

Mark Scheme (Results)

Summer 2015

Pearson Edexcel GCE in Biology (6BI01) Paper 01 Transport, Genes & 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.

Question Number	Answer	Additional Guidance	Mark
1(a)	idea that the (RNA) nucleotides attach to this	ACCEPT complementary to RNA nucelotides,	
	strand	codes for mRNA,	
	OR	{part of the DNA / antisense } strand that the	
	idea of {nucleotide / base } sequence that directs	mRNA is built along,	
	the synthesis of {complementary sequence /	NOT DNA nucleotides, plural strands	
	mRNA / eq};		(1)

Question Number	Answer	Mark
1(b)(i)	D have a sugar-phosphate chain ;	(1)

Question Number	Answer	Mark
1(b)(ii)	C semi-conservative replication is possible;	(1)

Question Number	Answer	Mark
1(b) (iii)	A 10%;	(1)

Question Number		Answer								Additional Guidance	Mark				
1(c)															
	U	G	А	Α	А	G	С	G	G	G	С	U			
	1. b	oth u	racils	corr	ect;										
	2. tl	he re:	st of	the s	equer	nce co	orrect	;							(2)

Question Number		Į.	Answer	Additional Guidance	Mark
1 (d)	Any	three from:		Must be clearly comparative for the mark IGNORE destination of the	
		replication	transcription	molecules	
	1	uses DNA nucleotides	uses RNA nucleotides / eq;	1. ACCEPT thymine / T, uracil / U comparison, deoxyribose and ribose,	
	2	uses DNA polymerase / eq	does not use DNA polymerase / uses RNA polymerase ;	DNA and RNA bases 2. ACCEPT no ligase in transcription	
	3	reference to semi- conservative	not semi-conservative / eq;		
	4	(copies) both DNA strands / eq	(copies) only {one strand / template / gene / eq};	4. ACCEPT whole DNA molecule unzipped for replication with only part for transcription ACCEPT all {DNA / genome}	
	5	makes DNA double helix / eq	Makes single strand mRNA / eq;	copied in replication only part in transcription 5. NOT just produces DNA and mRNA	
				ACCEPT two {new strands of DNA / DNA molecules} compared to one mRNA (each time) ACCEPT if clear what is being produced elsewhere in the response	(3)

Question Number	Answer	Additional Guidance	Mark
2(a)	 idea that both of these alleles need to be present in order for the recessive phenotype to be expressed; AND any two of: 	ACCEPT not expressed in presence of dominant allele	
	 different form of a gene / eq; same locus /position / eq; 	2. ACCEPT type of same gene NOT just type of gene	
	4. different base sequence / eq ;		(3)

Question Number	Answer	Additional Guidance	Mark
2(b) (i)		IGNORE gender	
	1. genotypes and phenotypes of parents;	1. & 4. ACCEPT carrier/ normal / healthy / unaffected /sufferer as a phenotype	
	2. gametes clearly shown as individual alleles;		
		2. NOT E.C.F. from 1.2. & 3 can be awarded in a	
	3. offspring genotypes;	Punnett square	
	4. phenotypes correctly matched to genotypes;	3. and 4. can be awarded as E.C.F. from 2	(4)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	0.5 / ½ / 1 in 2 / 50% ;	IGNORE expressed as a ratio	(1)

Question Number	Answer	Additional Guidance	Mark
3 (a) (i)	 idea that you can see the { heart / internal organs / eq}; 	1. ACCEPT they are transparent	
	Daphnia { are simple organisms / have less developed nervous system / can't feel pain / eq};		
	idea that there are fewer ethical concerns because it is an { invertebrate / eq};	3. NB. needs to be linked to something about the <i>Daphnia</i> and not just because it is a <i>Daphnia</i> e.g. a simple organism	
	4. idea that they are abundant / used as fish food / eq;	4. ACCEPT easy to reproduce / easy to keep / readily available / eq;	
	idea that they can absorb chemicals from the surrounding solution quickly;	5. ACCEPT they are small so chemicals can affect them quickly	(2)

