

Mark Scheme (Results)

Summer 2016

Pearson Edexcel
International Advanced Level
in Biology (WBI01) Paper 01
Transport, Genes and Health

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2016

Publications Code 46641_MS*

All the material in this publication is copyright

© Pearson Education Ltd 2016

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.

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.

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	Phrase/words inside round brackets are not essential for the award of the mark. It helps the examiner to get the context of the expected answer.
Bold Text	Phrases/words in bold indicate that the <u>meaning</u> of the phrase or the actual word is essential to the answer.
[] square brackets	Words inside square brackets are instructions or guidance for examiners
[ECF]	Consecutive error / transferred error. 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. Answers must be in the correct context. 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.

Quality of Written Communication (QWC)

Questions where QWC is likely to be particularly important are indicated with an asterisk (*) in the mark scheme, but this does not preclude others.

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 should be awarded if the candidate has demonstrated the above abilities.

QWC penalties should be applied after the total number of mark points has been decided.

Emphasis on *logical sequence* – penalise if response does not follow a logical/correct sequence.

Emphasis on *spelling of technical terms* – penalise incorrect spelling of italicised technical terms once only.

Emphasis on *clarity of expression* – penalise if response is not clearly contextualised or defined.

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

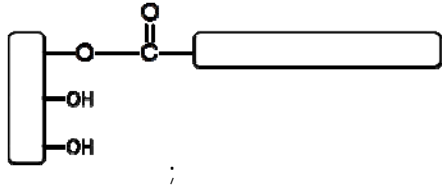
In general, an error made in an early part of a question is penalised when it occurs but not subsequently. The candidate is penalised once only and can gain credit in later parts of the question by correct reasoning from the earlier incorrect answer.

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.

Question Number	Answer	Additional Guidance	Mark
1(a)(i)	Any two from: 1. {carboxylic / carboxyl / eq} (acid) group ; 2. hydrocarbon chain ; 3. {single / one} carbon carbon double bond / monounsaturated ;	IGNORE fatty acid, -COOH IGNORE carbon chain ACCEPT description of hydrocarbon chain ACCEPT one C=C ALLOW a carbon double bond	(2)

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	Any three from: 1. idea that the greater the number of double bonds the lower the melting temperature ; 2. (because) the fatty acid chain is more { bent / less linear / eq } ; 3. (so) fatty acids do not pack closely together ; 4. weaker intermolecular forces / eq ; 5. less energy needed to separate fatty acid chain molecules / eq ;	ACCEPT converse statements ACCEPT answers in terms of saturation ACCEPT double bonds result in kinks IGNORE reference to breaking covalent bonds or carbon bonds or pi bonds	(3)

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	1.  ; 2. H ₂ O / water ;	ACCEPT fatty acid on any hydroxyl group IGNORE additional ester groups	(2)

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	esterification / condensation ;		(1)

Question Number	Answer	Additional Guidance	Mark
2(a)		IGNORE arrows on the right-hand side of heart	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	B blood low in oxygen from the heart		(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	D stop the tricuspid valve opening the wrong way		(1)

Question Number	Answer	Additional Guidance	Mark
2(c)	<p>Any three from:</p> <ol style="list-style-type: none"> 1. idea that one side (of heart) { pumps / sends / eq } blood to the lungs the other to the rest of the body ; 2. separation of oxygen rich and oxygen depleted blood / eq ; 3. idea of maintaining gas { concentration / diffusion } gradient (in the lungs / tissues) ; 4. idea that lower pressure in the pulmonary side protects delicate structures / alveoli capillary networks / eq ; 5. idea that higher pressure in systemic circuit allows { effective / rapid } { mass flow / supply of O₂ to body cells } ; 	<p>ACCEPT oxygen or carbon dioxide</p>	<p>(3)</p>

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	Any three from: 1. both polysaccharides ; 2. (made from) (α) glucose molecules ; 3. (joined by) glycosidic bonds ; 4. amylose has 1,4 (glycosidic) bonds, amylopectin has 1,4 and 1,6 (glycosidic) bonds ; 5. amylose is {coiled / eq}, amylopectin is {branched / eq} ;	IGNORE reference to both being polymers 'amylose has 1,4 glycosidic bonds whereas amylopectin has 1,4 and 1,6 glycosidic bonds' gains MP3 and MP4	(3)

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	1. (amylopectin) is branched ; 2. idea that {glucose} molecules are released quickly (from amylopectin) ;	ACCEPT has many ends / many terminal glucoses ACCEPT amylopectin is hydrolysed more quickly to glucose IGNORE reference to more easily hydrolysed / released	(2)

Question Number	Answer	Additional Guidance	Mark
3(b)	Any one from: 1. lactose is a disaccharide, starch is a polysaccharide / eq ; 2. starch is composed of glucose only, lactose is composed of glucose and galactose ; 3. starch has 1,4 and 1,6 glycosidic bonds, lactose has 1,4 glycosidic bonds only / eq ;	ACCEPT correct descriptions of a disaccharide and polysaccharide	(1)

