

18. Carboxylic acids and derivatives

18.1 Carboxylic acids

Paper 2

Question Paper

- 1 (b) Fig. 6.2 shows two reactions involving **V**.

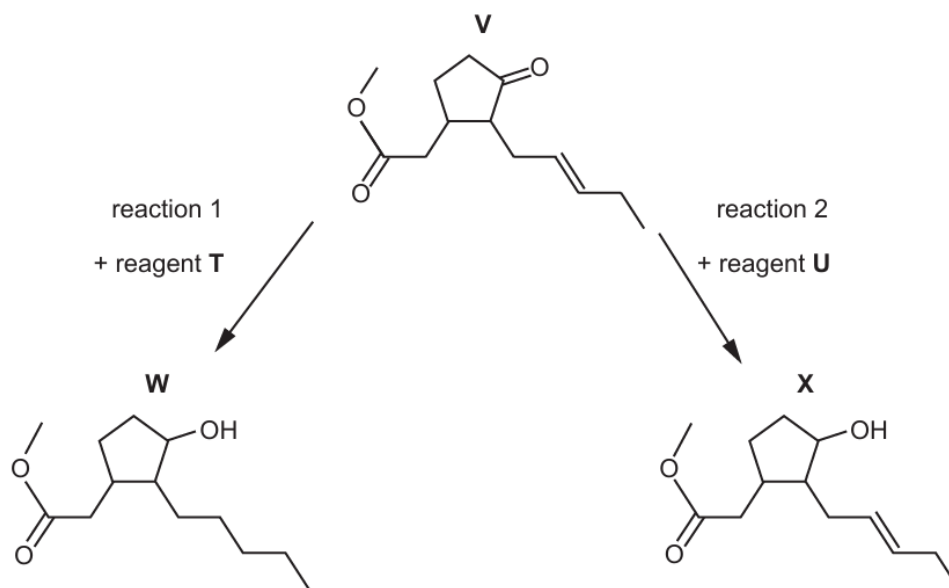


Fig. 6.2

- (i) Identify the role of reagent **T** for each functional group that reacts in reaction 1.

.....
 [1]

- (ii) Suggest the identity of reagent **U** in reaction 2.

..... [1]

- 2 **V** is a colourless liquid.

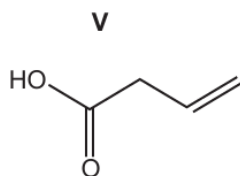


Fig. 4.1

- (a) **V** reacts with an excess of LiAlH_4 to form **W**.

- (i) Draw the structure of **W** in the box.



[1]

- (ii) Identify the role of LiAlH_4 in the reaction with **V**.

..... [1]

- 3 Fig. 3.1 describes a sequence of reactions that can be used to produce a food additive, compound **Y**, from $\text{CH}_3\text{CH}_2\text{Cl}$.

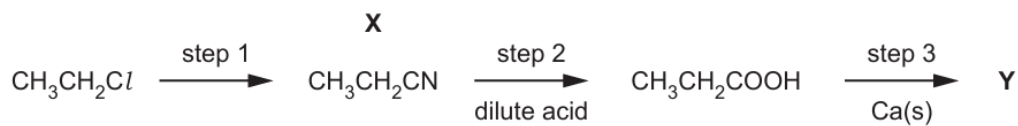


Fig. 3.1

- (a) (iv) In step 3, **Y** and a gas are produced.
Construct an equation for step 3.

..... [2]

4 Compound **V** is a liquid.

V contains 77.2% carbon, 11.4% hydrogen and 11.4% oxygen by mass.

V has a relative molecular mass of 280.

(b) **V** contains two types of functional group: a carboxylic acid and an alkene.

(i) Describe a chemical test and observation which confirms the presence of a carboxyl functional group.

.....
..... [2]

(ii) A 3.196 g sample of Br_2 reacts completely with 2.800 g of **V**.

Calculate how many alkene functional groups are present in one molecule of **V**. Show your working.

number of alkene functional groups in **V** = [1]

5 (c) Propene is separated from the mixture and heated in air in the presence of a catalyst. Propene is oxidised to **X**, which contains two functional groups.

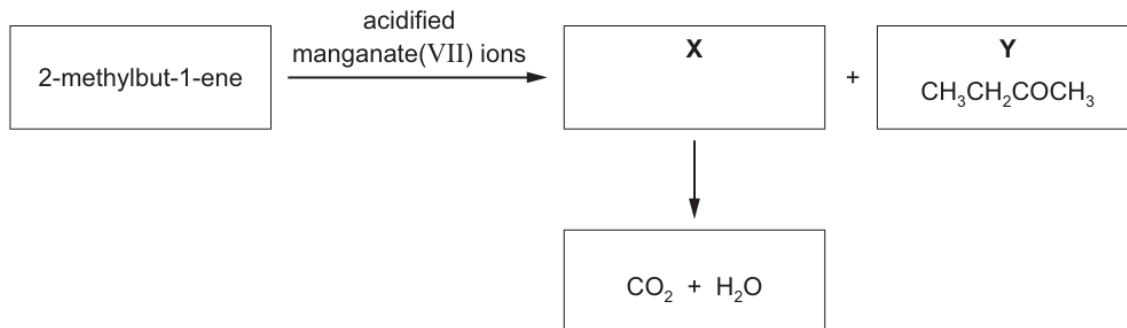
(i) Effervescence is seen when $\text{Na}_2\text{CO}_3(\text{aq})$ is added to **X**.

Identify the functional group present in **X** which is responsible for this observation.

..... [1]

- 6** 2-methylbut-1-ene reacts with acidified manganate(VII) ions, under specific conditions, to produce two organic compounds **X** and **Y**.

X immediately reacts with the acidified manganate(VII) ions to form carbon dioxide and water. **Y** has the structural formula $\text{CH}_3\text{CH}_2\text{COCH}_3$.



- (f)** Propanoic acid, $\text{CH}_3\text{CH}_2\text{CO}_2\text{H}$, is reduced by LiAlH_4 .
- (i)** Write an equation to show this reaction. Use $[\text{H}]$ to represent an atom of hydrogen from the reducing agent.
 [1]
- (ii)** Name the organic product formed in this reaction.
 [1]

- 7** Many naturally occurring esters are used as flavourings in food.

- (d)** Sodium carbonate solution reacts with methanoic acid.

Write the equation for this reaction.

..... [1]