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	suitable variables identified;	Other variables may be given	
	suitable control method ;	e.g. stress, oxygen, pH	
	Examples:	The methods shown are	
	temperature; heat shield;	examples others may be seen	
	 volume of caffeine (solution); (use pipette to measure) stated volume e.g. 2 cm³; { age / species / source /size / gender } of Daphnia; hatched from eggs at the same time; pre-treatment / acclimatisation; same time; reduce movement of Daphnia; use of cotton wool strands; method of measuring heart rate; count number of heartbeats in 30 seconds / eq; 	IGNORE water bath, room temperature etc ACCEPT keep lamp off except when needed DO NOT ACCEPT number of drops ACCEPT water bath used in acclimatisation	
	 {concentration / source} of caffeine; one caffeine tablet in 10 cm³ of water; 	DO NOT ACCEPT just stated concentration	(4)

Question Number	Answer	Additional Guidance	Mark
3(b)	1. reference to mass flow;	ACCEPT mass transport	
	2. name a suitable substance transported e.g. oxygen;	2. IGNORE oxygenated blood	
	comment on {blood pressure / fast movement of blood to cells /eq};	3. IGNORE pump alone	
	 idea of increased concentration gradient of solutes e.g. oxygen; 	4. ACCEPT improved gaseous exchange	
	5. idea that diffusion alone would be too slow;	5. ACCEPT surface area to volume ratio too small	
	6. has high metabolic rate / eq;	6. IGNORE activity level	(3)

Question Number	Answer	Additional Guidance	Mark
4(a)	1. homozygous ;	1. ACCEPT (a) homozygote	
	channel / transport / transmembrane / intrinsic / globular ;		
	3. chloride / Cl / Cl ;	3. DO NOT ACCEPT chlorine	
	4. reproductive / eq;		(4)

Question Number	Answer	Additional Guidance	Mark
4(b)	1. produces {thicker / stickier / more viscous / eq} mucus ;	1. ACCEPT sticky / thick in context,	
		ACCEPT less water in mucus	
	2. blocking { trachea / bronchi / bronchioles / airway / eq} / eq;	IGNORE respiratory system ACCEPT alveoli	
	3. cilia are unable to move mucus out of lungs / eq;		
	4. idea of reduced flow of {air / oxygen } to alveoli;		
	5. idea of reduced concentration gradient for {oxygen / carbon dioxide} (in alveoli);		
	6. idea of loss of surface area / elasticity / eq;		
	7. idea of reduced gaseous exchange ;	7. ACCEPT less O ₂ diffuses into blood	
	8. trapped bacteria may result in more respiratory infections / eq;	IGNORE larger diffusion pathway	
			(4)

Question Number	Answer	Additional Guidance	Mark
4(c) (i)	1. chorionic villus sampling / amniocentesis ;	1. ACCEPT CVS DO NOT ACCEPT chronic	
	idea that (fetal) {cells / DNA} are obtained from appropriate source { placenta / amniotic fluid / eq } ;	2. ACCEPT from embryo	
	 (cells / DNA) tested for presence of {CFTR / recessive / faulty / mutant / eq} {allele / gene } / eq; 	3. ACCEPT test for cystic fibrosis allele or gene	
			(3)

Question Number	Answer	Additional Guidance	Mark
4 (c) (ii)	Any of the following paired points		
	1. idea that it may result in a miscarriage / choice of an abortion ;	1. ACCEPT can {harm / damage / kill} the fetus	
	2. {killing / eq} is {wrong / unethical / eq};	2. ACCEPT fetus has right to life / distress to parents / genetic discrimination / eugenics	
	OR		
	3. idea of risk of false {positive / negative};	3. ACCEPT it isn't 100% accurate	
	4. comment on consequence e.g. healthy fetus may be aborted / parents not prepared for child with cystic fibrosis / eq;	4. ACCEPT parents did not have choice of abortion	
	OR 5. if cystic fibrosis or some other abnormality may be found;		
	6. comment on possible problems with {future employment / insurance / what constitutes a serious condition} / eq;		
	OR 7. who has right to decide if tests should be performed / eq ;		
	8. {implications of medical costs / disagreements over next step};		
	OR 9. issues relating to confidentiality of {parents / child} / eq ;		
	10. idea that {some other abnormality may be found / paternal DNA does not match / other family members have right to know results};		(2)

Question Number	Answer	Mark
5(a)(i)	31.0 / 31.02 / 31 ;	(1)

