

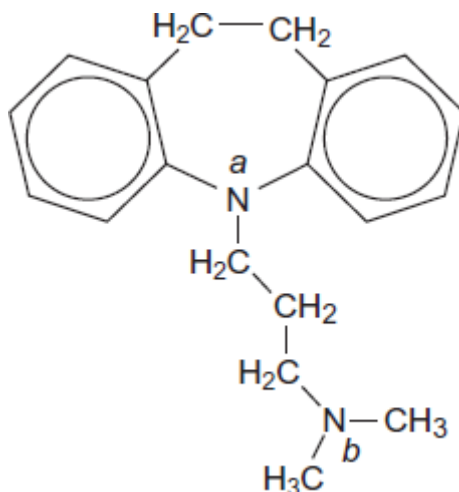
Name of the Student: _____

Max. Marks : 23 Marks

Time : 23 Minutes

Q1.

Imipramine has been prescribed as an antidepressant. The structure of imipramine is shown below.



- (a) The medicine is usually supplied as a salt. The salt is formed when one mole of imipramine reacts with one mole of hydrochloric acid.

Suggest why the nitrogen atom labelled *b* is more likely to be protonated than the nitrogen atom labelled *a* when the salt is formed.

(3)

- (b) Deduce the molecular formula of imipramine and give the number of peaks in its ^{13}C n.m.r. spectrum.

(2)
(Total 5 marks)

Q2.

Ammonia and methylamine were dissolved in separate samples of water. The two solutions had equal molar concentrations.

State **one** simple method, other than smell, of distinguishing these solutions.

State what you would observe.

Method _____

Observation _____

(Total 2 marks)

Q3.

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 _____

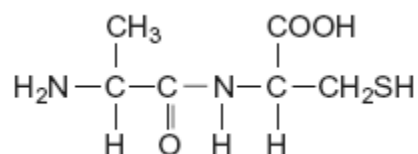
Mechanism

(5)

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

(1)

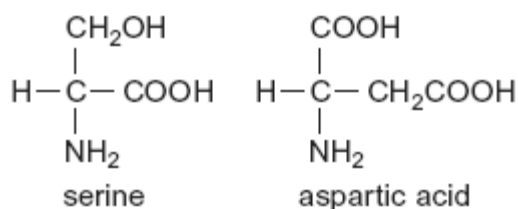
- (c) The dipeptide shown below is formed from two different amino acids.



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)