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Mark Scheme (Results)

Summer 2013

GCE Biology Unit 1 (6BI01) 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 allowing 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.

Question Number	Answer	Additional Guidance	Mark
1(a)	1. platelets ; 2. thromboplastin ; 3. enzymes ; 4. prothrombin ; 5. thrombin ;	NB: allow phonetic spelling 1. ACCEPT thrombocytes 2. ACCEPT enzyme if not given in Mp3 3. ACCEPT thromboplastin if not given in Mp2	**(5)**

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	1. central carbon with {R / H / eq} and H attached by single bonds ; 2. {NH_2 / NH_3^+ } attached to a carbon by single bond ; 3. {COOH / COO^- } attached to a carbon by single bond ;	Mp1 Must show C, H and R or a plausible R-group MP2 and 3 ACCEPT groups attached to a central C that is not shown (chemical notation) ACCEPT groups written wrong way round e.g. C-H_2N NOT incorrect bonding within groups if shown e.g. C=OH ACCEPT if correct group attached to wrong molecule e.g. glucose	**(3)**

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	peptide (bond) ;	ACCEPT peptide link NOT polypeptide or dipeptide	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(b)(iii)	1. Idea that fibrinogen is globular and fibrin is fibrous ; 2. fibrinogen is soluble and fibrin is insoluble ; 3. Idea that they are different sizes ;	ACCEPT marks to be pieced together across the response. NB: answers must be comparative e.g. fibrin is fibrous fibrinogen is not 1. ACCEPT fibrinogen globular and fibrin (long) strand or chain. 3. ACCEPT fibrinogen is {smaller / larger / more amino acids} than fibrin	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(a)	1. triplet code / 3 bases to each code / eq ; 2. reference to adenine, thymine, guanine and cytosine ; 3. idea that each triplet of bases codes for one amino acid ; 4. idea that the code is not overlapping ; 5. idea that code is universal ; 6. idea that code is degenerate ;	1. IGNORE codon, triple 2. ACCEPT phonetic spelling	**(2)**

Question Number	Answer	Additional Guidance	Mark
***2(b) QWC**	(QWC– Spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. reference to *semi-conservative replication* ; 2. DNA (*molecule* / strands) {unwinds / separate / eq} ; 3. *(mono)nucleotides* line up along (both) strands / eq ; 4. reference to *complementary* pairing between bases ; 5. reference to *hydrogen bonds* formed (between bases) ; 6. reference to formation of *phospho(di)ester* bonds (between adjacent *mononucleotides*) ; 7. ref. to condensation reaction; 8. name of an enzyme involved in DNA replication ;	QWC– Spelling of technical terms must be correct – penalise 1st error only – can still reach Max 5 marks if 6 points given. **If context is transcription, Max 2 marks from Mp2, 5, 6, 7, 8.** 1. ACCEPT clear description 2. ACCEPT unzipped / hydrogen bonds broken / eq 3. NOT RNA OR one strand only described IGNORE bases line up 4. ACCEPT description, NOT uracil / U 5. NOT between nucleotides in the same strand ACCEPT between (DNA) strands 8. e.g. (DNA) *polymerase*, (DNA) *helicase, ligase*	**(5)**

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

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

Question Number	Answer	Mark
3(a)(iii)	B ;	(1)

Question Number	Answer	Mark
3(a)(iv)	A ;	(1)