Question Number	Answer	Additional Guidance	Mark
5 (a) (ii)	Obese class I / moderately obese ;	ACCEPT category based on answer to (ai)	(1)

Question Number	Answer	Additional Guidance	Mark
5(a) (iii)	(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)	QWC emphasis is spelling [penalise once only]	
	 idea of damage to { endothelium / endothelial lining} of { artery / arteries}; 	1. ACCEPT lining of <i>artery</i> IGNORE wall NOT vein	
	 reference to <i>inflammatory</i> response; leading to formation of { atheroma / plaque / atherosclerosis }; 	2. ACCEPT detail e.g. foam cells, white cells move into wall, macrophages etc	
	4. increased risk of blood clot formation / eq;	4. ACCEPT thrombus	
	5. ref to {loss of elasticity of artery / narrowing of lumen / eq };	5. ACCEPT hardening of <i>artery</i> wall, blocking of artery	
	6. idea of (<i>positive feedback</i> causing) further increase in blood pressure;		(4)

Question Number	Answer	Additional Guidance	Mark
Number 5 (b)	Explanations should be linked to the medical advice. 1. reduce energy intake / increase activity / follow calorie controlled diet / eq; 2. idea of change in balance of energy budget; 3. lower {weight / BMI / obesity level / eq} / reduce risk of {atherosclerosis / diabetes / eq}; OR 4. statins / sterols / reduce { cholesterol / saturated fats / eq} in diet / eq; 5. reduce blood cholesterol levels;	NB: if more than one piece of medical advice given, mark the one which has the best explanation IGNORE smoking, salt intake 1. NOT just healthier diet ACCEPT regular exercise / lower {fat / carbohydrate } intake 2. ACCEPT lowers LDL / HDL ratio 3. and 6. ACCEPT reduces chance of atheroma / blood clot / eq 4. ACCEPT improve HDL/LDL ratio IGNORE increase HDL (unless instead of LDL)	Mark
	 6. idea of reducing risk of atherosclerosis / eq; OR 7. eat more fruit / vegetable / vitamins / moderate alcohol intake / eq; 8. reference to antioxidants; 9. they protect against free radical damage / reduce damage to cells / eq; OR 10. anticoagulants / platelet inhibitory drugs / warfarin / aspirin / eq; 11. prevent blood clot formation / eq; 	10. DO NOT ACCEPT drugs to treat blood pressure e.g. beta blockers	
	12.reduces risk of blocking artery / eq;		(3)

Question Number	Answer	Additional Guidance	Mark
5 (c)	 idea that death rates decrease over time for three of the countries; 	1. ACCEPT all except Poland / eq IGNORE separate descriptions of data for Finland, UK and Italy	
	and any two from		
	2. death rate for Poland has { increased / eq} (overall);	2. IGNORE decreased after 1990	
	3. limitations of the data due to number of countries / eq;		
	4. limitations due to timescale of data / eq;		(3)
	5. limitations due to men only data / eq ;		

Question Number	Answer	Additional Guidance	Mark
6 (a)	 idea of formation of secondary or tertiary structure; idea of bonding between R groups; named bond e.g. ionic, disulfide, hydrogen; 	1. ACCEPT e.g. alpha helix, beta pleated sheet, globular structure ACCEPT folding (of primary structure) IGNORE 3D shape 2. ACCEPT hydrophilic R groups go to outside/ hydrophobic R groups go to inside / eq	(3)
		3. DO NOT ACCEPT peptide	

Question Number	Answer	Additional Guidance	Mark
6 (b) (i)	 as the enzyme concentration increase the rate of reaction increases / eq; idea that enzyme lowers activation energy / provides alternative reaction pathway; idea that the higher concentration of enzyme means that more active sites are available; more chance of a collision between {enzyme / active site} and substrate; reference to {enzyme – substrate complex / specific 	ACCEPT bacteria as substrate 1. ACCEPT enzyme increases rate of reaction	
	interaction between enzyme active site and substrate };6. idea that substrate is in excess / enzyme concentration is limiting factor;		(3)

Question	Answer	Additional Guidance	Mark
Number			
6 (b) (ii)	there were {anomalies / sources of error / random error / measurement inconsistencies / lack of precision / lack of accuracy / eq};	· ·	(1)

