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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 3 Science, 2009

90729 Describe genetic processes

Credits: Four
9.30 am Monday 30 November 2009

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should answer ALL the questions in this booklet.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–10 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

For Assessor's use only	**Achievement Criteria**	
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Describe genetic processes. ☐	Explain genetic processes. ☐	Discuss genetic processes. ☐
Overall Level of Performance ☐		

You are advised to spend 45 minutes answering the questions in this booklet.

Assessor's use only

QUESTION ONE: PROTEIN SYNTHESIS

Enzymes are proteins made up of polypeptide chains, coded by DNA.

(a) Explain the importance of DNA in protein synthesis.

(b) Discuss the function of the three forms of RNA **in protein synthesis**.
A labelled diagram may assist your answer.

Assessor's use only

QUESTION TWO: MUTATIONS

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Use this codon table to answer the following question.

First Position	Second Position				Third Position
	U	C	A	G	
U	UUU Phe UUC UUA Leu UUG	UCU UCC UCA Ser UCG	UAU Tyr UAC UAA *Stop* UAG *Stop*	UGU Cys UGC UGA *Stop* UGG Trp	U C A G
C	CUU CUC CUA Leu CUG	CCU CCC CCA Pro CCG	CAU His CAC CAA Gln CAG	CGU CGC CGA Arg CGG	U C A G
A	AUU AUC Ile AUA AUG Met	ACU ACC ACA Thr ACG	AAU Asn AAC AAA Lys AAG	AGU Ser AGC AGA Arg AGG	U C A G
G	GUU GUC GUA Val GUG	GCU GCC GCA Ala GCG	GAU Asp GAC GAA Glu GAG	GGU GGC GGA Gly GGG	U C A G

A codon sequence for a protein is shown below:

AUG CAG CGA ACU GAG UUG

(a) Complete the amino acid sequence for this section of the protein using the codon table.

(b) A mutation occurs in the DNA at the point shown by the arrow

AUG CAG C↑GA ACU GAG UUG

Discuss what would happen to the protein if the indicated nucleotide mutated into a U, a G or an A.

Your answer should include:

- the type of mutation
- effect on the protein of replacing C with each of U, G and A.

A labelled diagram may assist your answer.

Assessor's use only

QUESTION THREE : DNA FINGERPRINTING

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Forensic scientists can match a small blood sample to a suspect using DNA fingerprinting, which uses the following techniques:

- PCR (polymerase chain reaction)
- modification by restriction enzymes
- gel electrophoresis.

(a) Explain the key purpose of ONE of the three techniques above.

(b) Discuss how the THREE techniques are used **together** to identify a suspect.

A labelled diagram may assist your answer.

Assessor's use only

QUESTION FOUR: GENETIC ENGINEERING

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Lettuce plants have been genetically modified to produce human insulin in their cells. The sterilised lettuce is treated, ground up and put in capsules. Tests have shown this to be effective in treating type 1 diabetes in humans.

Discuss the **scientific** issues of genetically engineering plants to combat type 1 diabetes in humans.

Your answer may include:

- random insertion of gene
- cross-contamination.

A labelled diagram may assist your answer.

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Extra paper for continuation of answers if required.
Clearly number the question.

Assessor's use only

Question number

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