Question Number	Answer	Additional Guidance	Mark
3(c)(i)	positive correlation ;	ACCEPT correct description of relationship	(1)

Question Number	Answer	Additional Guidance	Mark
3(c)(ii)	1. appropriate comment on the contents of milk ; 2. this can lead to {obesity / CVD / heart disease } ;	ACCEPT consuming large quantities of milk will be associated with large intake of fat / energy / sugar / lactose / cholesterol ACCEPT atherosclerosis / atheroma / diabetes	(2)

Question Number	Answer	Additional Guidance	Mark
3(c)(iii)	Any one from: 1. idea that the study only shows a correlation ; 2. idea that only {one study / in one country} ; 3. other { variables / factors } have not been identified ;	IGNORE named additional variables / factors	(1)

Question Number	Answer	Additional Guidance	Mark
4(a)(i)	A - arteries		(1)

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	B - damage to the endothelial layer of blood vessels		(1)

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	<p>Any four from:</p> <ol style="list-style-type: none"> 1. (platelets / damaged tissues) release thromboplastin ; 2. (thromboplastin) converts prothrombin to thrombin ; 3. reference to calcium ions ; 4. thrombin converts fibrinogen to fibrin ; 5. fibrin forms mesh of fibres ; 6. traps { red blood cells / platelets } to form clot ; 	ACCEPT blood cells	(4)

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	<p>Any two from:</p> <p>Warfarin / heparin / anticoagulant / Aspirin / platelet inhibitory drug / statin ; ;</p>	<p>Mark first response only if multiple responses provided on each answer line.</p> <p>ACCEPT other named anticoagulant</p> <p>e.g. Apixaban, Dabigatran, Rivaroxaban, Clopidogrel</p> <p>[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.]</p>	<p>(2)</p>

Question Number	Answer	Additional Guidance	Mark
4(c)(i)	Any two from: 1. (both) reduce (systolic) blood pressure ; 2. beetroot has a greater effect than garlic ; 3. credit manipulated data for both beetroot and garlic ;	IGNORE descriptions of pressure being higher with garlic than with beetroot e.g. beetroot reduces pressure by 0.7 (kPa) / 3.9% and garlic by 0.5 (kPa) / 2.8% or reduction from eating beetroot is 0.2 (kPa) more than from eating garlic	(2)

Question Number	Answer	Additional Guidance	Mark
4(c)(ii)	Any two from: 1. larger sample size ; 2. both genders studied ; 3. increased study time ; 4. quantify intake / eq ; 5. control of any other appropriate variable e.g. age, ethnicity ; 6. allow recovery time between treatments ;	ACCEPT include females ACCEPT use a placebo	(2)

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	genetic constitution of an organism / eq ;	e.g. all the alleles / genes ACCEPT the alleles for a particular trait / condition / gene	(1)

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	1. (all) the characteristics (of an organism) ; 2. determined by an interaction between genes and the environment ;	ACCEPT appearance / features / a trait	(2)

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	A - P and Q		(1)

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	C - 50 %		(1)

Question Number	Answer	Additional Guidance	Mark
5(b)(iii)	Any three from: 1. idea of obtaining unaffected { allele / gene / eq } ; 2. introduce the { allele / gene / eq } into the eye ; 3. description of { method / vector / eq } used to insert gene ; 4. idea that the gene produces the protein ;	e.g. liposome / plasmid / virus IGNORE idea that treatment needs to be repeated	(3)

Question Number	Answer	Additional Guidance	Mark
6(a)	<ol style="list-style-type: none"> 1. phosphate, deoxyribose, base (any order) ; 2. K identified as deoxyribose ; 	ACCEPT adenine / thymine / cytosine / guanine	(2)

Question Number	Answer	Additional Guidance	Mark
6(b)	<p>Any two from:</p> <ol style="list-style-type: none"> 1. formation of bonds between deoxyribose and phosphate ; 2. reference to DNA polymerase ; 3. idea of complementary base pairing ; 4. hydrogen bonds form between bases ; 	<p>ACCEPT formation of { phosphodiester bonds / sugar phosphate backbone }</p> <p>ACCEPT A pairs with T and G pairs with C</p>	(2)

Question Number	Answer	Additional Guidance	Mark
6(c) (i)	<p>Any two from:</p> <ol style="list-style-type: none"> 1. RNA contains ribose, DNA contains deoxyribose ; 2. RNA is single-stranded, DNA is double-stranded ; 3. RNA contains uracil, DNA contains thymine ; 	<p>ACCEPT RNA is one strand, DNA is two strands</p> <p>IGNORE double helix</p>	(2)

