OCR GCSE 21ST CENTURY BIOLOGY B · J257

BIOLOGY



MARK SCHEME

B1.1 WHAT IS A GENOME AND WHAT DOES IT DO? (FOUNDATION)

SCORE	PERCENTAGE
/61	%

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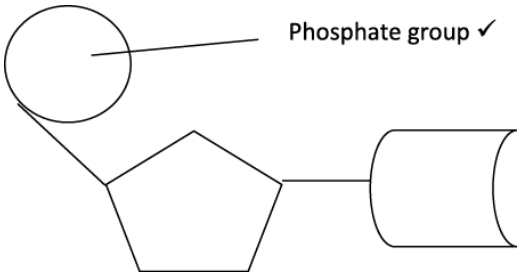
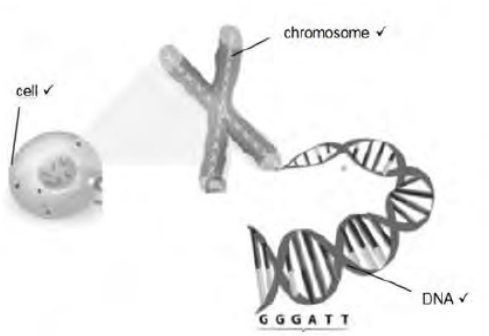
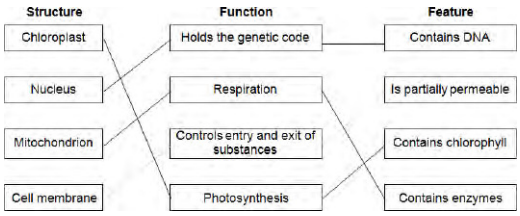
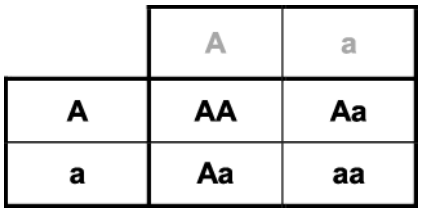
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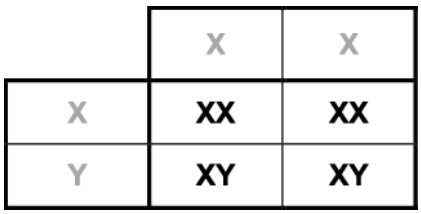
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Question			Answer/Indicative content	Marks	Guidance
1	a	i		1	
		ii	GAATCTAG ✓	1	Label is given next to any structure
	b			3	If more than one label is given next to any structure, do not award the mark even if the correct label is also given
			Total	**5**	
2	a			3	Mark each structure separately Both lines need to be correct for 1 mark
	b		**1.** Same DNA / genes (1) **2.** Resulting from a single fertilised egg / zygote that splits into two (1) **3.** Idea of environmental differences (1) **4.** One example of an environmental difference (1)	4	MP4 e.g. scar, piercings, dyed hair, different clothes
			Total	**7**	
3	a			2	One mark for correct gametes for second parent One mark for correct completion of Punnett square **ALLOW** aA for Aa

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Question			Answer/Indicative content	Marks	Guidance
	b		Punnett square correct ✓  Probability is 50% / 0.5 / ½ ✓	2	ALLOW YX for XY
	c		Homozygous - having the same allele on both chromosomes of a pair e.g. AA or aa Heterozygous - when the alleles on a pair of chromosomes are different e.g. Aa	2	DO NOT ALLOW 'have same gene on both chromosomes' DO NOT ALLOW 'have different genes on both chromosomes'
			Total	6	

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Question			Answer/Indicative content	Marks	Guidance
4			**[Level 3]** Answer explains why the twins look very similar AND explains why they look different. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Answer gives an explanation for difference OR similarity with an example. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Answer gives examples of possible differences OR gives examples of possible similarities. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	• they have identical alleles / genotype / genetic information / DNA / chromosomes • they are clones • zygote / fertilised egg / sperm **and** egg *Why they look similar:* *examples* of similarities in appearance (eye colour, nose shape, hair colour and style) *explanation* genes/chromosomes **accept** same DNA/alleles *Why they will not always look exactly the same:* *examples* of possible differences in appearance that could arise physical damage, weight, hairstyle, clothes, tattoos *explanation* • idea that differences are only due to environment/lifestyle • high level idea that any genetic differences must be due to changes/mutations in body cells (not in original gametes) **Use the L1, L2, L3 annotations in Scoris;** **do not use ticks.** **Examiner's Comments** This was the first of the six-mark extended writing questions. It is pleasing to see that the candidates are now confident in tackling these questions and that many

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Question			Answer/Indicative content	Marks	Guidance
					have developed good strategies to ensure that all parts of the question are answered. Candidates were asked to explain why identical twins look similar, but will not always look exactly the same. The majority of candidates scored between 1 and 4 marks on this question, with a large proportion scoring at Level 2. Candidates were able to correctly identify similarities and differences, though similarities were discussed less frequently. Candidates were able to express well that the differences were observed due to the environment and gave a good range of examples. Candidates struggled to explain why the twins looked similar. Many referred to the twins having the same genes rather than the same alleles and unfortunately were therefore unable to score. Centres are asked to ensure that when discussing similarities that the distinction is made between genes and alleles. Some candidates were confused and thought that the twins would have different genes/alleles and discussed the inheritance of dominant and recessive alleles from the parents. Candidates did seem aware that something 'split' and frequently made reference to the egg splitting, fertilised egg or embryo splitting was rarely mentioned. Genetic variation was not well understood by most candidates.
			Total	6	

