Pearson

Mark Scheme (Results)

Summer 2017

Pearson Edexcel GCE
In Biology Spec A (8BN0) Paper 02
Development, Plants and the Environment

edexcel

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the world's leading learning company. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information, please visit our website at www.edexcel.com.

Our website subject pages hold useful resources, support material and live feeds from our subject advisors giving you access to a portal of information. If you have any subject specific questions about this specification that require the help of a subject specialist, you may find our Ask The Expert email service helpful.

www.edexcel.com/contactus

Pearson: helping people progress, everywhere

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 2017
Publications Code 8BN0_02_1706_MS
All the material in this publication is copyright
© Pearson Education Ltd 2017

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)(i)	Beta-glucose	Allow b glucose / β glucose	(1)

Question Number	Answer	Mark
1(a)(ii)	**1(a)(ii). The only correct answer is B – by glycosidic bonds in an unbranched chain** ***A*** *is not correct because a cellulose molecule is not branched* ***C*** *is not correct because a cellulose molecule is not branched* ***D*** *is not correct because the monomers in a cellulose molecule are not held together by hydrogen bonds*	(1)

Question Number	Answer	Mark
1(a)(iii)	**1(a)(iii). The only correct answer is C – middle lamella** ***A*** *is not correct because there is no calcium pectate in the amyloplast* ***B*** *is not correct because there is no calcium pectate in the chloroplast* ***D*** *is not correct because there is no calcium pectate in the tonoplast*	(1)

Question Number	Answer	Mark
1(b)(i)	**1(b)(i). The only correct answer is D - strength and waterproofing** ***A*** *is not correct because lignin is not permeable to water* ***B*** *is not correct because lignin does not provide flexibility* ***C*** *is not correct because lignin is not permeable to water*	(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	An answer that makes reference to the following: • xylem / sclerenchyma **(1)**	DO NOT ALLOW mark if phloem is mentioned. IGNORE vessels etc	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(c)	An explanation that makes reference to three the following: • contains glucose needed for {respiration/energy} **(1)** • insoluble so { has no osmotic effect / remains in the cell } **(1)** • amylose is coiled making starch compact (so more can be stored) **(1)** • amylopectin {is branched/contains 1-6 glycosidic bonds} so is rapidly hydrolysed **(1)**	ALLOW description of osmotic effect eg. water moving into cell ALLOW broken down	**(3)**

Question Number	Answer	Mark
2(a)(i)	**2(a)(i). The only correct answer is C - polygenic** ***A*** *is not correct because epigenetic does not refer to characteristics determined by more than one gene* ***B*** *is not correct because monogenic would only involve one gene* ***D*** *is not correct because sex-linked refers to inheritance of genes on the sex chromosomes*	**(1)**

Question Number	Answer	Mark
2(a)(ii)	**2(a)(ii). The only correct answer is B – diet** ***A*** *is not correct because age is not an environmental factor* ***B*** *is not correct because gender is not an environmental factor* ***D*** *is not correct because height is not an environmental factor*	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(b)	An explanation that makes reference to three the following: • males are more likely (to have lupus) **(1)** • (because) females have two X chromosomes and males only one **(1)** • therefore males would only inherit one copy of the gene **(1)** • males only need one recessive allele to have lupus **(1)**	ALLOW converse statements ALLOW males more likely to develop sex linked recessive condition ALLOW females XX and males XY	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	An answer that makes reference to the following: • it is found {in one location / only in Scotland} **(1)**	DO NOT ALLOW habitat	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	An explanation that makes reference to the following: • increases (genetic diversity)/increases size of gene pool **(1)** • because of introduction of {new/different} alleles (into the population) **(1)**	ALLOW increase variety of alleles ALLOW maintain genetic diversity	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)	An explanation that makes reference to the following: • (compare) sequences of {bases in DNA /amino acids in proteins} **(1)** • the more similarities in common the more closely-related the subspecies **(1)**	ALLOW nucleotides for bases ALLOW more recently evolved from a common ancestor ALLOW converse statements	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(c)	A description that makes reference to the following: • (relocating) isolates Scottish wildcats from domestic cats **(1)** • use of {studbooks/selection of mates} **(1)** • increase the number (of Scottish wildcats) **(1)** • prepared for reintroduction (to native habitat) **(1)**	ALLOW moves away instead of isolates ALLOW hacking out	**(4)**