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	1. (total) cholesterol levels in people with mutation are not higher than people without mutation / eq ; 2. LDL (cholesterol) levels in people with mutation are not higher than people without mutation / eq ; 3. HDL (cholesterol) levels in people with mutation are not lower than people without mutation / eq ; 4. credit correct use of manipulated figures ;	1, 2, 3: ACCEPT converse, similar / little difference. Decreased/reduced is **not** equivalent to lower. 1. IGNORE same 2. IGNORE same 3. ACCEPT ref to HDL to LDL ratio higher in people with the mutation. 4. must be manipulated e.g. difference calculated and not just quoted (difference in LDL= 10, total cholesterol= 7) ACCEPT without units	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	(plant) statin ;	IGNORE named drug, sterol, stanin	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(iii)	1. muscle {inflammation / pain / eq} 2. liver {damage / failure / eq} 3. joint {aches / pains / eq} 4. nausea/ constipation / diarrhoea / indigestion / flatulence / loss of appetite / eq 5. kidney {damage /failure /eq} 6. cataracts / blurred vision 7. diabetes 8. allergies / skin inflammation / skin rash / eq 9. respiratory problems / persistent cough / nosebleeds / eq 10. headaches / dizziness / depression / insomnia / ringing in ears / fatigue / eq ;	NOT cancer or reduced vitamin absorption IGNORE affect ACCEPT problems as equivalent to damage etc 2. ACCEPT disease 4. ACCEPT vomiting 5. ACCEPT kidney disease 10. ACCEPT mood swings	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(a)	1. idea of large surface area to volume ratio or that it is thin (body) ; 2. idea that this helps diffusion e.g. short diffusion distance, faster diffusion ;	1. IGNORE flat, small unqualified, thin membrane, thin skin etc NOT cell wall 2. IGNORE gas exchange NOT osmosis	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	1. solubility of oxygen decreases as temperature increases / eq ; 2. credit correct manipulation of figures ;	1. ACCEPT converse, negative correlation 2. units not required but if given then they must be correct e.g. 8.2 mg dm^{-3} difference in solubility between 0 and 40 ^{o}C, solubility halved between 5 ^{o}C and 40 ^{o}C	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	1. idea that there is quite a lot of dissolved oxygen in the water at this temperature ; 2. idea of oxygen concentration gradient (between water and flatworm's cells) ; 3. idea of enzyme activity being temperature-dependent ; 4. idea that water below 15^{o}C would be too cold for {enzymes / metabolism / eq} to work effectively ; 5. idea that it is a balance between oxygen availability and {enzyme activity / kinetic effects /eq} ;	IGNORE there is most oxygen available 1. ACCEPT sufficient O_2, not enough O_2 at higher temps. 2. Ref. to diffusion or gas exchange alone, not sufficient for the mark 3. ACCEPT e.g. 15^{o}C is optimum for their enzymes NB: This is for linking enzymes and temperature, Mp4 is a development of Mp3 stating something specific. 4. IGNORE ref to effects above 15^{o}C	**(3)**

Question Number	Answer	Additional Guidance	Mark

4(c)	1. heart needed to {pump / move / eq} blood (around the body) ; 2. reference to mass flow ; 3. idea that many animals have a small surface area to volume ratio ; 4. idea that a circulatory system is needed to overcome limitations of diffusion / eq ; 5. credit correctly named molecule transported (in blood) ; 6. idea that many animals have a high metabolic rate ;	4. ACCEPT idea that diffusion is not sufficient 5. oxygenated blood not enough by itself ACCEPT any appropriate molecule in the blood ACCEPT idea of thermoregulation e.g. heat	**(4)**

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	1. reference to {H on the N / NH} in the reduced DCPIP ; 2. reference to more {H on the O / OH / hydroxyl} in the reduced DCPIP ; 3. more Hs in the reduced DCPIP / eq ; 4. idea of double bonds different in {number / location /eq} e.g. fewer in reduced DCPIP ; 5. idea of CN double bond not present in reduced ; 6. idea of CO double bond not present in reduced ;	IGNORE hydrogen bonds ACCEPT converse for oxidised DCPIP ACCEPT a clear statement about one implies a difference 2. e.g. two OH groups in reduced form ACCEPT alcohol groups 3. NOT more than two more Hs 4. IGNORE reduced more saturated 6. ACCEPT ref to ketone group	(2)

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	idea that the Hs come from the vitamin C / idea that vitamin C acts as a reducing agent ;	ACCEPT Description in terms of electrons (Vit C loses electrons/DCPIP gains electrons) ACCEPT vitamin C is oxidised ACCEPT vitamin C reduces DCPIP DCPIP is reduced alone is not enough	(1)

