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Mark Scheme (Results)

Summer 2013

GCE Biology (6BI01) Paper 01R

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	Mark
1(a)(i)	C ;	(1) comp

Question Number	Answer	Mark
1(a)(ii)	A ;	(1) comp

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

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	1. idea of {reduced blood flow / bleeding} ; 2. {less/no} {oxygen /glucose} (reaches brain) ; 3. idea of {less/no} (aerobic) respiration ; 4. idea of {less / no} ATP produced ; 5. idea that brain needs lots of {energy / ATP} to function ; 6. lactic acid produced (from anaerobic respiration); 7. lactic acid {inhibits enzymes / toxic / eq };	IGNORE brain cell death 1. ACCEPT no blood 2. ACCEPT no oxygenated blood and this gets Mp1 as well 3. ACCEPT anaerobic respiration (instead) 3. & 4 ACCEPT clearly linked ideas e.g. “cells will not receive enough oxygen for respiration” will gain mp 2 and 3.	(3) exp

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	Any **two** from: 1. less saturated fat / less cholesterol ; 2. less salt ; 3. {less / moderate /eq} alcohol ; 4. Increase activity e.g. more / regular exercise, less sedentary job ; 5. reduce stress / eq ; 6. reduce smoking ; 7. reduce {body weight / BMI / obesity} / maintain healthy BMI / eq ;	Mps awarded if change correctly qualified e.g. IGNORE salt unqualified 1.IGNORE just 'better' diet, less fat	**(2) grad**

Question Number	Answer	Additional Guidance	Mark
2(a)	1. reference to phospholipid bilayer ; 2. correct orientation and structure of the phospholipids in the bilayer ; 3. explanation of why the phospholipids are orientated the way they are e.g. heads attracted to water OR tails repelled by water ; 4. proteins in the membrane (described / shown) ; 5. idea of two different locations of proteins e.g. extrinsic, intrinsic, transmembrane ; 6. glycoproteins / glycolipids (described / shown) ; 7. idea of cholesterol within the membrane (described / shown) ;	Read what is written on the lines first Accept points made on a clearly labelled diagram If diagram and description contradict then Mp not awarded 2. ACCEPT heads on outside and each with two tails if drawn 2. NOT if gap between phospholipids is too large e.g. as large as a phopholipid in the diagram 3. ACCEPT ref to heads being hydrophilic OR tails hydrophobic OR explained in terms of polarity 5. If only one protein located then still get Mp4	**(5) Exp**

Question Number	Answer	Additional Guidance	Mark
2(b)	1. small ; 2. non-polar / non –charged ; 3. lipid soluble / eq ; 4. idea that they are recognised by (specific) protein receptors /eq ;	1. NOT 'size' alone 2. ACCEPT ref. to polar if correctly qualified 3. ACCEPT solubility in lipids NOT just 'solubility' NOT 'water soluble' ACCEPT 'fat soluble'	**(2)** **Grad**

Question Number	Answer	Additional Guidance	Mark
2(c)	Similarity any **one** from: 1. use {carrier / channel} proteins **OR** 2. transport {hydrophilic / eq} molecules / named molecule ; Difference any **one** from: 3. idea that active transport requires {energy / ATP} / facilitated diffusion does not require {energy / ATP} **OR** 4. active transport moves molecules against a concentration gradient / facilitated diffusion allows molecules to move down a concentration gradient / eq ;	1. IGNORE protein unqualified IGNORE transport protein 2. ACCEPT charged / polar	**(2)** **Grad**

Question Number	Answer	Additional Guidance	Mark
3 (a)	1. Idea that vitamin C content falls over time (for all temperatures) ; 2. The lower the storage temperature the less vitamin C is lost / eq ; 3. idea that –7^{o}C loses (significantly) more than -15 ^{o}C and –25^{o}C OR –25^{o}C loses the least ; 4. credit correct manipulation of figures ;	IGNORE just quoting the data or values from the graph 1. ACCEPT in context of all three temperatures and piece together 2. ACCEPT converse NOT decrease in storage temp increases vitamin C content 3. ACCEPT –7^{o}C loses most 4. ACCEPT calculate a difference for a given time OR loss between 2 storage times OR an overall loss (90 days) e.g. 27 to 29 for –7^{o}C , 15 for -15 ^{o}C, 5 / 8.5 for –25^{o}C IGNORE units unless incorrect	**(3) Exp**