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Question			Answer/Indicative content	Marks	Guidance
5			instructions ; chromosomes ; alleles	2	**ignore** any line in which more than one word is circled three correct lines = 2 marks two correct lines = 1 mark one correct line = 0 marks **Examiner's Comments** In this question candidates were required to the select the correct word to complete three sentences to explain how genes function. The majority of students scored one mark for this question. The most common error being in the first sentence where many candidates thought that genes were **cells** that describe how to make proteins.
			Total	2	

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Question			Answer/Indicative content	Marks	Guidance
6			**Level 3 (5–6 marks)** Refers to genetic and environmental factors, clearly links the factors to explanation of similarities and differences. Correct technical terms. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Refers to both genetic and environmental factors, probably using some technical terms. Less technical terms, ie more description. Incomplete with only some explanation. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Brief vague account, possibly only accounting for either similarities or differences, or give only genetic or only environmental responses. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to E.** **Relevant points include:** **general** environmental factors mentioned genetic factors mentioned **specific** examples of environmental variation given eg food eaten examples of genetic variation given eg skin, hair and eye colour some variation is a combination of both with examples such as weight multiple genes can work together to produce different characteristics characteristics are determined by a combination of maternal and paternal genes genes can be inherited in different combinations **ignore** primary sexual characteristics **Use the L1, L2, L3 annotations in SCORIS; do not use ticks.** **Examiner's Comments** Saw most candidates score some marks. Level 1 responses were often limited to references to genetic factors, and a number of candidates limited their marks by making clear their misconception that alleles are not genes. Many responses might have been much improved by giving examples such as genetic variation leading to variation in hair or eye colour.
			Total	**6**	

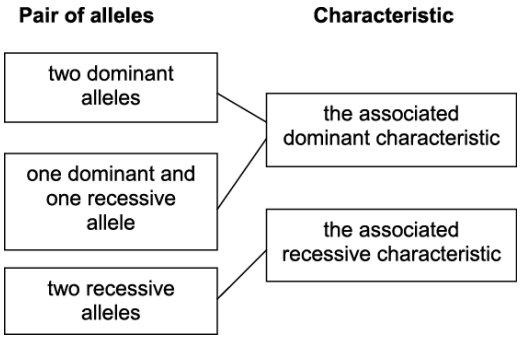
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Question			Answer/Indicative content	Marks	Guidance
7			**Level 3 (5–6 marks)** Good description of the structure of DNA **AND** describes the job of the DNA in the cell. Quality of written communication does not impede communication of the science at this level **Level 2 (3–4 marks)** Good description of the structure of DNA **AND** job Quality of written communication partly impedes communication of the science at this level **Level 1 (1–2 marks)** Basic description of the structure of DNA OR job Quality of written communication impedes communication of the science at this level **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit	6	**This question is targeted at grades up to C** **Indicative scientific points may include** **Job in the cell** • contains / holds the genetic code / genes • involved in / has instructions for the synthesis of proteins / enzymes / amino acids **ignore** DNA **makes / synthesises** protein • able to replicate (to produce new chromosomes) • stores information **DNA structure** • **double** helix (or description) • consists of 2 strands • has (4) bases • (bases are) A,T, C, G • A pairs with T **OR** C pairs with G **NB** Base A pairs with T and C pairs with G covers the third, fourth AND fifth bullets. Examiner's Comments This was a 6 mark, level of response question on the structure and the function of DNA. Most candidates gained some credit for aspects of structure – double helix, bases ATCG and the fact that they pair. The better answers referred to DNA as a store of information, genetic coding for proteins and being able to replicate.
			Total	6	

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Question			Answer/Indicative content	Marks	Guidance
8				2	one mark for two recessive correctly linked to characteristic one mark for **both** two dominant and one dominant correctly linked to characteristic credit if line is crossed out and no obvious replacement drawn **Examiner's Comments** This question tested candidates' ability to link the pair of alleles with the characteristic that would result from the combination. The majority of candidates correctly identified that two recessive alleles would result in the recessive characteristic and two dominant alleles would result in the dominant characteristic. However, relatively few candidates indicated that one dominant allele and one recessive allele would result in the dominant characteristic.
			Total	**2**	