Question Number	Answer	Additional Guidance	Mark
*6(c)(ii)	<p>(QWC – Take into account quality of written communication when awarding the following points)</p> <ol style="list-style-type: none"> 1. idea that mRNA produced by transcription ; 2. idea that mRNA {leaves the nucleus / enters the cytoplasm} ; 3. mRNA carries the genetic code for a protein / eq ; 4. idea that mRNA associates with ribosomes ; 5. idea of specificity of tRNA for a particular amino acid / eq ; 6. idea that tRNA molecules carry amino acids to the {ribosome / mRNA} ; 7. correct reference to translation ; 	<p>QWC emphasis is logical sequence</p>	<p>(5)</p>

Question Number	Answer	Additional Guidance	Mark
7(a)	<p>Any three from:</p> <ol style="list-style-type: none"> 1. part of the phospholipid { is hydrophobic / avoids water / is non-polar } ; 2. part of phospholipid { is hydrophilic / associates with water / is polar } ; 3. forming a bilayer ; 4. with hydrophobic part on the inside and hydrophilic part on the outside (of the bilayer) / eq ; 	IGNORE reference to orientation relative to water	(3)

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	A - endocytosis, which is an active process		(1)

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	B - allows the movement of some substances into the cell		(1)

Question Number	Answer	Additional Guidance	Mark
7(c)(i)	1. facilitated diffusion ; 2. down a concentration gradient / eq ;	ACCEPT a description of facilitated diffusion e.g. diffusion through a {carrier protein / channel protein / membrane protein / transporter protein}	(2)

Question Number	Answer	Additional Guidance	Mark
7(c)(ii)	1. the concentration of glucose (in the cell) decreases ; 2. resulting in steeper concentration gradient / eq ;		(2)

Question Number	Answer	Additional Guidance	Mark
7(d)	1. mutation changes the primary structure of the (CFTR) protein ; 2. reference to { incomplete / incorrectly folded / missing} (CFTR) protein ; 3. idea that chloride ions will not move out of the cell ; 4. water does not move out of the cell ; 5. (water moves) by osmosis ;	IGNORE change in sequence of bases ACCEPT non-functional / faulty protein ACCEPT water moves into the cells or water leaves the mucus	(4)

Question Number	Answer	Additional Guidance	Mark
8(a)	1. - 0.5 ; 2. mg per 100 cm ³ per minute / eq ;	ACCEPT 0.5 / ½ / -½	(2)

Question Number	Answer	Additional Guidance	Mark										
8(b)	Any two from 1. initial rate of hydrolysis increases with concentration of pepsin ; 2. increase in the initial rate is directly proportional to the concentration of pepsin ; 3. credit comparison of any two calculated initial rates ;	ACCEPT converse e.g. <table border="1" data-bbox="1435 694 1839 912"> <thead> <tr> <th>Units pepsin</th> <th>Initial rate</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.0625</td> </tr> <tr> <td>2</td> <td>0.125</td> </tr> <tr> <td>4</td> <td>0.25</td> </tr> <tr> <td>8</td> <td>0.5</td> </tr> </tbody> </table>	Units pepsin	Initial rate	1	0.0625	2	0.125	4	0.25	8	0.5	(2)
Units pepsin	Initial rate												
1	0.0625												
2	0.125												
4	0.25												
8	0.5												

Question Number	Answer	Additional Guidance	Mark
8(c)	1. (increased concentration of pepsin) increases the number of active sites ; 2. idea that more enzyme substrate complexes formed / more occupied active sites ; 3. (more enzyme substrate complexes formed) per unit time / eq ;	ACCEPT more successful collisions between enzyme and substrate 'More frequent successful collisions' gains MP2 and MP3	(3)

Question Number	Answer	Additional Guidance	Mark
*8(d)	<p>(QWC – Take into account quality of written communication when awarding the following points)</p> <ol style="list-style-type: none"> 1. primary structure is the sequence of <i>amino acids</i> ; 2. idea that the primary structure determines the { positioning / type } of the { bonds / folding / eq } ; 3. any <u>two</u> correctly named { bonds / interactions } ; 4. idea of { <i>polar / hydrophilic</i> } R groups on the outside of enzymes / { <i>non polar / hydrophobic</i> } R groups on the inside ; 5. (pepsin is) <i>globular / soluble / eq</i> ; 6. determines the { shape / structure } of the <i>active site / eq</i> ; 7. determines that the enzyme (pepsin) is <i>specific</i> ; 	<p>QWC emphasis on spelling</p> <p>[must be a clear statement and not just implied for MP1]</p> <p>e.g. <i>disulfide</i> bond, <i>hydrogen, ionic</i> bonds, <i>hydrophobic</i> interactions (between R groups) ACCEPT <i>disulphide</i></p> <p>e.g. allowing interaction of the active site with its <i>substrate / formation of an enzyme substrate complex</i> ;</p>	<p>(5)</p>