Question Number	Answer	Additional Guidance	Mark
4 (a)	An answer that makes reference to four of the following: • (eukaryotic organisms) have membrane-bound organelles **(1)** • (eukaryotic organisms contain) a named membrane- bound organelle **(1)** • size of ribosomes larger than in prokaryotes **(1)** • (eukaryotic organisms contain) DNA that is {linear / associated with (histone) proteins} **(1)** • (eukaryotic organisms) do not contain plasmids (in cytoplasm) **(1)**	ALLOW converse throughout ALLOW nucleus, mitochondria, Golgi, RER, SER, vesicles. ALLOW 80S instead of 70S ribosomes ALLOW DNA not circular ALLOW absence of mesosomes/pili	**(4)**

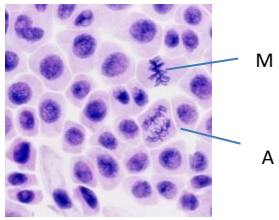
Question Number	Answer	Mark
4(b)(i)	**1(a)(iii). The only correct answer is B - 6.7 µm** ***A*** *is not correct because did not use calculation 20 000 µm ÷ 3000* ***C*** *is not correct because did not use calculation 20 000 µm ÷ 3000* ***D*** *is not correct because did not use calculation 20 000 µm ÷ 3000*	**(1)**

Question Number	Answer	Additional Guidance	Mark
4 (b)(ii)	• correct value for p and q • correct proportion of heterozygotes (2pq) • correct number of heterozygotes	Example of calculation ALLOW 0.2 and 0.8 either way round 2pq = 2 x (0.8 x 0.2) = 0.32 number of heterozygotes = 2pq x 600 = 192 Correct answer with no working scores full marks	**(3)**

Question Number	Answer		
***4(b)(iii)**	Answers will be credited according to candidate's knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. • sickle cell anaemia is more frequent in those areas where malaria is also found (as shown on the maps) • highest proportions of populations with allele for sickle cell anaemia are in areas where there is malaria • the Yoruba people live in an area where *P.falciparum* is found • malaria can be fatal and acts as a selection pressure • individuals heterozygous for sickle cell anaemia more likely to survive malaria • these individuals pass on alleles for sickle cell anaemia to their offspring • over time the number of individuals in the population with alleles for sickle cell anaemia has increased		
Level	**Marks**	**Descriptor**	**Additional guidance**
0		No awardable content	
1	1-2	An explanation may be attempted but with limited interpretation or analysis of the scientific information with a focus on mainly just **one** piece of scientific information. The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context.	eg. 9-12% Yoruba have sickle cell allele / Malaria and Sickle cell anaemia are found in the same place OR Heterozygotes resistant to malaria
2	3-4	An explanation will be given with occasional evidence of analysis,	Two from level 1

		interpretation and/or evaluation of **more than one** piece of scientific information. The explanation shows some linkages and lines of scientific reasoning with some structure.	Malaria is a selection pressure
3	5-6	An explanation is made which is supported throughout by sustained application of relevant evidence of analysis, interpretation and/or evaluation of **all pieces** of scientific information. The explanation shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.	Individuals with sickle cell allele survive malaria and pass on allele to offspring. Over time frequency of sickle cell allele increases in Yoruba population

Total for Question 4 = 14 MARKS

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	• cell correctly labelled M **(1)** • cell correctly labelled A **(1)**		**(2)**

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	• correct number of cells undergoing mitosis and correct total number of cells calculated • correct answer	<u>Example of calculation</u> 67 and 529 Correct % calculated = 12.665(%) / 12.67(%) / 12.7(%) Correct answer with no working gains full marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	A description that makes reference to the following: • negative correlation between Agil concentration and {number of cells undergoing mitosis / mitotic index} **(1)** • no significant difference between 1.0 and 1.5 ppm Agil **(1)**	ALLOW description ALLOW overlap between Agil concentrations of 1.0 and 1.5 ppm	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	An answer that makes reference to the following: • controlled concentration of Agil **(1)** • one other variable controlled **(1)** • roots exposed (to Agil) for a range of time intervals **(1)** • details of root tip squash procedure **(1)** • an appropriate named stain **(1)** • counting number of cells undergoing mitosis (to calculate mitotic index) **(1)**	e.g. temperature / onions of same type – age, source ALLOW root tips e.g. correct use of hydrochloric acid or maceration procedure e.g. toluidine blue / (acetic) orcein / Schiff's /methylene blue	**(6)**

