

(b) Following a bite by an insect, the area around the bite may show signs of inflammation as histamine is released.

(i) Explain why an insect bite, which breaks the surface of the skin, may lead to inflammation around the injury.

(3)

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(ii) In order to reduce inflammation, a cream containing antihistamines might be applied to the skin, around an insect bite.

Suggest why applying this cream might be better than taking tablets containing antihistamines.

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(Total for Question 1 = 13 marks)

2 The sequence of amino acids in a polypeptide chain is determined by the sequence of bases in DNA. This sequence of bases is used as a template to synthesise messenger RNA (mRNA).

(a) Describe the structure of an amino acid.

(2)

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(b) Describe how mRNA is synthesised.

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(c) The table below shows the amino acids coded for by the codons on **mRNA**.

| Three-letter codons of mRNA and the amino acids specified by the codons | | | | | | | |
|---|------------|----------------------------------|-----------|----------------------------------|----------------|----------------------------------|--------------------|
| AAU } AAC } | Asparagine | CAU } CAC } | Histidine | GAU } GAC } | Asparatic acid | UAU } UAC } | Tyrosine |
| AAA } AAG } | Lysine | CAA } CAG } | Glutamine | GAA } GAG } | Glutamate | UAA } UAG } | Stop |
| ACU } ACC } ACA } ACG } | Threonine | CCU } CCC } CCA } CCG } | Proline | GCU } GCC } GCA } GCG } | Alanine | UCU } UCC } UCA } UCG } | Serine |
| AGU } AGC } | Serine | CGU } CGC } CGA } CGG } | Arginine | GGU } GGC } GGA } GGG } | Glycine | UGU } UGC } | Cysteine |
| AGA } AGG } | Arginine | | | | | UGA } UGG } | Stop Tryptophan |
| AUU } AUC } AUA } | Isoleucine | CUU } CUC } CUA } CUG } | Leucine | GUU } GUC } GUA } GUG } | Valine | UUU } UUC } | Phenylalanine |
| AUG | Methionine | | | | | UUA } UUG } | Leucine |

The diagram below shows part of a messenger RNA molecule.



(i) Place a cross ☒ in the box next to the complementary sequence of bases found on the strand of the **DNA** molecule, from which part of this mRNA molecule was synthesised.

(1)

A G G T A A G C G C C T T

B G G U A A C G C G G A A

C A A C G G A U A U U G G

D A A C G G A T A T T G G

(ii) Place a cross ☒ in the box next to the sequence of amino acids found in the polypeptide chain that is coded for by this part of the **mRNA** molecule.

(1)

A proline lysine alanine valine

B proline phenylalanine alanine valine

C glycine lysine arginine glutamine

D proline lysine alanine glutamine

(iii) Place a cross ☒ in the box next to the final codon on this **mRNA** molecule if GUU is the last codon for an amino acid.

(1)

A AGU

B ACU

C UCA

D UGA

(Total for Question 2 = 9 marks)

3 The questions below refer to some important biological molecules.
Place a cross (☒) in the most appropriate box that describes the structure or role of these biological molecules.

(a) Disaccharides can be split by (1)

- A** hydrolysis of glycosidic bonds
- B** condensation of glycosidic bonds
- C** hydrolysis of ester bonds
- D** condensation of ester bonds

(b) Amylose is an example of a (1)

- A** monosaccharide
- B** disaccharide
- C** polysaccharide
- D** trisaccharide

(c) The role of starch is to (1)

- A** be a source of energy to plants
- B** store energy in all living organisms
- C** store energy in plants
- D** store energy in animals

(d) Proteins are polymers of amino acids joined by peptide bonds formed between the (1)

- A** R groups
- B** R group and the amino group
- C** R group and the carboxyl group
- D** carboxyl group and the amino group

(e) The three-dimensional structure of a protein is held together by (1)

- A** peptide, hydrogen and ionic bonds
- B** hydrogen, ester and ionic bonds
- C** disulphide bridges and ester bonds
- D** disulphide bridges, hydrogen and ionic bonds

(f) DNA consists of mononucleotides joined together by bonds between (1)

- A** two pentose sugars
- B** one ribose sugar and one phosphate group
- C** one deoxyribose sugar and one phosphate group
- D** two phosphate groups

(g) Water is described as a dipolar molecule because it has a (1)

- A** positively charged hydrogen end and a negatively charged oxygen end
- B** positively charged hydrogen end and a positively charged oxygen end
- C** negatively charged hydrogen end and a negatively charged oxygen end
- D** negatively charged hydrogen end and a positively charged oxygen end

(Total for Question 3 = 7 marks)