

Name of the Student: _____

Max. Marks : 24 Marks

Time : 24 Minutes

Q1.

The amide or peptide link is found in synthetic polyamides and also in naturally occurring proteins.

- (a) (i) Draw the repeating unit of the polyamide formed by the reaction of propanedioic acid with hexane-1,6-diamine.

(2)

- (ii) In terms of the intermolecular forces between the polymer chains, explain why polyamides can be made into fibres suitable for use in sewing and weaving, whereas polyalkenes usually produce fibres that are too weak for this purpose.

(3)

- (b) (i) Name and outline a mechanism for the reaction of $\text{CH}_3\text{CH}_2\text{COCl}$ with CH_3NH_2

Name of mechanism _____

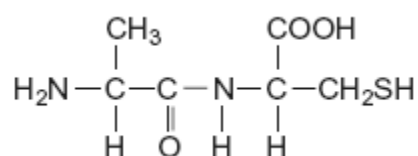
Mechanism

(5)

- (ii) Give the name of the product containing an amide linkage that is formed in the reaction in part (b) (i).

(1)

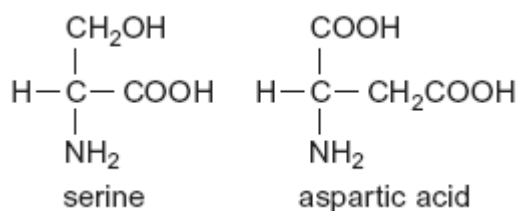
- (c) The dipeptide shown below is formed from two different amino acids.



Draw the structure of the alternative dipeptide that could be formed by these two amino acids.

(1)

- (d) The amino acids serine and aspartic acid are shown below.



- (i) Give the IUPAC name of serine.

(1)

- (ii) Draw the structure of the species formed when aspartic acid reacts with aqueous sodium

hydroxide.

(1)

- (iii) Draw the structure of the species formed when serine reacts with dilute hydrochloric acid.

(1)

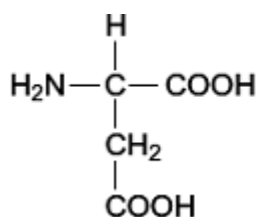
- (iv) Draw the structure of the species formed when serine reacts with an excess of bromomethane.

(1)

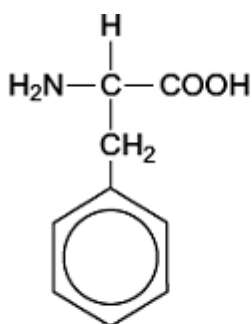
(Total 16 marks)

Q2.

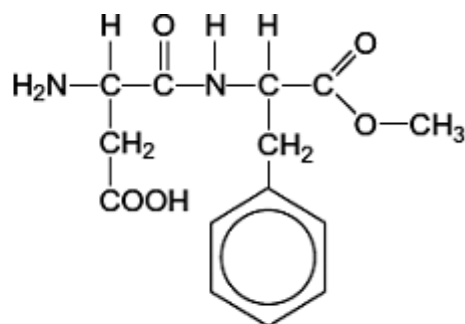
The amino acids aspartic acid and phenylalanine react together to form a dipeptide. This dipeptide can be converted into a methyl ester called aspartame.



aspartic acid



phenylalanine



aspartame

Aspartame has a sweet taste and is used in soft drinks and in sugar-free foods for people with diabetes.

Hydrolysis of aspartame forms methanol initially. After a longer time the peptide link breaks to form the free amino acids. Neither of these amino acids tastes sweet.

- (a) Apart from the release of methanol, suggest why aspartame is **not** used to sweeten foods that are to be cooked.

(1)

- (b) Give the IUPAC name of aspartic acid.

(1)

- (c) Draw the organic species formed by aspartic acid at high pH.

(1)

- (d) Draw the zwitterion of phenylalanine.

(1)

(e) Phenylalanine exists as a pair of stereoisomers.

(i) State the meaning of the term *stereoisomers*.

(2)

(ii) Explain how a pair of stereoisomers can be distinguished.

(2)

(Total 8 marks)