PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

BIOLOGY



MARK SCHEME

TOPIC 7: MODERN GENETICS

USING GENE SEQUENCING

SCORE	PERCENTAGE
/32	%

STEMUP

These questions belong to Pearson Edexcel, not to us.

The examination questions and mark schemes in this pack were written and published by Pearson Edexcel. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with Pearson Edexcel and does not own, and makes no claim to own, any of the question or mark scheme material in this pack. Pearson has not endorsed, approved or been involved in the production of it. Pearson, Edexcel and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

Pearson publishes its past papers and mark schemes free of charge. Always check the current specification at qualifications.pearson.com before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Mark Scheme

Q1.

Question Number	Correct Answer	Additional guidance	Mark
(a)	both species look alike and are active at night (1)	morphologically and behaviourally similar	**(1)**

Question Number	Correct Answer	Additional guidance	Mark
(b)	A description that makes reference to the following: • sample of {cells / DNA} (1) • DNA polymerase chain reaction (1) • procedure repeated several times (1) • temperature requirements (1)	e.g. 55 °C, 72 °C, 95 °C	**(4)**

Question Number	Correct Answer	Additional guidance	Mark
(c)	An explanation that makes reference to the following points: • increases biodiversity / index of diversity increases (1) • as the value for {N / numerator} increases in the index of diversity (1)	Accept justification consistent with formula Correct answer gains full marks	**(2)**

Q2.

Question Number	Acceptable Answer	Additional Guidance	Mark
(i)	An experimental method that makes reference to five of the following steps: • use of experts to identify and collect many samples of rhinoceros dung from all areas of the park (1) • DNA extracted from rhinoceros cells and amplified using PCR (1) • use of { restriction endonucleases / appropriate primers } to obtain short tandem repeat sequences from DNA (1) • use of gel electrophoresis to separate DNA fragments (1) • description of method used to visualise fragments (1) • each different pattern of bands represents one individual rhinoceros (1)	e.g. radioactive probe / fluorescent probe / Southern blotting / UV light / autoradiography / X- rays	

Question Number	Acceptable Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to the following: • no dung found from some rhinoceros, so they were not counted (1) • closely related individuals have similar DNA profiles, so they may not be distinguished as separate individuals (1)		**(2)**

Q3.

Question Number	Answer	Additional guidance	Mark
(a)(i)	1. reference to {polymerase chain reaction / PCR} ; 2. polymerase (enzyme) {added / eq }; 3. idea of need for primers and nucleotides ; 4. {90-98} (°C) → {50-65} (°C) → {70-75} (°C) ; 5. idea that cycle needs to be repeated {several times / to make several copies of DNA / eq};	**1. Accept** as a ref to PCR machine	**(4)**

Question Number	Answer	Additional guidance	Mark
(a)(ii)	(DNA) {profiling / fingerprinting / (gel) electrophoresis} ;	**Ignore** Southern blotting, PCR **Accept** DNA profile / DNA fingerprint	**(1)**

Question Number	Answer	Additional guidance	Mark
(b)	1. idea of work appearing in a (Scientific) journal or being presented at a conference ; 2. idea that validity or reliability is considered ; 3. by other scientists / ref to peer review ;	**1. Accept** publishing a paper, scientific meeting	**(2)**

Question Number	Answer	Additional guidance	Mark
(c)(i)	1. reference to different {conditions / environments /eq} (in each region) ; 2. idea of different selection pressures ; 3. idea of {restricted gene flow / separate gene pools} ; 4. reference to reproductive isolation;	**1. Accept** appropriate named factor e.g. temperature **3. Ignore** different allele frequency	**(2)**

Question Number	Answer	Additional guidance	Mark
(c)(ii)	1. idea of different {alleles/ gene pool} ; 2. idea that this leads to {new / different} phenotypes ; 3. idea of new {allele / gene} can be {advantage / disadvantage} ; 4. reference to (advantageous) {(mutated) gene / (new) allele} passed onto offspring ;	**1. Ignore** allele frequency **2. Accept** traits / characteristics / features	**(2)**

Q4.

Question Number	Answer	Additional Guidance	Mark
(i)	cut DNA to produce {short sections of DNA / short tandem repeats / mini satellites} (1)	Accept cut DNA into fragments / cut DNA to give sticky ends	**(1)**

Question Number	Answer	Additional Guidance	Mark
(ii)	A description that makes reference to three of the following: • use (DNA) primers / nucleotides (1) • use {high temperature / 95 °C} for 30 seconds (to separate DNA strands) (1) • use {lower temperature / 55 °C} for 20 seconds (to bind primers) (1) • heat to 72°C with polymerase (to replicate DNA) (1) • repeat process (to obtain many copies of DNA) (1)		(3)

Q5.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to two of the following: • because DNA needs to be {amplified / replicated} (1) • as only small samples are taken / to produce enough DNA (1) • all copies of the DNA need to be identical (to the original sample)(1)		(2)

Q6.

Question Number	Answer	Additional Guidance	Mark
	The only correct answer is B A is incorrect because child 2 has no matching bands with the father **C** is incorrect because child 2 has no matching bands with the father **D** is incorrect because child 4 has no matching bands with either adult		(1)