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	1. pH increases during storage (over 4 days) / eq ; 2. greatest increase in pH at 12^{o}C / smallest increase in pH at 24^{o}C / eq ; 3. idea that pH changes are similar at 6 ^{o}C and 8 ^{o}C ; 4. reference to slight decrease in pH during first {one / two} days at 24 ^{o}C ; 5. credit correct manipulation of figures for a time period;	ACCEPT reduction in acidity for increase in pH 1. ACCEPT for all or for any one temperature 2. ACCEPT 12^{o}C highest pH 3. ACCEPT the same up to day 2 5. Assume value is for four days unless otherwise stated, as four days specified in question stem. E.g. 12^{o}C increased 0.45 / 12^{o}C 0.4 higher than 24^{o}C / only 0.03 between 6 ^{o}C and 8 ^{o}C (after 4 days)	**(3)**

Question Number	Answer	Additional Guidance	Mark
***5(b)(ii) QWC**	(QWC– Spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. idea of using juice (from stored fruits) ; 2. reference to {titration / eq} (of juice) ; 3. correct colour change described ; 4. compare volumes of {juice / DCPIP} used ; 5. use of {repeats / replicates / eq } ; 6. reference to extended storage ;	QWC points must be clear and unambiguous for awarding 1. NOT storing the juice 2. can be described or named 3. must be checked for context e.g. blue to colourless / clear / pink when titrating juice into the DCPIP, colourless to blue if DCPIP to juice. ACCEPT suitable description of use of colourimeter 4. ACCEPT in context of calibration of DCPIP against a standard concentration of vitamin C.	**(5)**

	7. reference to named controlled variable e.g. same volume DCPIP ; 8. reference to testing at regular intervals ;	6. i.e. beyond the 4 days of the original experiment	

Question Number	Answer	Additional Guidance	Mark
6(a)	1. {phosphate group / heads} are hydrophilic ; 2. Idea that heads can be attracted to water ; 3. {fatty acids / tails} are hydrophobic ; 4. Idea that tails orientate themselves away from water / eq ; 5. Idea of aqueous environment on both sides of the membrane ;	ACCEPT marks for annotated diagram, phonetic spelling OK IGNORE "water loving / hating" 1. ACCEPT polar 2. not just facing water 3. ACCEPT non polar 4. ACCEPT repel water, face away from water, away from polar environment 5. ACCEPT polar environment	**(3)**

Question Number	Answer	Mark
6(b)	B ; C ; A ;	**(3)**

Question Number	Answer	Additional Guidance	Mark
6(c)(i)	1. both have a phospholipid bilayer and protein / eq ; 2. idea that the fluid mosaic model has {proteins within the phospholipid layer / protein channels } while the	1. ACCEPT point pieced together in response 2. needs clear comparative statement re the position of the proteins in the two models, but can be expressed in a	

