OCR GCSE 21ST CENTURY BIOLOGY B · J257

BIOLOGY



MARK SCHEME

B4.3 HOW DO ORGANISMS GROW AND DEVELOP? (HIGHER)

SCORE	PERCENTAGE
/41	%

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Question			Answer/Indicative content	Marks	Guidance
1	a	i	Cornea – responsible for bending the light ✓ Light rays will no longer meet on the retina so sight will be poor ✓	2	ALLOW reference to blindness
		ii	An unspecialised cell which can become any cell type ✓	1 1	
		iii	Any one fromEmbryos killed in the process ✓Embryos could be a life ✓	2	
	b		FIRST CHECK THE ANSWER ON THEANSWER LINE IFanswer = 27.42 award 2 marks		
			(141 ÷ 360) × 70 ✓ 27.42 (minutes) ✓		
			Total	6	
2	a		Cell division X: meiosis Cell division Y: mitosis	2	DO NOT ALLOW ambiguous spelling e.g. meiotis
	b		Some genes are switched off ✓ Some genes are switched on ✓ These makes proteins ✓ For specific cell types ✓	6 4	This question is targeted at grades up to AIndicative stages in the frogs life cycle:
			Total	6	
3			Level 3 (5-6 marks)Correct identification of the two stageswhere cell division occurs, ANDcomparison of the t		
			Level 2 (3-4 marks) Correct identification of the two stages where cell division occurs AND identifies characteristics of the two types of cell division Quality of written communication partly impedes communication of the science at this level		
			Level 1 (1-2marks)		• Stage A – meiosis • Stage C – mitosis If Stage B is identified as meiosis or mitosis, alongside A or C, then do not credit A or C (as appropriate). Comparison of two forms of cell division: Similarities

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Question	Answer/Indicative content	Marks	Guidance
	Correct identification of the stages where cell division occurs. 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		• idea that **both** require DNA replication • idea that **both** require doubling / copying / duplication of chromosomes • cells in **both** will require a growth phase • during growth phase, more organelles will be produced **Differences** *Mitosis* *Meiosis* One division Two divisions DNA as adult cells Idea of 2 daughter cells Idea of 4 daughter cells Idea that daughter cells are genetically identical Idea that daughter cells non - identical somatic/body cells produces gametes ignore mention of location of mitosis and meiosis take place Idea that daughter choromosomes as adult / same amount Idea that daughter choromosomes as half of DNA as adult cells are diploid/2n/ cells are haploid/2n/ **Examiner's Comments** Over one third of candidates scored zero marks in this question, suggesting a lack of knowledge of meiosis and mitosis, and/or a lack of knowledge of where they take place and what their purpose is within a living organism. Having to apply their knowledge to a non-human context may also have caused them difficulty.

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Question			Answer/Indicative content	Marks	Guidance
					been problematic. Of those who scored, responses were very variable with marks spread relatively evenly across the range. A large proportion of candidates identified B (rather than C) as a process of cell division, usually alongside A. Some candidates forgot to name the stages. Some candidates mixed meiosis with mitosis, e.g. stating that mitosis makes gametes, or showed other signs of confusion, e.g. sperm cells dividing before fertilisation. Explicit comparisons were quite rare, being recognised in about 25% of responses, although primarily focused on differences rather than similarities. Most candidates described aspects of each process without explicit comparison (usually talking about chromosome number, genetically identical/different, number of divisions, and number of cells produced), and in some cases they also forgot to name the types of cell division. Many candidates appeared not to understand the difference between fertilisation and meiosis, with many describing fertilisation as meiosis. A fairly common error was also to describe meiosis as happening in the gametes, rather than producing them. Candidates should try to ensure that they spell meiosis and mitosis sufficiently well that an Examiner can distinguish between them.
			Total	6	

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Question			Answer/Indicative content	Marks	Guidance
4	a		idea that colour / flower will be the same / ORA for seeds; ref. to clone / genetically identical; ORA taking a cutting is a faster process / seeds would take longer to grow into a plant;	3	**Ignore** cost Examiner's Comments ??The majority of higher level candidates obtained one or two marks for this item. The item overlapped with an item on the foundation paper. Most correctly stated that the cuttings were clones or genetically identical copies of the parent/stock plant and referred to the colour of the flowers produced by the products i.e. purple. The speed of the process was generally not considered by many of the candidates. A common error appeared when candidates stated that the cuttings were clones but then repeated this feature by noting that the products generated by seeds were, effectively, not clones. This type of response could not obtain two marks for this feature. Some candidates erroneously introduced the idea of cost and said that taking cuttings is cheaper.
	b		meristem	1	**do not accept** stem cell **Ignore** cambium Examiner's Comments A surprising number of candidates did not know the term meristem. Stem cell was frequently given as an answer. Some candidates misread the question as needing to provide a **type** of cell **division** so answered **mitosis**. Cambium was another incorrect answer.

