PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

BIOLOGY



MARK SCHEME

TOPIC 2: CELLS, VIRUSES AND REPRODUCTION OF LIVING THINGS

SEXUAL REPRODUCTION IN MAMMALS

SCORE	PERCENTAGE
/28	%

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Mark Scheme

Q1.

Question Number	Acceptable Answer	Additional Guidance	Mark
(a)	An explanation that makes reference to the following points: • increase in number of cells by mitosis without growth (1) • therefore cells are progressively smaller (1) • cells form a thin layer surrounding a fluid-filled cavity (1)		**(3)**

Question Number	Acceptable Answer	Additional Guidance	Mark
(b)	• correct calculation (1)	Example of calculation ($\log_2 128 = 7$) Allow mark for correct answer with no working	**(1)**

Q2.

Question Number	Answer	Additional Guidance	Mark
	A description that makes reference to three of the following: • (contact between sperm and secondary oocyte results in) acrosome reaction (1) • meiosis is completed (1) • cortical reaction takes place (1) • fusion of sperm {nucleus / genetic material} with {nucleus genetic material} of ovum (1)	**PENALISE** 'egg' once **ACCEPT** ovum / egg cell / female gamete description e.g. enzymes are released from the acrosome **DO NOT ACCEPT** if described after cortical reaction or fusion of two cells **ACCEPT** description e.g. cortical granules are released that {hardens the membrane / forms a fertilisation membrane} **ACCEPT** egg cell / nuclei of the gametes	(3) EXP

Q3.

Question Number	Answer	Additional Guidance	Mark
	An answer that makes reference to four of the following: • {screening / both techniques} are {more effective / produce more births} than control (1) • more embryos survive screening with polar body biopsy than PGD / polar body biopsy is less damaging than PGD (1) • PGD more effective (than polar body biopsy) / PGD produces more births (than polar body biopsy) (1) • (because) PGD produces 21% births compared to 18% with polar body (1) • PGD detects abnormalities in both paternal and maternal chromosomes / polar body biopsy only checks for maternal chromosome abnormalities (1)	**ACCEPT** converse **ACCEPT** converse **ACCEPT** converse **ACCEPT** 21.46 / 21.5 / 18.27 /18.3 **ACCEPT** 0.21 /0.215 / 0.18 / 0.183 / 0.1827 **DO NOT ACCEPT** just 21% alone **ACCEPT** ideas that polar body biopsy only screens for abnormalities from mother / PGD screens both parents	**(4)**

Q4.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to the following: • because nuclear DNA is present in both the male and female {gametes / sex cells } **(1)** • because mitochondria are present in the { female gamete / ovum / secondary oocyte / egg cell} and not the sperm head **(1)**	**Accept** in male and female nuclei in the context of fertilisation **Accept** mitochondria are present in sperm {neck / mid piece} / mitochondria (DNA) not released by the sperm	**(2)**

Q5.

Question Number	Answer	Mark
(i)	**The only correct answer is A** ***B*** *is not correct because the father's mitochondria do not enter the ovum on fertilisation* ***C*** *is not correct because only the nucleus was used from the mother* ***D*** *is not correct because only the nucleus was used from the mother and the father's mitochondria do not enter the ovum on fertilisation*	**(1)**

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to three of the following: • zygote divides by mitosis (several times to form blastocyst) (1) • to make identical copies of the {DNA (molecules) / chromatids} (1) • so that all cells (in the blastocyst) {will be diploid / have two copies of each chromosome} (1) • so that when the mitochondria divide they will have a copy of the DNA (1)	**ACCEPT** genetically-identical (daughter) cells / same genetic information **ACCEPT** correct number of chromosome / 46 chromosomes / 23 pairs **ACCEPT** mitochondrial DNA divides	**(3)**

Q6.

Question Number	Answer	Additional Guidance	Mark
(i)	B ovum and secondary oocyte A is incorrect because secondary oocyte is diploid C is incorrect because the secondary oocyte is diploidD is incorrect because the primary oocyte is diploid		1
(ii)	*An explanation that makes reference to:* • crossing over (1) • which swaps {alleles / DNA / genes} between {homologous chromosomes} (1) • independent / random assortment (1) • because it is random movement of homologous chromosomes to poles (1)	**Allow** random movement of paternaland maternal chromosomes / random combinations of paternal and maternal chromosomes	4

Q7.

Question Number	Answer	Additional Guidance	Mark
(i)	• correct reading from graph (1) • correct calculation of mean total cell volume (1) • correct conversion into two significant figures (1)	Example: 17 or 16 952.94 or 956.25 (ignore dps) **950** or **960** (952.94 or 956.25 gains **two marks)** (950 or 960 gains **three marks**) Correct answer with no working gains full marks	**3 exp**

Question Number	Answer	Additional Guidance	Mark
(ii)	An answer that makes reference to three of the following points: • (ratio) ICM increases up to 3/4 days (at a steady rate) / trophectoderm cells increase up to 3/4/5 days (1) • (after 3/4 days) ratios increases more steeply for ICM cells / (after 3/4/5 days) levels off for trophectoderm cells (1) • (as ratio increases) {volume of cytoplasm / volume of cells} decreases (over time) (for ICM cells) (1) • cells are differentiating (1)	**Accept** ratio increases up to 3 days **Accept** faster increase for ICM cells **Accept** ICM divide faster than trophectoderm cells	**3 exp**