;	 2. ACCEPT converse. e.g. atrial pressure is lower than the ventricular pressure	**(2)**

Question Number	Answer	Additional guidance	Mark
2(b)(iii)	1. {semilunar / aortic} valve opens ; 2. blood leaves ventricle / enters aorta / eq ;	1. valve opens is not sufficient	**(2)**

Question Number	Answer	Additional guidance	Mark
2(b)(iv)	1. (aorta wall) contains elastic fibres / eq ; 2. (wall / elastic fibres) stretch / eq ; 3. (wall / elastic fibres) then recoil / eq ; 4. idea that the semilunar / aortic valves close ;	1. ACCEPT it contains elastic fibres 2. ACCEPT aorta / wall has stretched 3. IGNORE contracts 4. ACCEPT has closed / is closed	**(3)**

Question Number	Answer	Mark
3(a)(i)	D ;	(1)

Question Number	Answer	Additional guidance	Mark
3(a)(ii)	A ;		(1)

Question Number	Answer	Additional guidance	Mark
3(a)(iii)	1. part A / tail is {hydrophobic / non polar / uncharged / eq} / eq ; 2. part B / head is {hydrophilic / polar / charged / eq} eq ; 3. an explanation of the orientation of (hydrophilic) heads OR (hydrophobic) tails ; 4. idea of interaction with {protein / cholesterol / eq } ;	Question is about structure not function Mp1 and Mp2 attracted or repelled not accepted as alternatives 3. attracted or repelled acceptable	(3)

Question Number	Answer	Additional guidance	Mark
3(b)(i)	1. increase in temperature causes more to be released / eq ; 2. increase in temperature gives a {small increase / eq} in chloride ions up to 50^{o}C OR greater increase between 50^{o}C and {60 / 61} ^{o}C / eq ; 3. above 60^{o}C / 61^{o}C no further chloride ions leave cells / eq ; 4. credit manipulation of figures / eq ;	Some are giving answers in terms of effect on diffusion so faster, slower can be equivalent to greater or smaller NOT incorrect reference to concentrations in the cell for Mp1 and Mp2 3. ACCEPT concentration stays the same / levels off 4. ACCEPT difference or % change	**(3)**

Question Number	Answer	Additional guidance	Mark
3(b)*(ii)	**(QWC – emphasis clarity of expression)** 1. reference to diffusion ; 2. idea of rate (of diffusion) increases with temperature ; 3. idea of increase temperature gives an increase in permeability of membrane ; 4. idea of damage to membrane above 50 ^{o}C ; 5. idea of damaged membrane described e.g. phospholipids disrupted, proteins denature(d) ; 6. above {60 / 61} ^{o}C equilibrium is reached / no longer a diffusion gradient / eq ;	**QWC emphasis clarity of expression** rate of diffusion increases with temperature = Mps 1 and 2 4. any unqualified suggestion of membrane damage or denaturation Describing a particular type of damage gets MP 4 and 5 only if 50 ^{o}C mentioned e.g. lipid melting, protein denaturation	**(4)**

Question Number	Answer	Additional guidance	Mark
4(a)(i)	1. any one H from NH_2 and any OH from COOH ringed ; 2. another one H from NH_2 and any OH from COOH ringed ;	ACCEPT individually ringed OH and H groups	(2)

Question Number	Answer	Mark
4(a)(ii)	D ;	(1)

Question Number	Answer	Additional guidance	Mark
4(b)(i)	{sequence / order / eq} of amino acids ;	IGNORE chain unqualified	(1)

Question Number	Answer	Additional guidance	Mark
4(b)*(ii)	**(QWC – Spelling of technical terms must be correct)** 1. idea that the primary structure determines the {positioning / type} of the {bonds / folding / eq} ; 2. AND 3. credit any two correctly named {bond / interaction} e.g. *disul{ph / f}ide* bond, *hydrogen, ionic* bonds, *hydrophobic* interactions (between R groups) ;; 4. idea of {*polar* / *hydrophilic*} on the outside of enzymes / {*non polar* / *hydrophobic*} on the inside / eq ; 5. *globular* / *soluble* / eq ; 6. determining the {shape / properties} of the *active site* / eq ; 7. idea of interaction of active sites and *substrates* e.g. *enzyme substrate complex* forms ; 8. idea of enzyme *specificity* ;	**QWC – emphasis on spelling of technical terms in italics penalise spelling once only** 2. ACCEPT *sulphur bridges* / *van der Waals*	**(5)**

Question Number	Answer	Additional guidance	Mark
5(a)	1. (disease) of the {heart / blood vessels / eq} ; 2. description of effect e.g. narrowing of lumen, high blood pressure, atherosclerosis, thrombus, reduces blood supply ;	1. ACCEPT heart disease 2. IGNORE blocking / angina / heart attack ACCEPT atheroma, plaque	**(2)**

Question Number	Answer	Additional guidance	Mark
5(b)	1. idea of populations of different countries will vary OR 2. it allows for a (valid) comparison / eq ;	 2. ACCEPT standardise	**(1)**

Question Number	Answer	Additional guidance	Mark
5(c)(i)	1. higher in men / eq ; 2. idea that as rates for men increase so does the rate for women ; 3. (general trend is that) the bigger the death rate the bigger the difference between men and women / eq ; 4. use of data to compare death rates of men and women e.g. men only below 400 in 3 countries but women below 400 in 5 countries ;	ACCEPT converse for women 2. ACCEPT as deaths for men increase so do deaths for women 4. ACCEPT description e.g. rates for men and women are most similar in Spain / show biggest differences in Ukraine	**(2)**