Question Number	Answer	Additional Guidance	Mark
3 (b)(i)	1. –25^{o}C at 90 days / eq ;	ACCEPT The point at coordinates (90,30) ACCEPT at -25^{o}C the vitamin C rises after 80 days IGNORE –25^{o}C at 30mg per 100g	**(1) Grad**

Question Number	Answer	Additional Guidance	Mark
3 (b)(ii)	1.idea of checking results eg: repetition, extend storage time ;	ACCEPT leave this result out and do it again ACCEPT repeat (the experiment) NOT omit result unqualified	**(1)** **Grad**

Question Number	Answer	Additional Guidance	Mark
3 (c) (i)	1. {mass / volume} of broccoli 2. method of juice extraction / volume of (juice) extracted 3. {volume / concentration} of {DCPIP / eq} 4. time for thawing and testing / eq 5. pH 6. same {variety / type / source / eq } of broccoli 7. same pre-treatment of broccoli (e.g. growth conditions, age, time between picking and freezing) ;	IGNORE amount 1. IGNORE size, surface area 6. ACCEPT same initial vitamin C content	**(1) Exp**

Question Number	Answer	Additional Guidance	Mark
3 (c) (ii)	Appropriate comment on {increase / decrease / change / eq} in vitamin C {content / estimation / eq} ;	Depending on the context of 3(c)(i) a direction of change should be included where possible e.g. higher mass of broccoli will have more vitamin C. If not possible to identify a clear direction of change from context allow vitamin C content will vary e.g. the vitamin C content will vary for different types of broccoli. IGNORE results may vary	**(1) exp**

Question Number	Answer	Additional Guidance	Mark
3 (d)(i)	DCPIP / dichlorophenolindophenol /iodine ;	ACCEPT Iodine in starch solution	**(1) Grad**

Question Number	Answer	Additional Guidance	Mark
3 (d) (ii)	1. idea of obtaining {extract / juice / eq} ; 2. {reference to / description of} titration ; 3. Reference to control {volume / concentration} of {DCPIP / extract} ; 4. Reference to {record / compare / eq} volume needed / eq ; 5. (To obtain) described colour change ; 6. Comment on standardisation / calibration / colour standards / calibration graph	1. ACCEPT 'juice / solution of broccoli' 5. Must be checked against Mp2 ACCEPT e.g. decolourised, blue to colourless / clear / pink, when titrating juice into DCPIP OR colourless to blue for converse OR appropriate use of colourimeter	**(3) Exp**

Question Number	Answer	Additional Guidance	Mark
4 (a) (i)	1. somatic involves {body / somatic} cells AND germ line involves {gametes / ovaries / testes / eq} / eq ; 2. somatic can't be inherited / germ line can be inherited / eq ; 3. somatic legal / germ line illegal / eq ; 4. somatic temporary treatment / germ line could be cure / eq ;	1. Must mention both 3 ACCEPT prohibited	**(2) Exp**

Question Number	Answer	Additional Guidance	Mark
4 (a) *(ii) (QWC)	(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. reference to {a vector / named vector} e.g. liposome, virus, plasmid ; 2. idea of inserting (functional) gene that codes for the CFTR protein ; 3. reference to method of getting into lungs e.g. nebuliser ; 4. CFTR protein made via { transcription/ translation } / eq ; 5. Allows chloride ions to leave cells / eq ; 6. idea that water leaves cells by osmosis / eq ; 7. idea that mucus is less sticky ;	QWC emphasis answer must be in a logical sequence Penalise once for point out of sequence / context 2. NOT replaces faulty gene 3. ACCEPT Inhalation /aerosol 7. ACCEPT not sticky / more runny / less viscous / thinner	**(4) Exp**

Question Number	Answer	Additional Guidance	Mark
4 (b)	1. idea of loosens mucus ; 2. idea of mucus expelled from lungs (more easily) ; 3. idea of clearer airways / better breathing ;	1. IGNORE 'becomes thinner' ACCEPT sticks less 2. ACCEPT helps to remove mucus 3. ACCEPT less breathless, lower risk of chest infections, larger surface area for gas exchange in lungs. IGNORE less coughing	**(2)** **Exp**

