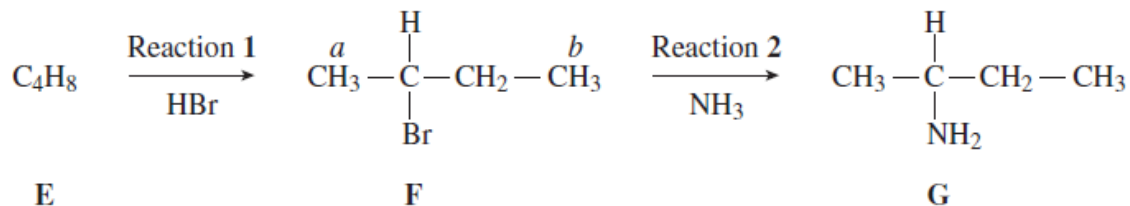


F324 Synoptic HW2

Consider the reaction sequence shown below.



- (a) (i) Name the mechanism for Reaction 1.

.....

- (a) (ii) Compound **F** is the **only** product formed in Reaction 1. Deduce the structure of compound **E**.

(2 marks)

- (b) Name and outline a mechanism for Reaction 2.

Name of mechanism

Mechanism

(5 marks)

- (c) Compound **G** is a primary amine with molecular formula $\text{C}_4\text{H}_{11}\text{N}$
 In Reaction 2, the percentage conversion of **F** into **G** is 53.4%.

- (c) (i) Calculate the mass of **G** formed in Reaction 2 from 10.0 g of **F**.

.....

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- (c) (ii) Suggest a reason, other than experimental technique, for the relatively low percentage conversion of **F** into **G** in Reaction 2.

.....
.....

(4 marks)

- (d) Predict the total number of peaks in the proton n.m.r. spectrum of **F**. State the splitting pattern of the peak for the protons labelled *a* and the splitting pattern of the peak for the protons labelled *b*.

Total number of peaks

Splitting pattern of the peak for the protons labelled *a*

Splitting pattern of the peak for the protons labelled *b*

(3 marks)

- (e) Draw the structure of the following isomers of **G**.

- (e) (i) The isomer which is a primary amine and has two peaks in its proton n.m.r. spectrum.

- (e) (ii) The isomer which is a secondary amine and has four peaks in its proton n.m.r. spectrum.

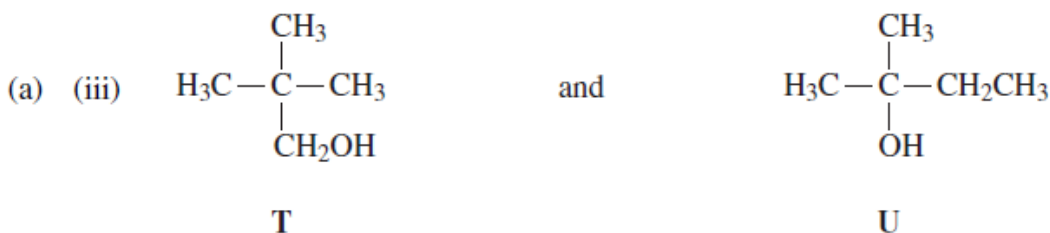
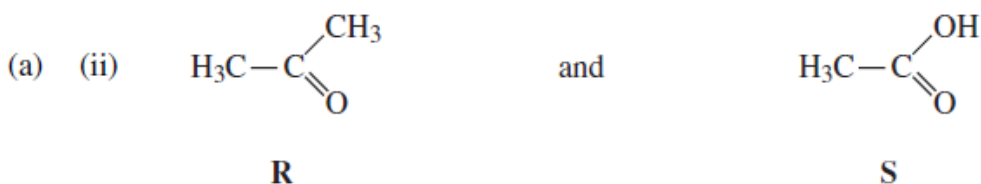
- (e) (iii) The isomer which is a tertiary amine.

(3 marks)

F324 Synoptic HW2

Part 2

- (a) Describe, by giving reagents and stating observations, how you could distinguish between the compounds in the following pairs. Use **one** simple test-tube reaction for each pair.



(9 marks)

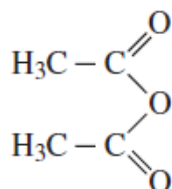
- (b) Compound **T** in part (a)(iii) has a mass spectrum with a peak at $m/z = 57$

Draw the structure of the ion responsible for this peak and write an equation for the fragmentation of the molecular ion of **T** to produce this species.

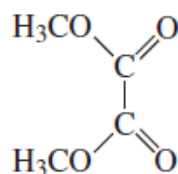
(3 marks)

- (c) Identify a solvent used for samples in proton n.m.r. spectroscopy.

Give the names of compounds **V** and **W**, shown below, and describe how they can be distinguished using their proton n.m.r. spectra.



V



W

(4 marks)