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Question			Answer/Indicative content	Marks	Guidance
9			**[Level 3]** Answer describes the role of genes AND the environment in determining our characteristics AND gives examples of characteristics determined by each. Answer also describes that some characteristics are controlled by both genes and the environment. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Answer describes the role of genes AND the environment in determining our characteristics AND gives at least one examples of characteristics determined by one of these. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Answer describes the role of genes OR the environment in determining our characteristics. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	• some characteristics are determined by genes / chromosomes / DNA / alleles • inherited from our parents • examples include blood group, dimples, eye colour, gender **environment:** This question is targeted at grades up to E • our environment Indicative scientific points may include: • examples include scars, tattoos **genetic:** **both:** • some characteristics are determined by both • examples include height, weight, hair colour ignore general references to ‘looks’ and ‘behaviour’ as examples (as given in stem of question) **Examiner's Comments** This was the first six-mark extended-writing question. A large range of responses at all levels were observed with many candidates achieving Level 2 and Level 3. Candidates provided good, detailed descriptions and examples of both genetic and environmental influences. Unfortunately some candidates did not discuss both elements and in these cases the mark was limited. Fewer candidates identified characteristics that would be influenced by both genes and the environment, which again limited their mark. A common error made by candidates was in the selection of a characteristic determined solely by the environment, many candidates incorrectly identified

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Question			Answer/Indicative content	Marks	Guidance
					height and weight. Examiners were pleased to see full and very good answers to this question.
			Total	6	

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Question			Answer/Indicative content	Marks	Guidance
10	a		T, A, A, C, G, T	2	6 correct responses = 2 marks 5 or 4 correct responses = 1 mark 3 or less correct responses = 0 marks Examiner's Comments This question was worth 2 marks and candidates tended to score either 2 or 0 marks. Where candidates scored 0 marks it was evident that they had attempted the question but had copied the original strand information onto the new strand.
	b	i	36% (1) C pairs with G / if G is 36%, C must be the same (1)	2	**allow** bonds / joins / goes together / matches **ecf** eg C pairs with T or A then C = 14% because 36 × 2 = 72, 100–72 = 28, 28/2 = 14% Examiner's Comments Some candidates who had understood question 3a knew that the percentage of C bases was 36% as C pairs with G, however many thought that the percentage of type C bases was 64% as the total percentage would be 100%.
		ii	different genes code for / make different proteins / this (second) gene codes for a different protein / AW **(2)**	2	**allow** genes code for / make proteins = 1 mark Examiner's Comments This was not a particularly well answered question.
	c		nucleus **and** cytoplasm (1)	1	two correct responses in correct order = 1 mark Examiner's Comments This question required candidates to complete the sentences by choosing words from the list. Most candidates were able to correctly use the word “nucleus” but only half were able to correctly identify both words.

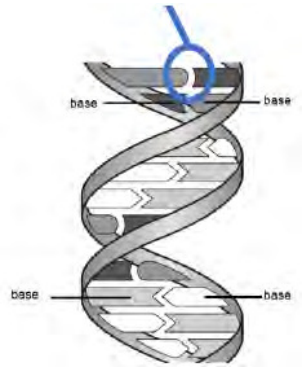
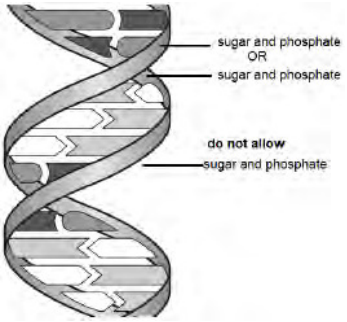
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Question			Answer/Indicative content	Marks	Guidance
			Total	7	
11			<table><tr><td>dimples</td><td>scars</td><td>weight</td></tr><tr><td>eye colour</td><td></td><td></td></tr></table>	2	4 correct = 2 marks 3 correct = 1 mark if a feature is placed in more than one column, does not score Examiner's Comments In this question candidates were asked to complete the table by writing each characteristic in the correct column. Many candidates were able to assign 3 characteristics correctly and it was encouraging to see that over half could assign all 4 correctly.
			Total	2	

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Question			Answer/Indicative content	Marks	Guidance
12		i	base correctly labelled ✓	1 (AO 1.1)	label lines must clearly touch the relevant part of the molecule only one of the four types of base need to be labelled ALLOW A, T, C or G for the base DO NOT ALLOW 
		ii	sugar and phosphates correctly labelled ✓	1 (AO 1.1)	label lines must clearly touch the relevant part of the molecule  <u>Examiner's Comments</u> On this AO1 question, base was better recognised than the sugar phosphate backbone. Candidates should be encouraged to label using straight lines rather than arrows and take care that their lines touch the diagram. They should also be advised that unless instructed otherwise, only a single line is necessary to identify a feature and that circling large parts of a diagram should be avoided.
			Total	2	

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Question			Answer/Indicative content	Marks	Guidance
13			(nitrate ions are the plant's only source of) nitrogen ✓ to make amino acids/proteins/nitrogenous compounds ✓	2 (AO 1.1 × 2)	ALLOW examples e.g. enzymes / DNA Examiner's Comments Very few candidates showed understanding that nitrate ions are the plant's source of nitrogen, or that this is necessary for making amino acids and therefore proteins.
			Total	2	
14			23% of the sample will be base T ✓ 27% of the sample will be base C ✓	2 (AO 1.2)	Examiner's Comments Two thirds of candidates obtained one or more marks on this AO1 question. Although many could identify that 23% of the sample would be base T, far fewer were able to use this information to correctly calculate the percentage of C.
			Total	2	

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