Question Number	Answer	Additional Guidance	Mark
6 (c)	1. idea that this increased temperature changes the bonding in the enzyme;	IGNORE enzyme is denatured ACCEPT bonds are broken	
	2. the active site is {denatured / changes shape};		
	3. the substrate no longer fits into the active site / the enzyme no longer {catalyses the reaction / lowers the activation energy / eq};	3. ACCEPT no enzyme substrate complex can form / eq	(2)

Question Number	Answer	Mark
7(a)(i)	A a hydrogen bond ;	(1)

Question Number	Answer	Mark
7(a)(ii)	D a peptide bond ;	(1)

Question	Answer	Mark
Number		
7(a)(iii)	D glucose;	(1)

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

Question	Answer	Additional Guidance	Mark
Number			
7(b)	nitrogen ;	IGNORE N if it is the only	(1)
		response	

Question	Answer	Additional Guidance	Mark
Number			
7(c)	glycosidic bond correctly drawn;	1. IGNORE labelling of bond	
	2. molecule of water shown to be produced;	2. ACCEPT water named or formula	
	3. remaining groups around disaccharide drawn		
	correctly;	3. DO NOT ACCEPT two	(3)
		separate glucose molecules	
		NB: check carefully H on C5	

Question Number	Answer	Additional Guidance	Mark
7 (d)	idea that water can form {hydrogen bonds / eq}; and any one from	ACCEPT water is slightly charged, description of charges on O and /or H IGNORE polar/ dipole as stated in Q stem	
	2. water is a solvent / {ions / polar molecules / eq } can {dissolve / be transported / eq } in water3. reference to cohesion/adhesion	2. ACCEPT named polar molecule IGNORE non polar molecules dissolving3. ACCEPT specific example e.g. surface tension on a pond	
	 4. idea of hydrogen bonds holding water together as a liquid, so that it can move in mass flow systems 5. suitable ref. to specific heat capacity 6. idea of distribution of thermal energy around body 	5. ACCEPT thermal buffer / needs a lot of energy to change the temperature / eq	(2)
	7. reference to high latent heat of vaporisation ;	IGNORE pH buffer	

Question	Answer	Mark
Number		
8(a) (i)	ACCEPT answers between 0.14 and 0.15 inclusive	
	•	
		(1)

Question	Answer	Mark
Number		
8(a) (ii)	ACCEPT answers between 13.4 and 13.6 inclusive	
	• ,	
		(1)

Question Number	Answer	Additional Guidance	Mark
8(b)	pressure increases from 0 to 3.3 during {atrial systole / ventricular diastole / from 0 to 0.14s / eq};	IGNORE units 1. ACCEPT between 3 and 3.5, to 0.12 to 0.14s	
	2. pressure increases to {14.5 / 14.4} {during ventricular systole / from 0.14s / eq};3. pressure decreases to 0 (during diastole) / eq;	2. ACCEPT calculated increase e.g. 11.2 (range 11 to 11.5), from 0.12s	
		3. ACCEPT calculated decrease e.g. 14.5 (range 14 to 14.5)	(3)

Question Number	Answer	Additional Guidance	Mark
8 (c)	(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)	QWC emphasis on clarity of expression Marking points are for comparing what is happening in L.A. and L.V. and giving reasons for these. NOT just a description of the cardiac cycle ACCEPT converse in each statement	
	 { pressure changes / maximum pressures} are smaller in the atrium than the ventricle / eq; 	1. ACCEPT higher pressure in V than A in context of pumping distance	
	the atrium has less (cardiac) muscle than the ventricle;	ACCEPT piecing together for MPs 1, 2, 3	
	 the atrium does not have to push the blood as far as the ventricle has to / eq; 		
	4. the increase in pressure happens in the atrium before the ventricle / eq;		
	 idea that atrial systole has to happen before ventricular systole in order for the ventricle to fill with blood; 	5. ACCEPT delay at AVN / eq	
	6. idea that increase in atrial pressure causes increase in {pressure / volume}} in ventricles ;		
	7. appropriate reference to effect of atrioventricular valve (AV) (on pressure);	7. E.g. when pressure in the atrium exceeds pressure in the ventricle the AV valve opens preventing further significant rise in the pressure in the atrium	
	8. credit correct comparative manipulation of figures to illustrate a marking point;	8. e.g. compare maximum pressures exerted	(5)