Question Number	Answer	Additional guidance	Mark
5(c)(ii)	1. idea of {differences / eq} in risk factor ; 2. named risk factor ; 3. second risk factor ; 4. idea of differences in education (related to health); 5. idea of differences in healthcare e.g. screening, diagnosis, medication ;	ACCEPT comparison of Mps related to men and women OR country to country ACCEPT difference in named risk factor in each country for Mp1 and Mp2 Mp2 and Mp3 ACCEPT genetic, diet, age, smoking, blood pressure, inactivity	**(4)**

Question Number	Answer	Additional guidance	Mark
6(a)	6:1 / 6.04:1 ;	NOT 1:6 or the number 6 alone	(1)

Question Number	Answer	Additional guidance	Mark
6(b)(i)	thin / moist / good blood supply / eq ;	ACCEPT concentration gradient, short distance for diffusion, permeable (to gases)	(1)

Question Number	Answer	Additional guidance	Mark
6(b)(ii)	1. Idea that diffusion over (external) surface is not enough ; 2. (because) smaller s.a. relative to volume / eq ; 3. Respiratory system has a large s.a. ; 4. idea that diffusion would be too slow (over distance) ; 5. idea that {circulatory system / eq} needed to distribute {oxygen / named material} to all parts of the animal ; 6. reference to mass {flow / transport} ;	Mp1-3 relate to respiratory system 3. ACCEPT lungs / gills / eq ; in place of respiratory system Mp5 and Mp6 to circulatory system 5. ACCEPT pump needed ACCEPT glucose , RBC, hormones, CO_2, urea, heat	(4)

Question Number	Answer	Additional guidance	Mark
7(a)(i)	1. the overall trend for low fat margarine shows a decrease / eq; 2. idea that butter consumption {stayed constant / little change / eq} ; 3. consumption of low fat margarine has always been higher than butter ; 4. credit manipulation of data ;	IGNORE partial description of the graph 4. overall trend e.g. margarine decreases by 4.9 au, butter range is 0.6 au or drops by 0.4 au	**(3)**

Question Number	Answer	Additional guidance	Mark
7(a)(ii)	1. (in general) intake in women higher than in men ; 2. overall drop is greater in women than in men ; 3. Idea of trend for men is less consistent e.g. in 2005 male consumption increased but female fell continuously from 1990 to 2010 / eq ; 4. credit other comparative use of data ;		**(2)**

Question Number	Answer	Additional guidance	Mark
7(b)(i)	1. some might leave the area / lose contact with them / eq ; 2. some might die / become too ill to participate ; 3. some may no longer want to participate in study ;	ACCEPT two Mps in part 1 or part 2	**(2)**

Question Number	Answer	Additional guidance	Mark
7(b)(ii)	<u>Advantage</u>: 1. can use fewer staff to administer questionnaire / eq 2. idea that participants may be more likely to be truthful than face to face ; <u>Disadvantage</u>: 3. participants may be more likely to give inaccurate {information / recollections} 4. idea that participants may be more likely to give answers which correspond with a healthier lifestyle than they have 5. relatively high level of literacy required ;	ONLY one mark for each advantage and disadvantage 1. can process more responses / more participants / quicker process / cheaper process 3. ACCEPT may not take survey seriously. 5. ACCEPT may not understand the questions	**(2)**

Question Number	Answer	Additional guidance	Mark
8(a)	1. *Daphnia* positioned so heart visible ; 2. idea of immobilising *Daphnia* ; 3. thermometer (bulb) submerged in pond water ; 4. idea that thermometer positioned close to *Daphnia* ;	4. ACCEPT next to / same distance from coil as *Daphnia*.	**(3)**

Question Number	Answer	Additional guidance	Mark
8(b)	1. repeats / eq ; 2. idea of system of counting in set time e.g. beats per 20sec ;	2. ACCEPT times less than or equal to one minute	**(2)**

Question Number	Answer	Additional guidance	Mark
8(c)(i)	1. need for {acclimatisation / adjustment / eq} of *Daphnia* (to the temperature) / eq ;	1. ACCEPT heart	**(1)**

Question Number	Answer	Additional guidance	Mark
8(c)(ii)	1. heart rate would be {slow at 10°C/ fast at 30°C} ; 2. less risk *Daphnia* will {die / be harmed / eq} at 10°C / eq ;	1. ACCEPT easier to count beats 2. ACCEPT *Daphnia* are more likely to die at 30 °C 2. IGNORE reference to stress	**(2)**

Question Number	Answer	Additional guidance	Mark
8(d)(i)	1. increasing temperature increased heart rate / eq ; 2. idea that *Daphnia* will be at same temperature as the water e.g. they are cold-blooded ; 3. increased temperature increases kinetic energy / eq ; 4. comment on rate of enzyme controlled reactions / eq ; 5. idea of increased temperature increases { respiration / metabolism / eq ; } ;	1. ACCEPT correlation between heart rate and temperature for one mark	**(3)**

Question Number	Answer	Additional guidance	Mark
8(d)(ii)	1. hard to count at (40°C / 50°C / higher temperatures) because heart rate too fast ; 2. {harm / eq} to *Daphnia* ; 3. idea of being unethical ;	2. ACCEPT may kill *Daphnia* / *Daphnia* may suffer 2. IGNORE stress	**(2)**

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