NAME TEACHER

**NQA**

Nayland Qualification Authority

## Level Two Biology, 2013

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| **Demonstrate understanding of gene expression**  Credits: 4 |

### Suggested Time: 40 minutes

**Instructions**

* Answer all questions in the spaces provided.
* You must hand this examination paper to the supervisor at the end of the examination.
* Check that this paper has all 5 pages numbered and in the correct order.

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| Achievement Criteria. (for assessors only) | | | | | |
| Achievement | | Achievement  with Merit | | Achievement  with Excellence | |
| Demonstrate understanding of gene expression |  | Demonstrate in-depth understanding of gene expression |  | Demonstrate comprehensive understanding of gene expression |  |
| Overall Level of performance: | | | |  | |

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| **Question 1 Making Proteins**  Protein synthesis occurs in two main stages.   1. **Name** these stages and describe **where** they occur |  |

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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b. Explain how a mRNA copy is created from DNA

In your answer you should:

* describe the role of DNA and enzymes in mRNA production
* explain the advantages of using mRNA, rather than DNA, to carry the genetic information to the site of protein synthesis
* describe the structure of the DNA molecule and explain why it is used as the ‘master’ copy of genetic information stored by the cell.

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**Question 2 Breaking the Code**

The following table shows the ‘Genetic Code’ i.e. the amino acid codons are translated into.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | | **Second position** | | | |
|  | | | U | **C** | **A** | **G** |
|  | **First position** | U | **Phe** | **Ser** | **Tyr** | **Cys** | **U** | **Third Position** |
| **C** |
| **Leu** | **Stop** | **Stop** | **A** |
| **Stop** | **Try** | **G** |
| **C** | **Leu** | **Pro** | **His** | **Arg** | **U** |
| **C** |
| **Gin** | **A** |
| **G** |
| **A** | **Iso** | **Thr** | **Asn** | **Ser** | **U** |
| **C** |
| **Lys** | **Arg** | **A** |
| **Met** | **G** |
| **G** | **Val** | **Ala** | **Asp** | **Gly** | **U** |
| **C** |
| **Glu** | **A** |
| **G** |

Consider this sequence of bases in a template strand of DNA:

TAC CCA **ATA** TGG CGC TAA

Discuss the effects mutations can have on the amino acid sequence being coded for.

In your explanation you should:

* describe the **mRNA sequence** and the **sequence of amino acids** coded for by the original DNA sequence

mRNA: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

amino acid sequence:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Explain the possible **effects** of a mutation, if it were to occur **AT THE THIRD TRIPLET** in the sequence above.

* **use examples** from the amino acid table above to illustrate your answer
* explain how the **degeneracy of the genetic code** provides some protection against some types of mutation.

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