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Mark Scheme (Results)

January 2012

GCE Biology (6BI01) Paper 01
Lifestyle, Transport, Genes and Health

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GENERAL INFORMATION

The following symbols are used in the mark schemes for all questions:

Symbol	Meaning of symbol
; semi colon	Indicates the end of a marking point
Eq	Indicates that credit should be given for other correct alternatives to a word or statement, as discussed in the Standardisation meeting
/ oblique	Words or phrases separated by an oblique are alternatives to each other
{} curly brackets	Indicate the beginning and end of a list of alternatives (separated by obliques) where necessary to avoid confusion
() round brackets	Words inside round brackets are to aid understanding of the marking point but are not required to award the point
[] square brackets	Words inside square brackets are instructions or guidance for examiners
[CE] or [TE]	Consecutive error / transferred error

Crossed out work

If a candidate has crossed out an answer and written new text, the crossed out work can be ignored. If the candidate has crossed out work but written no new text, the crossed out work for that question or part question should be marked, as far as it is possible to do so.

Spelling and clarity

In general, an error made in an early part of a question is penalised when it occurs but not subsequently. The candidate is penalised once only and can gain credit in later parts of the question by correct reasoning from the earlier incorrect answer.

No marks are awarded specifically for quality of language in the written papers, except for the essays in the synoptic paper. Use of English is however taken into account as follows:

- the spelling of technical terms must be sufficiently correct for the answer to be unambiguous
  e.g. for amylase, 'ammalase' is acceptable whereas 'amylose' is not
  e.g. for glycogen, 'glicojen' is acceptable whereas 'glucagen' is not
  e.g. for ileum, 'illeum' is acceptable whereas 'ilium' is not
  e.g. for mitosis, 'mytosis' is acceptable whereas 'meitosis' is not

- candidates must make their meaning clear to the examiner to gain the mark.

- a correct statement that is contradicted by an incorrect statement in the same part of an answer gains no mark – irrelevant material should be ignored

Question Number	Answer	Comments	Mark
1(a)	1. amino acids ; 2. peptide ; 3. condensation / polymerisation ; 4. amino / amine / NH_3^+ / NH_2 ; 5. carboxyl / carboxylic (acid) / COO^- / COOH ; [Accept answers for 4 and 5 the opposite way round]	2. mp2 IGNORE covalent. NOT dipeptide/polypeptide 4. NOT NH_3 with no +, Amino acid 5. NOT COO with no - for 4 & 5 ALLOW drawn out groups.	**(5)**

Question Number	Answer	Comments	Mark
1(b)(i)	1. globular / eq ; 2. reference to active site ; 3. reference to specific <u>shape</u> of active site ; 4. reference to {bonds /named bond / interaction / eq} between R groups ; 5. credit correctly named {bond/interaction} e.g. disulphide bond, hydrogen bonds, hydrophobic interactions (between R groups) ;	ALLOW Mps in context of labelled diagram mp 1: NOT fibrous, IGNORE spherical, 3D 4. ALLOW side groups 5. IGNORE peptide, covalent. ALLOW s-s, disulphide bridge NOT disulphate, sulphur	**(3)**

Question Number	Answer	Comments	Mark
1(b)(ii)	1. (primary structure) {position / sequence / order /eq} of the {amino acids / R groups} / eq ; 2. idea that this determines the {positioning / type} of the {bonds / folding / eq} ; 3. determining the {shape / properties} of the active site / eq ; 4. idea of interaction of active sites and substrates ; 5. idea of {polar / hydrophilic} on the outside of enzymes / {non polar / hydrophobic} on the inside / eq ; 6. reference to solubility ;	4. e.g. ALLOW enzyme substrate complex forms	**(3)**

Question Number	Answer	Comments	Mark
***2 (a)QWC**	(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. *(gas exchange)* occurs through the {*cell membrane / phospholipid bilayer}* ; 2. idea that the *membrane* is thin ; 3. *oxygen* enters cell (from water) / eq ; 4. *carbon dioxide* leaves cell (into water) / eq ; 5. {O_2 / *oxygen* / CO_2 / *carbon dioxide*} are {small / *non-polar*} (*molecules)* ; 6. reference to *diffusion* ; 7. {reference to / description} (suitable) *concentration gradient* ; 8. reference to *large surface area (to volume ratio)* ;	Spelling and use of *italicised technical terms* must be correct for this response – penalise <u>once only.</u> 1. NOT in ALLOW across, at 2. reject ref. to wall 3. cell NOT membrane 3. and 4 ALLOW an annotated diagram 6. NOT if reference to other mechanisms e.g. osmosis, facilitated diffusion 7. NOT across the gradient, high to low gradient	**(4)**