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Question			Answer/Indicative content	Marks	Guidance
	c		*Tissue* – phloem / xylem / palisade / spongy mesophyll / epidermis / cambium / meristem; *Organ* – flower / root / leaf / stem / fruit / petal / sepal / stamen / ovary;	2	Accept higher level answers e.g. parenchyma Examiner's Comments ??The majority of candidates were able to identify the organ, such as stem, flower, leave or root, but struggled to name a type of tissue. Those that did usually chose xylem or phloem. As a result, some candidates responded by writing the names of two different organs and incorrectly used the tissue line to include one of the organ names. Examples of a tissue was not answered well with many poorer candidates listing incorrectly leaf, chlorophyll, cytoplasm, stem as examples of tissues.
			Total	6	

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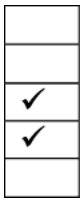
Question			Answer/Indicative content	Marks	Guidance
5	a		Meiosis	1	Examiner's Comments Again, the majority of candidates were successful with this item. Relatively few named the cell division as mitosis instead of the correct response of meiosis with many hybrid spellings. Weaker candidates guessed fertilisation, sexual reproduction and other terms associated with reproduction.
	b		<table><tr><th></th><th>Horse</th><th>Donkey</th></tr><tr><td>Sperm cell</td><td>32</td><td>31</td></tr></table>	1	NEED BOTH Examiner's Comments The majority of candidates coped well with this item and correctly identified the number of chromosomes for each of the two sets of gametes as 32 for sperm from the horse and 31 for sperm from the donkey, showing understanding that the chromosome number was halved in each case. A common mistake was to double the number instead. Poorer responses seen were, XX and XY /31 and 32.
			Total	2	

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Question			Answer/Indicative content	Marks	Guidance
6	a	i	A meiosis B mitosis C mitosis	1	all correct responses needed for 1 mark reject meitosis / miosis Examiner's Comments Mixed responses were demonstrated for this question. Some candidates obtain the mark but many were challenged by the sequence of cell division. Others referred to fertilisation and other incorrect interpretations of the model. The terms meiosis and mitosis were often spelled incorrectly in answers to this question.
		ii	any three from zygote contains chromosomes / gene / DNA / alleles from both parents ; zygote is split in 2 / undergoes mitosis (to give 2 embryos / piglets) ; piglets have identical / same DNA / genes / alleles / are clones / same genotype ; embryos / piglets have different DNA / genes / chromosomes / alleles from parents	3	accept ~~correct references to the letters /~~ stages in the diagram accept piglets / embryos come from the same zygote ignore similar genes answers with correct descriptions of meiosis / mitosis but without reference to the diagram / scenario = 2 marks Examiner's Comments It was encouraging to note the good understanding of combined genetic material at the stage of fertilisation, involving gametes from the two parents. Some responses referred to identical features without involving a reference to genetic material (either DNA, chromosomes, genes etc.).

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Question			Answer/Indicative content	Marks	Guidance
	b	i		2	**accept** any clear response eg. crosses (without ticks), shaded boxes three ticks = 1 mark max. four or more ticks = 0 marks **Examiner's Comments** Most candidates gave the correct response for this question.
		ii	**any two from** cells still unspecialised / undifferentiated / stem cells **AND** can become any type (of cell) ; any gene (at this stage) can be switched on / off ; before 8 cell stage	2 1	**ignore** 'not fully developed' **accept** genes are activated / inactivated **Examiner's Comments** It was unfortunate that, although many realised that the cells were unspecialised, they did not link this to the potential to create any form of cell. A number of responses correctly described the importance of the 8 cell stage but very few candidates incorporated references to genes being switched on/off.
		iii	**any one from** embryo may be destroyed / killed / harmed; **accept** embryo could have grown to form a baby / person **ignore** playing God / it is immoral / not natural / cause a miscarriage **Examiner's Comments** The majority of candidates correctly noted that the cell, embryo, potential baby etc. was killed by this procedure.		
			Total	9	

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