	Davison – Danielli model has protein layer on the outside of the membrane only ; 3. reference to other components present in fluid mosaic model e.g. glycolipid, glycoprotein, cholesterol ;	number of ways.	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(c)(ii)	1. idea that molecules would not be able to diffuse through the (two) protein layers / eq ; 2. idea of no {channels / carriers / protein } for {facilitated diffusion / active transport / osmosis} ; 3. comment on fluidity of membrane / limits fusion of vesicles /eq ;	1. ACCEPT osmosis in context of water passing through protein layer 2. ACCEPT pumps for active transport 3. ACCEPT endo/exocytosis	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(a)	1. mutation changes the sequence of bases / eq ; 2. reference to stop code / idea of {insertion / deletion / eq} changes all triplets / frame shift / eq ; 3. {transcription / translation} does not occur / mRNA too short / protein too short / a different protein is made / eq ;	1. ACCEPT correct sequence of bases not there 2. IGNORE changes one triplet / codon ACCEPT no start codon, no ribosome binding site 3. IGNORE change of an amino acid ACCEPT wrong protein made, different sequence of amino acids	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(b)	1. in the (cell surface) membrane ; 2. of mucus-producing cells / eq ;	1. ACCEPT in phospholipid bilayer, apical membrane NOT on, attached, basal membrane 2. ACCEPT {epithelial/endothelial / lining} cells of appropriate named organ or system e.g. cells lining respiratory, digestive, reproductive	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(c)	1. (change in) {number / type / sequence / eq} of {amino acids / R groups} ; 2. So the {bonding / named bond } will be different / eq ;	2. ACCEPT hydrogen, disulfide bridges, van der Waal forces, ionic NOT peptide, glycosidic, ester bond, etc IGNORE references to shape including active sites	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(d)	1. CFTR is a channel protein / eq ; 2. idea that {fewer / no} chloride ions will be able to {enter / bind to / pass through / eq} the CFTR protein ; 3. idea that fewer chloride ions will leave the cell ;	NOT chlorine penalise once 1. NOT carrier 2. ACCEPT CFTR has a specific shape for chloride ions ACCEPT other ions can pass through	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(e)	1. less {chloride ions / water} in mucus / eq ; 2. idea that mucus is different e.g. thicker, stickier ; 3. in the {respiratory system / lungs / digestive system / pancreas / reproductive system / oviducts / fallopian tubes / cervix / sperm duct / vas deferens / eq } ; 4. credit correct reference to a consequence of thicker mucus ;	E.g. less ventilation, enzyme release, absorption of nutrients, more chest infections, reduced fertility, etc	**(2)**
Question Number	**Answer**	**Additional Guidance**	**Mark**
7(f)	1. by {enzymes / proteases} ; 2. by hydrolysis / eq ; 3. of peptide bonds ;		**(2)**

Question Number	Answer	Additional Guidance	Mark
8(a)	Idea that the {increase / change} in relative risk of developing cirrhosis is {reflected / accompanied / eq} by the {increase / change} in alcohol consumption ;	ACCEPT 'the higher the consumption, the higher the risk' and similar IGNORE causation comments, it is positive	**(1)**

Question Number	Answer	Additional Guidance	Mark
8(b)(i)	1. both show an increase in risk with an increase in alcohol consumption / eq ; 2. idea that the risk increases markedly at 30 g day^{-1} in study A but at 40 g day^{-1} in study B ; 3. study A found the risk was higher than study B / eq ; 4. credit use of comparative manipulated figures ;	ACCEPT mps to be pieced together IGNORE faster ACCEPT steeper 3. ACCEPT for specified value of alcohol consumption or risk 4. E.g. for 30g alcohol per day study A women have a relative risk 2 higher than study B women If units given they must be correct	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(b)(ii)	Any **two** from differences in: age / diet / medication / other drug abuse / nationality / ethnicity / genetics / body mass /activity levels / other medical conditions / study method / sample size / {over / under / eq} estimation of consumption of alcohol / pattern of drinking (e.g. binge compared to regular/type of drink) ;;	ACCEPT two correct answers in first section IGNORE environmental factors, lifestyle, occupation, pregnancy, ACCEPT smoking, weight, BMI, countries, regions, areas, metabolism, liver size	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(c)	1. Each study found women to have a greater risk than men / eq ; 2. idea that the risk increases markedly at 50 g day-1 for men but at {30 /40 / both} g day-1 for women ; 3. idea that gradient of increased risk smaller for men than women (in both studies) ; 4. credit correct use of figures e.g. above 42-44 g day^{-1} men are at a lower risk / eq ;		**(2)**

Question Number	Answer	Additional Guidance	Mark
8(d)	1. the results of both studies are (fairly) similar suggesting that the results are reliable / eq ; 2. comments on the numbers of people in the studies / eq ; 3. comment on lack of error bars / eq ; 4. idea that the results do not reliably show at what level risk increases significantly ;	1. ACCEPT results show same pattern e.g. men lower than women in both studies 2. E.g. we don't know the sample size. IGNORE number of studies 3. ACCEPT no information about the range of results in each study	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(e)	misreporting the amount of alcohol they had consumed / {did not know /guessed} the alcohol content of their drinks / used average values for alcohol content of drinks / {lost track of / could not remember } how much they drank / eq ;		**(1)**

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