Question Number	Answer	Comments	Mark
2 (b)	1. reference to diffusion (in the cytoplasm) ; 2. through the cytoplasm / description of part of cytoplasm ; 3. down a concentration gradient (in the cytoplasm) ;	NOT if in the context of cell membrane 1. NOT other mechanisms e.g. osmosis, facilitated diffusion 3. NOT across the gradient, high to low gradient	**(2)**

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

Question Number	Answer	Comments	Mark
3 (a)(ii)	C ;		**(1)**

Question Number	Answer	Comments	Mark
3 (a)(iii)	A ;		**(1)**

Question Number	Answer	Comments	Mark
3(b)	1. an increase in temperature increases the permeability / eq ; 2. idea of change in {colour / permeability} related to {42 °C / 64 °C} OR no change up to 42 °C ;	1. ALLOW positive correlation, ALLOW increase from 42 °C ;	**(2)**

Question Number	Answer	Comments	Mark
3(c)(i)	Any **two** from: 1. reference to pre-treatment e.g. rinsing method ; 2. {size / mass / surface area / volume / shape} of beetroot ; 3. beetroot storage conditions / eq ; 4. {same / type / species / eq} beetroot ; 5. {age of beetroot / storage time} ; 6. (incubation) time / eq ; 7. {volume / concentration / eq} of {water / solution}(added to beetroot) ; 8. pH ;	2. NOT amount, ALLOW weight 4. ALLOW “the beetroot” 7. NOT amount	**(2)**

Question Number	Answer	Comments	Mark
3(c)(ii)	1. reference to repeats / replicates / eq ; 2. idea that (colorimeter / readings) are {objective / quantitative / not qualitative / more accurate / provide numbers / more precise / measured not judged / eq} ;	IGNORE reference to validity	**(2)**

Question Number	Answer	Comments	Mark
3(c)(iii)	1. (pink colour due to) {pigment / dye /betalain / eq} ; 2. idea that this is released when {cells / vacuoles/ membranes} are damaged; 3. and had not been washed off / eq ; ACCEPT converse	1. ALLOW betanin	**(2)**

Question Number	Answer	Comments	Mark
3(c)(iv)	idea that the second experiment shows that the permeability increases between {5 / 22} °C and 42 °C / in first experiment 5 °C has an effect / eq **OR** idea that the second experiment's results are quantified ;	ALLOW idea that second experiment shows increase at all temperatures ALLOW answers related to permeability or colour ALLOW reference to arbitrary units, figures, numbers used in second experiment. NOT data unqualified.	**(1)**

Question Number	Answer	Comments	Mark
4 (a)	Any 3 of the following: 1. consists of (α) glucose ; 2. (joined by 1,4 / 1,6) glycosidic bonds ; 3. branched structure / eq ; 4. idea of compact structure ; Any 3 of the following: 5. idea that it is {easily / rapidly / eq} hydrolysed ; 6. (leading to) more {glucose / eq} in a smaller space (in a cell)/ eq ; 7. idea of low solubility ; 8. it does not diffuse out of cells /eq ; 9. it has no osmotic effect / eq ;	If reference to glycogen being amylose / amylopectin then penalise once only 5. ALLOW digested, broken down qualified 6. IGNORE more energy	**(4)**

Question Number	Answer	Comments	Mark
4 (b)(i)	1. increasing intensity {increases carbohydrate use / decreases fat use / eq} ; 2. {low intensity exercise / intensity below {39 / 40} au} uses more energy derived from fats / eq ; OR {high intensity exercise / intensity above {39 / 40} au} uses more energy derived from carbohydrates / eq ; 3. at {39 / 40} au both sources of energy used equally / eq ; 4. credit correct manipulation of figures to compare energy usage ;	1. ALLOW appropriate use of correlation 4. manipulation to compare {two intensities / fat and carbohydrate}	**(3)**

