

SUPERVISOR'S USE ONLY

91159



Level 2 Biology, 2012

91159 Demonstrate understanding of gene expression

2.00 pm Thursday 22 November 2012 Credits: Four

| 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. |

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 attempt 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 2–8 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.

TOTAL

You are advised to spend 60 minutes answering the questions in this booklet.

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QUESTION ONE: EFFECT OF ENVIRONMENT

| The environment | can affect the pl | nenotype of an | organism | through | direct | changes | to the | genotype, |
|-------------------|-------------------|----------------|----------|---------|--------|---------|--------|-----------|
| and/or by the way | in which the ge | notype is expr | essed. | | | | | |

| Discuss this statement, with reference to mutagens, gene mutations and environmental factors. |
|---|
| In your answer you should give at least one example of each of these key terms. |
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QUESTION TWO: PROTEIN SYNTHESIS

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Part of a sequence of mRNA is shown below.

(a) Complete the DNA strands by filling in the missing bases, AND identify which strand is the DNA template, by circling the appropriate label.

| DNA { | <u>T</u> | <u>A</u> | <u>C</u> | _ | _ | _ | _ | _ | _ | _ | _ | _ | Strand 1 |
|-------|----------|----------|----------|---|----------|---|---|---|---|---|----------|---|----------|
| DNA | <u>A</u> | <u>T</u> | <u>G</u> | _ | _ | _ | _ | _ | _ | _ | _ | | Strand 2 |
| mRNA | Α | U | G | G | <u>C</u> | Α | G | A | U | U | <u>C</u> | U | |

| With reference to the table below, explain what is meant by the term 'redundancy due to degeneracy within the code'. | | | | | | |
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TABLE OF mRNA CODONS

| | | SEC | COND COD | ON ELEME | ENT | | |
|---------------------|---|-----|----------|----------|------|---|---------------------|
| | | U | C | A | G | | |
| | U | PHE | SER | TYR | CYS | U | |
| | | PHE | SER | TYR | CYS | C | |
| | | LEU | SER | STOP | STOP | A | |
| Ţ | | LEU | SER | STOP | TRP | G | HI |
| ME | C | LEU | PRO | HIS | ARG | U | |
| E | | LEU | PRO | HIS | ARG | C | 00 |
| E | | LEU | PRO | GLU | ARG | A | 100 |
| NO | | LEU | PRO | GLU | ARG | G | |
| FIRST CODON ELEMENT | A | ILE | THR | ASPN | SER | U | THIRD CODON ELEMENT |
| Τ(| | ILE | THR | ASPN | SER | C | ÆΝ |
| RS | | ILE | THR | LYS | ARG | A | |
| E | | MET | THR | LYS | ARG | G | T |
| | G | VAL | ALA | ASP | GLY | U | |
| | | VAL | ALA | ASP | GLY | C | |
| | | VAL | ALA | GLU | GLY | A | |
| | | VAL | ALA | GLU | GLY | G | |

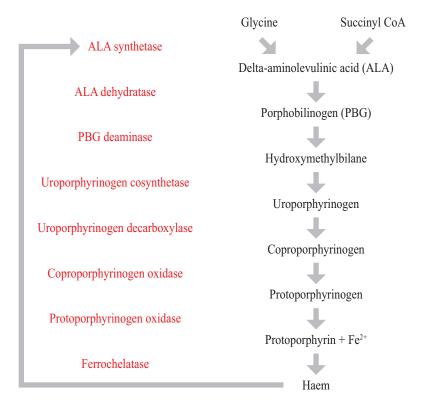
| | the formation of a functional protein, beginning with a completed mRNA strand. | AS L |
|------|--|---------|
| | discussion, you should refer to each of the following: | |
| | anslation | |
| | bosomes | |
| | RNA | |
| | odons AND anticodons | |
| • st | art AND stop codons | |
| • po | plypeptide chains. | |
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QUESTION THREE: METABOLIC PATHWAYS

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Porphyrias are a group of rare disorders passed down through families, in which an important part of haemoglobin, called haem, is not made properly.

Normally, the body makes haem in a multi-step process. Porphyrins are made during several steps of this process. Patients with porphyria have a deficiency of certain enzymes needed for this process. This causes abnormal amounts of porphyrins or related chemicals to build up in the body.



In the above diagram, the enzymes are shown in red.

Discuss why patients with Porphyria may have different causes of the disorder, and how two parents with Porphyria could give birth to children who do not have it.

In your answer you should consider:

- **description** of what is meant by the term 'metabolic pathway'.
- an **explanation** of why some enzymes might be deficient.

| • | an evaluation of the diagram to justify how there can be different causes of the disorder, AND how normal children could be born from affected parents. | | | | | | | | |
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| | | Extra paper if required. | |
|--------------------|---|---|--|
| OUESTION | | Write the question number(s) if applicable. | |
| QUESTION NUMBER | l | | |
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