Question Number	Answer	Additional Guidance	Mark
5(a) QWC	(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. *alveoli* one cell thick / thin (*epithelium*) ; 2. {walls / *endothelium* } of *capillaries* { one cell thick / thin} ; 3. *Alveoli* covered with *capillaries* / eq ; 4. idea of short (*diffusion*) distance ; 5. reference to *diffusion* ; 6. idea of large surface area provided by {*alveoli* / *capillaries*} ; 7. idea that *concentration gradient* maintained by {*ventilation* / breathing /eq } ; *8.* ref. to large numbers of red blood cells OR idea that *oxygen* combines with *haemoglobin ;* 9. idea that *concentration gradient* maintained by blood flow ; 10. {reference to / description of} *Fick's Law* ;	QWC emphasis is spelling Penalise once only 2. IGNORE capillaries are one cell thick NOT one cell thick membrane, cell wall 4. Award Mps 4 and 5 if diffusion stated 6.IGNORE 'many alveoli' 10. Diffusion rate is proportional to the surface area	**(5) Exp**

Question Number	Answer	Additional Guidance	Mark
5(b) (i)	1. Idea that blood carries {oxygen / carbon dioxide} ; 2. Idea that blood moving maintains concentration gradient ; 3. Reference to mass flow ; 4. Idea that organs have large surface area to volume ratio ;	1. ACCEPT oxygenated blood 3. IGNORE mass transport 4. IGNORE *Daphnia* has a large surface area	**(2) Exp**

Question Number	Answer	Additional Guidance	Mark
5 (b) (ii)	1. idea that one side (of heart) transports blood to the lungs other to the body ; 2. separation of oxygenated and deoxygenated blood / eq ; 3. idea of maintaining concentration gradient ; 4. comment on blood pressures e.g. lower to lungs, higher to body ; 5. Reference to mass flow / supply of O2 to body cells maximised ; 6. idea of need for a good supply of oxygen as (mammals are) {very active / high rate of metabolism / warm blooded / eq} ;	5. IGNORE mass transport	**(3) Exp**

Question Number	Answer	Additional Guidance	Mark
6 (a)	Diagram clearly showing: 1. central carbon with {R / H / eq} and H attached by single bonds ; 2. {NH2 / $NH3^+$ } attached to carbon by single bond ; 3. {COOH / COO^- } attached to carbon by single bond ;	1. Must show C, H and R or a plausible R group 2. 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 e.g. C=OH ACCEPT if correct group attached to wrong molecule e.g. glucose	**(3) Exp**

Question Number	Answer	Additional Guidance	Mark
6 (b) (i)	1. idea that enzymes reduce activation energy ; 2. reference to active sites (of enzyme) ; 3. reference to effect on collisions between enzymes and substrates / enzyme substrate complexes / eq ; 4. idea of number of active sites occupied ; 5. (levels off when) substrate becomes limiting factor ;	IGNORE increases the rate of the reaction 1. Accept 'decreases energy needed for reaction', provides an alternative reaction pathway 4. ACCEPT below 6a.u. all sites occupied OR above 6 a.u. not all occupied	**(3) Exp**

Question Number	Answer	Additional Guidance	Mark
6 (b) (ii)	1. idea of a range of concentrations of enzyme (at least 5) ; 2. idea of substrate concentration not limiting ; 3. reference to mixing ; 4. description of how to measure dependent variable with time ; 5. description of how to measure the initial rate of reaction ; 6. reference to an appropriate named controlled variable ; 7. reference to {replicates / repeats} at each enzyme concentration ; 8. control {described / used as comparison} ;	4. and 5. Must relate to reaction / enzyme named 5. ACCEPT clear indication of rate measured soon after mixing, plot and calculate rate from linear part of graph NOT time taken for all substrate to be converted but could get Mp4 6. ACCEPT e.g. pH, temperature, volume, concentration of substrate 7. IGNORE repeat for other concentrations ACCEPT repeat whole experiment 8. ACCEPT control used is with {no enzyme / distilled water}	**(4)** **Exp**