Question Number	Answer	Comments	Mark
4(b)(ii)	1. idea that this diet is suitable for {a high intensity / eq} event ; 2. credit suitable example of athletic event ; 3. reference to more carbohydrate being used (than fat) above {39 / 40} a.u. / eq ; 4. reference to carbohydrate being stored as glycogen ; 5. idea of {maximum / more / lots of} glycogen (stored) ; 6. idea that breakdown of glycogen provides energy (for the event) ;	1. ALLOW intense / strenuous exercise 2. any endurance or power event e.g. running, cycling, marathons, swimming etc. IGNORE jogging. 6. IGNORE glucose.	**(3)**

Question Number	Answer	Comments	Mark
5(a)	x ✓ ✓ x ;; [Any two correct for one mark]	IGNORE tick/cross combinations do NOT credit blanks as crosses	**(2)**

Question Number	Answer	Comments	Mark
5(b)(i)	amniocentesis / chorionic villus sampling / CVS ;	NOT chronic villus sampling	**(1)**

Question Number	Answer	Comments	Mark
5(b)(ii)	1. idea of right to life ; 2. abortion is murder / ref to risk of miscarriage / eq ; **Or:** 3. false positive / negative / eq ; 4. consequences of false result e.g. abortion of (healthy) fetus ; **Or:** 5. who has right to decide if tests should be performed / eq ; 6. {implications of medical costs / discrepancies over next step} / parents {have a right to know / can prepare / eq} ; **Or:** 7. issues relating to confidentiality of {parents / child} / eq ; 8. idea that {some other abnormality may be found / paternal DNA does NOT match / other family members have right to know results} ; **Or:** 9. if abnormality found / eq ; 10. consequence of abnormality found e.g. abortion, comment on possible problems with {future employment / insurance / what constitutes a serious condition} / eq ; **Or:** 11. damage to fetus / risk of miscarriage ; 12. loss of fetus / risk to mother / eq ; **Or:** 13. ref. to stress to parents /eq ; 14. consequences of stress e.g. increased risk of miscarriage ;	For fetus ALLOW baby, child. If a pair of statements are in the context of an embryo only allow 1 mark. If a second pair of statements are provided in the correct context both marks can be awarded.	**(2)**

Question Number	Answer	Comments	Mark
5(c)(i)	1. reference to faulty {alleles / genes / DNA / eq} ; 2. idea that gene therapy uses {normal / functioning / healthy} {alleles / genes / eq} ; 3. so the normal {protein / gene product / RNA / eq } is produced (by the cells) / eq ;	1. ALLOW mutated, damaged, non-functioning 2. NOT replaces / corrects faulty gene / eq	**(2)**

Question Number	Answer	Comments	Mark
5(c)(ii)	1. reference to using {alleles / genes / eq} coding for the CFTR {protein / channel} ; 2. reference to introducing the {alleles / genes / eq} into the cells ; 3. of the {lungs / pancreas / reproductive tracts / eq} ; 4. that produce mucus / eq ; 5. using a {vector / named vector} ; 6. credit suitable delivery mechanism e.g. nebuliser, injection ; 7. idea that treatment needs to be repeated (due to cell replacement) ;	2. NOT bacterial 3. NOT other organs 5. e.g. liposome, virus. IGNORE plasmid. 6. if named organ given then mechanism must be suitable	**(3)**

Question Number	Answer	Comments	Mark
6 (a)(i)	1. different tissues have different activities of catalase / eq ; 2. Z has highest (activity) / eq ; 3. Y has the lowest (activity) / X and Y have very similar levels / eq ; 4. credit correct manipulation of figures ;	1. ALLOW "it" as equivalent to activity e.g. it is different in all tissues 4. e.g. Z has 12 more than Y / Z has 11 more than X	**(3)**

Question Number	Answer	Comments	Mark
6(a)(ii)	1. idea activity in mussel E is not higher than M in all tissues ; 2. mussel E has lower (activity) in tissue X / eq OR (activity) is the same in tissue Y / eq OR mussel E has higher (activity) in tissue Z / eq ; 3. mussel E has more (overall activity)/ eq ; 4. credit correct comparative manipulation of figures ; 5. Idea that both mussels have tissues with same order of activity e.g. Y X Z ;	1. ALLOW it depends on the tissue	**(2)**

