

**Answers to examination-style questions**

<b>Answers</b>	<b>Marks</b>	<b>Examiner's tips</b>
<b>1 a)</b> to separate the two strands / break hydrogen bonds	1	
<b>b) i)</b> enables replication / sequencing to start	1	Not complementary bases.
<b>ii)</b> joins DNA nucleotides	1	Not complementary bases.
<b>c) i)</b> 64	1	
<b>ii)</b> replication of DNA from crime scene / tissue sample / for DNA sequencing / gene cloning	1	
<b>d)</b> (transcription uses) RNA polymerase; RNA nucleotides / uracil; one (template) strand / PCR both strands; start / stop codons;	2 max.	Accept enzyme separates strands.
<b>2 a) i)</b> transfer / carry genes from one organism to another / into bacteria / cells	1	
<b>ii)</b> cut open plasmid; cut donor DNA, to remove gene / length of DNA; cut donor DNA and plasmid with the same enzyme / enzyme that cuts at the same base sequence; sticky ends / (overhanging) ends with, single strand / bases exposed; association / attachment / pairing of complementary strand;	2 max.	
<b>iii)</b> annealing / splicing / backbones joined / phosphodiester strand	1	
<b>b) i)</b> L and M	1	
<b>ii)</b> fragments 64 and 26 (kilobases obtained)	1	
<b>3 a)</b> introduction of healthy gene / 'replacement' of defective gene	1	
<b>b)</b> reproductive cells / gamete cells do not contain ADA allele / gene	1	

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c) i) to 'prevent' rejection / immune response	1	
ii) T lymphocytes have a limited life span / die off / do not reproduce; bone marrow provides continual supply of T lymphocytes / ADA gene / ADA enzyme;	2	
4 a) polymerase chain reaction / PCR	1	
b) i) joins nucleotide together	1	Not complementary bases.
ii) enables replication / sequencing to start / keeps strands separate	1	
c) i) (modified nucleotide) does not form bonds / react with other nucleotides; does not 'fit' DNA polymerase / enzyme / active site;	1 max.	
ii) AC	1	Accept reading from right-hand side i.e. TC.
d) i) different lengths / sizes / mass	1	
ii) <b>radioactive primer</b>	1	
iii) <b>GAAGTCTCAG</b>	1	Accept reading from autoradiogram i.e. CTTCAGAGTC.
5 a) 1. DNA is cut; 2. using restriction enzyme; 3. use electrophoresis; 4. separates according to length / mass; 5. southern blotting / transfer to (nylon) membrane; 6. make single-stranded; 7. apply probe; 8. radioactive / fluorescent; 9. reference to tandem repeats / VNTRs / minisatellites; 10. autoradiography (if radioactivity used);	6 max.	

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<b>b) i)</b> all bands in cub which don't come from mother; must be in father's DNA fingerprint;	2	Principle that all bands in cub must come from mother and father = 1 mark.
<b>ii)</b> select pairs with dissimilar DNA fingerprints	1	
<b>c) i)</b> cells (from panda) in faces / gut cells / blood cells	1	
<b>ii)</b> to increase amount of DNA / only small amount present	1	
<b>iii)</b> DNA / primer has specific base-sequence; reference to specific / complementary base-pairing;	2	
<b>d)</b> taking samples from animals causes stress / injury to animal; difficult to find animals; pandas are dangerous / threat to humans;	2 max.	