Question Number	Answer	Additional Guidance	Mark
7 (a) (i)	B ;		**(1) comp**

Question Number	Answer	Additional Guidance	Mark
7 (a) (ii)	B ;		**(1) comp**

Question Number	Answer	Additional Guidance	Mark
7 (a) (iii)	C ;		**(1) comp**

Question Number	Answer	Additional Guidance	Mark
7 (b) (i)	C **;**		**(1) comp**

Question Number	Answer	Additional Guidance	Mark
7 (b) (ii)	D ;		**(1) comp**

Question Number	Answer	Additional Guidance	Mark
7 (c)	nucleus ;	ACCEPT chloroplast, mitochondria	**(1) clerical**

Question Number	Answer	Additional Guidance	Mark
7 (d) (i)	Advantage any **one** from: 1. prevent child dying late in pregnancy / eq 2. idea of less stress for parents / eq 3. parents can prepare for child { with / without } achondroplasia / eq 4. idea of making an informed choice ; Disadvantage any **one** from: 5. risk of miscarriage of healthy child / eq 6. idea of more stress for parents / eq 7. cost / eq 8. risk of false { negatives / positives } / eq ;	4. ACCEPT may choose termination 5. ACCEPT risk of spontaneous abortion	**(2) Exp**

Question Number	Answer	Additional Guidance	Mark
7 (d) (ii)	1. genotype of parents shown ; 2. alleles in the gametes shown ; 3. possible genotypes of children shown AND corresponding phenotypes shown ; 4. (probability =) 1/4 / 25% / 1 in 4 / 0.25 ;	4. NOT a ratio e.g. 1:4 ACCEPT 1/3, 33(.3)% , 1 in 3, 0.3 this assumes AA dies	**(4) Exp**

Question Number	Answer	Additional Guidance	Mark
8 (a) (i)	1. Increase in alcohol consumption increases risk of developing cirrhosis / eq ; 2. idea that risk increases much higher above 40 g per day ; 3. correct manipulation of figures e.g. increase in risk by 10.4 between 40 and 60 g per day, increase in risk of 1.4 between 10 and 40 g per day ;	1. IGNORE references to graph rising, ACCEPT positive correlation 2. IGNORE faster, more rapid 3. IGNORE about if the calculation has the correct figures and is rounded appropriately.	**(3) Exp**

Question Number	Answer	Additional Guidance	Mark
8 (a) (ii)	1. idea that women have a greater risk than men / eq ; 2. idea of little difference between them from 10-30g per day ; 3. idea that the steeper increase in risk is at lower alcohol consumption in women e.g. women steeper increase above 30 g per day while the steep increase for men is above 50 g per day / eq ; 4. idea that can't compare above 40g per day ; 5. credit manipulation of figures e.g. increase of 13.6 for women between 10 and 40 g per day AND increase of 2.6 for men between 10 and 40 g per day, 0.8 higher risk for women than men at 30g per day;	1. ACCEPT converse ACCEPT women have the same risk as men at lower alcohol consumptions 3. ACCEPT converse ACCEPT women (always) have a steeper increase ACCEPT same risk when women consume 30g/day and men consume 50g/day 5. This should be a comparative calculation	**(2) Exp**

Question Number	Answer	Additional Guidance	Mark
8(a) (iii)	1. the {results / conclusions / eq} 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 / statistical analysis /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)EXP**

Question Number	Answer	Additional Guidance	Mark
8 (b)	1. Higher LDL (cholesterol) levels /eq ; 2. lower HDL:LDL ratio / credit calculation of HDL:LDL ratios; 3. LDL (cholesterol) may {overload membrane receptors / be deposited in artery walls / eq} ; 4. resulting in {atherosclerosis / atheroma / plaque formation narrower artery lumen / reduced blood flow / higher blood pressure / eq } / eq ;		**(3) Exp**

Question Number	Answer	Additional Guidance	Mark
8 (c)	Any **two** from: 1. fatty acid (s) ; 2. glycerol / eq ; 3. monoglyceride ; 4. diglyceride ;	1. IGNORE number stated 2. ACCEPT propan 1,2,3 triol	**(2) Grad**

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