Question Number	Answer	Additional Guidance	Mark
5(c)	An explanation that makes reference to two of the following: • (sister) chromatids cannot be separated / centromere cannot be split **(1)** • mitosis stops at metaphase / anaphase cannot occur / chromosomes remain at equator **(1)** • (daughter) cells produced with incorrect numbers of chromosomes **(1)**		**(2)**

Total for Question 5 = 14 MARKS

Question Number	Answer	Additional Guidance	Mark
6(a)	An answer that makes reference to the following: • more plants can be grown **(1)** • {plants / plant fibres} are a renewable resource /resource available to future generations **(1)**	ALLOW plants can be regrown	**(2)**

Question Number	Answer	Mark
6(b)(i)	**6(b)(i). The only correct answer is C – temperature and humidity** ***A*** *is not correct because light intensity would not affect tensile strength when testing fibres* ***B*** *is not correct because light intensity would not affect tensile strength when testing fibres* ***D*** *is not correct because pH would not affect tensile strength when testing fibres*	**(1)**

Question Number	Answer	Additional Guidance	Mark
6 (b)(ii)	A description that makes reference to the following: • tensile strength calculated as a factor of force divided by cross sectional area of fibre **(1)** And any two of the following: • addition of {force / weight / mass} to a fibre **(1)** • measurement of {force / weight /mass} required to break fibre **(1)** • calculation of cross-sectional area **(1)**	ALLOW last before breaking or the value at which the fibre breaks.	**(3)**

Question Number	Answer	Additional Guidance	Mark
6(c)	An answer that makes reference to the following: • (positive) correlation between cell wall thickness and tensile strength **(1)** • due to presence of lignin **(1)** • no correlation between lumen diameter and tensile strength **(1)** • curaua fibres strongest as they had the thickest cell walls **(1)**	ALLOW lumen diameter has {little / no effect} on tensile strength ALLOW converse statements, e.g. jute has thinnest cell wall and is the weakest fibre	**(1)**

Total for Question 6 = 10 MARK

Question Number	Answer	Additional Guidance	Mark
7(a)(i)	A description that makes reference to the following: • tissue contains one type of cell **(1)** • a system contains (many) {different tissues /organs} **(1)**	ALLOW similar cells	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(a)(ii)	A description that makes reference to the following: • different stimuli activate different genes **(1)** • genes activated are transcribed / mRNA produced from active genes **(1)** • mRNA translated to produce proteins **(1)** • proteins determine {structure / function} of cells **(1)** • different {genes activated / proteins produced} result in different types of cell being produced **(1)**	ALLOW switch on	**(4)**

Question Number	Answer	Additional Guidance	Mark
7(b)	• correct figures from the graph • correct answer	<u>Example of calculation</u> 0.001 and 0.0004 0.0006 ÷ 16 = 0.0000375 / $3.75*10^{-5}$ (% y^{-1}) IGNORE minus sign in answer Correct answer with no working gains full marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(c)	An answer that makes reference to the following: • time will increase (with age) **(1)** • due to fewer (mesenchymal) stem cells (in bone marrow) with age **(1)** • (fewer mesenchymal stem cells) to replace cells in {bone / muscle / cartilage} tissues **(1)**		**(3)**

Total for Question 7 = 11 MARKS

Question Number	Answer	Additional Guidance	Mark
8(a)	An answer that makes reference to three of the following: • Albuterol has the greatest FEV improvement **(1)** • little difference between no treatment and placebo on FEV **(1)** • placebo effect demonstrated by greater subjective improvement compared to no treatment **(1)**		**(3)**

Question Number	Answer	Additional Guidance	Mark
8(b)(i)	An explanation that makes reference to two of the following: • check for side effects **(1)** • different doses to determine safe dose **(1)** • placebo to make sure that any side effects described were due to the drug **(1)**		**(2)**

Question Number	Answer	Mark
8(b)(ii)	**8(b)(ii). The only correct answer is B – 15:1** ***A*** *is not correct because incorrect ratio because 90 volunteers were given the drug and 6 became ill* ***C*** *is not correct because incorrect ratio because 90 volunteers were given the drug and 6 became ill* ***D*** *is not correct because incorrect ratio because 90 volunteers were given the drug and 6 became ill*	**(1)**

Question Number	Answer	Additional Guidance	Mark
8(b)(iii)	An explanation that makes reference to the following: • both trials used different doses (to determine safe dose) **(1)** • William Withering did not use healthy volunteers and this drug trial did **(1)** • William Withering did not use a placebo while this trial did **(1)**	ALLOW different concentrations	**(3)**

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom