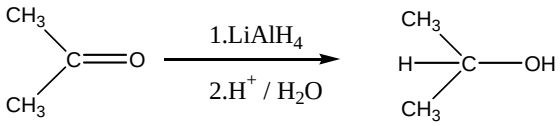
CH1012 Tutorial 10 Answers

1. Predict the organic product from the following reactions. Briefly justify your answer in each case.

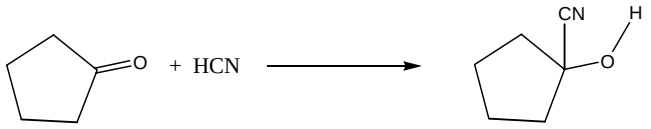
(i)



2-propanol

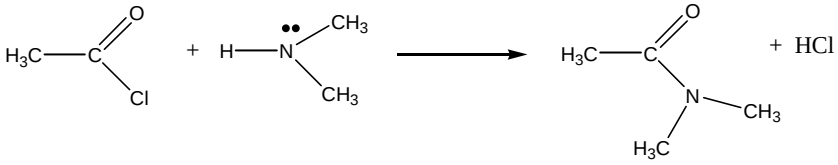
This is a nucleophilic addition to C=O by H^- (from $LiAlH_4$) to form an anion which is quenched by water to give the secondary alcohol.

(ii)



nucleophilic addition, formation of a cyanohydrin.

(iii)

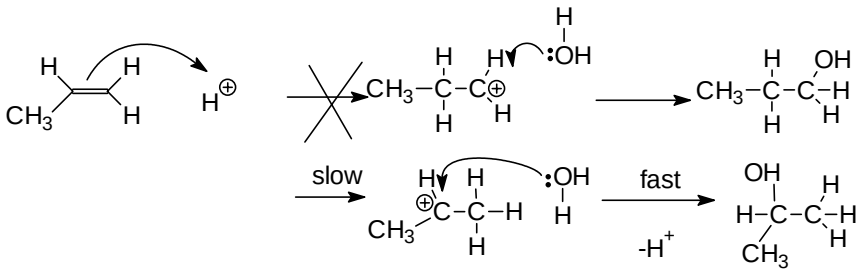


Nucleophilic acyl substitution N,N-dimethylethanamide

2. Addition of water to 1-propene in the presence of conc. H_2SO_4 (catalyst) could, in principle, give two products.

- Name the possible products.
- Explain in detail why only one of these products is formed.

1-propanol



2-propanol

This is a Markovnikov addition where the electrophile adds to the unsymmetrical alkene to form a 2^o substituted carbocation intermediate which is more stable (due to hyperconjugation) than the 1^o substituted

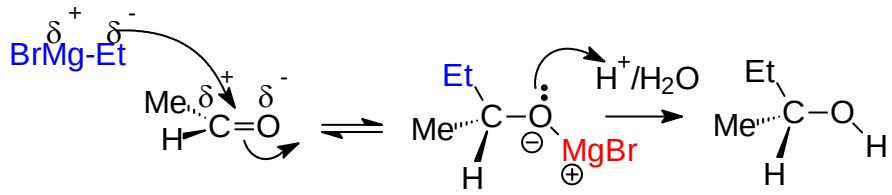
carbocation intermediate formed in the first route. The second pathway therefore has a lower barrier (E_a) which results in the preferential formation of 2-propanol.

3. Describe a chemical test to distinguish if an organic compound is an aldehyde or a ketone. Write an equation for the test you propose and indicate the observations that you would expect.

Tollens reagent could be used. This is an ammoniacal solution of Ag^+ which oxidises aldehydes but not ketones. A silver mirror is produced on the inside of the reaction vessel when Tollens reagent reacts with an aldehyde.

$RCHO + Ag^+/NH_3(aq) \rightarrow RCHOH + Ag$ (mirror)
$RCOR' + Ag^+/NH_3(aq) \rightarrow$ no reaction

4. Give a detailed mechanism for the nucleophilic reaction between ethanal and ethyl magnesium bromide.



5. Provide a detailed mechanism for the **Aldol reaction** of butanal under basic conditions (NaOH).