Question Number	Answer	Comments	Mark
6(b)	1. reference to measuring volume of oxygen ; 2. suitable reference to time e.g. oxygen produced in unit time, time taken to produce same volume of oxygen ; 3. idea of measuring the initial rate of reaction ; 4. reference to controlled variable in relation to the mussel e.g. age, part of mussel, mass, surface area ; 5. reference to a controlled variable in relation to the experiment e.g. volume of hydrogen peroxide, temperature, concentration, pH ; 6. suitable reference to repeats ;	NOT amount 1. ALLOW count number of bubbles	**(4)**

Question Number	Answer	Comments	Mark
*** 7(a) QWC**	(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. {damage / eq} to {endothelial cells/ epithelial cells / lining / eq} of artery ; 2. ref to inflammatory response ; 3. ref to migration of white blood cells into area / eq ; 4. build up of cholesterol /eq ; 5. reference to formation of atheroma / plaque ; 6. reference to {calcium salts / fibrous tissue}; 7. ref to {loss of elasticity (of artery) / narrowing of lumen} / eq ; 8. idea that this process is self–perpetuating ;	For this item the answer must be organised in a logical sequence – do NOT award the corresponding mpt the first time any one comment is clearly out of sequence 1. NOT artery wall alone 3. ALLOW accumulation of WBC 4. IGNORE fatty streaks or deposits 6. NOT calcium unqualified 7. IGNORE narrowing, blocking artery. ALLOW hardening of artery. 8. ALLOW positive feedback	**(4)**

Question Number	Answer	Comments	Mark
7(b)(i)	{the alleles / eq} present (in an organism) / eq ;	NOT genes unqualified ALLOW genetic makeup	**(1)**

Question Number	Answer	Comments	Mark
7(b)(ii)	a (different) form of one gene / eq ;	ALLOW version, variety, variation ALLOW different type but NOT type unqualified	**(1)**

Question Number	Answer	Comments	Mark
7(c)	Any **two** from: More saturated fat / more cholesterol / more salt /obesity / more alcohol / more age / male / post-menopausal women / high blood pressure / smoking / diabetes / less activity / stress ;	ALLOW lack of exercise for less activity	**(1)**

Question Number	Answer	Comments	Mark
7(d)	1. muscle {inflammation / pain / eq} ; 2. liver {damage / failure/ eq} ; 3. joint {aches / pains/ eq} ; 4. nausea/constipation/diarrhoea ; 5. kidney {damage / failure / eq} ; 6. cataracts ; 7. diabetes ; 8. allergies / skin inflammation / skin rash / eq ; 9. respiratory problems / persistent cough / eq ; 10. headaches / dizziness / depression ;	IGNORE ref to cancer, other conditions	**(2)**

Question Number	Answer	Comments	Mark
8(a)	1. a bar showing 2% ; 2. a bar showing 16% ; 3. the obesity (dark) and overweight (light) portion identified / eq ;	IGNORE width of bars, lack of ruler	**(3)**

Question Number	Answer	Comments	Mark
8(b)(i)	A ;		**(1)**

Question Number	Answer	Comments	Mark
8(b)(ii)	D ;		**(1)**

Question Number	Answer	Comments	Mark
8(b)(iii)	A ;		**(1)**

Question Number	Answer	Comments	Mark
8(b)(iv)	C ;		**(1)**

Question Number	Answer	Comments	Mark
8(c)	1. graph shows percentages ; 2. population size is not known e.g. sample size not known / the actual number of males and females who are obese will depend on the population size of each gender / eq ; 3. there may be a different number of males to females / eq ;		**(2)**

Question Number	Answer	Comments	Mark
8(d)(i)	(relationship between two variables is such that) a change in one of the variables is reflected by a change in the other variable / eq ;	NOT cause, leads, links ACCEPT mirrored by, accompanied by, followed by ACCEPT factors but NOT things ACCEPT change mentioned only once	**(1)**

Question Number	Answer	Comments	Mark
8(d)(ii)	1. the (consumption of) corn syrup goes up / eq ; 2. (this is) before the increase in obesity / eq ; 3. reference to the (consumption of) dextrose falling with time e.g. during the 1970s ; 4. reference to the consumption of glucose staying fairly constant ;		**(3)**

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