

13. An introduction to AS Level organic chemistry

13.1 Formulas, functional groups and the naming of organic compounds

Paper 2

Question Paper

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

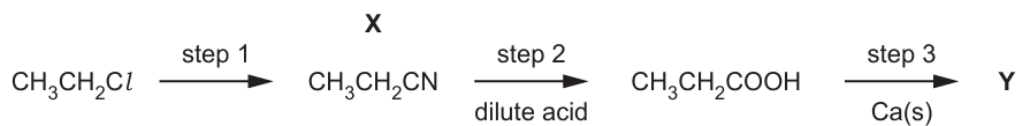


Fig. 3.1

- (a) (ii) Give the systematic name of **X**.

..... [1]

- 2 Compounds **C** and **D** are alkenes with the same molecular formula, C_5H_{10} .



Fig. 4.1

- (a) (i) Give the systematic name of **D**.

..... [1]

- 3 Lactic acid, $\text{CH}_3\text{CH}(\text{OH})\text{COOH}$, and pyruvic acid, $\text{CH}_3\text{COCO}_2\text{H}$, both contain two functional groups.

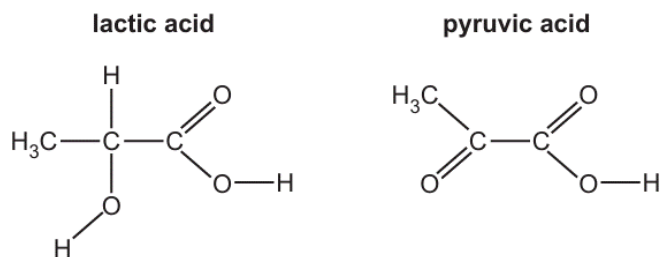


Fig. 4.1

- (a) (ii) Give the systematic name of lactic acid.

..... [1]

- 4 (a) Naphtha is a mixture which contains only hydrocarbon molecules.

- (i) What is meant by the term *hydrocarbon*?

.....
 [1]

- 5 (a) The table shows the structural formulae of four compounds, **A**, **B**, **C** and **D**, with molecular formula C_4H_8 .

- (i) Complete the table by giving the systematic name of **A**, **B**, **C** and **D**.

	structural formula	name
A	$\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$	
B		
C		
D	$\text{CH}_2=\text{C}(\text{CH}_3)_2$	

[4]

6 **S** is a secondary alcohol with molecular formula $C_4H_{10}O$.

(a) Draw the displayed formula of **S**.

[1]

(b) **S** is converted to **V** in a three-step reaction sequence.



In step 1, the secondary alcohol **S** reacts with PBr_3 to produce **T**, which has molecular formula C_4H_9Br .

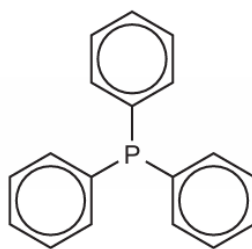
(i) Give the systematic name of **T**.

..... [1]

7 Phosphorus is a reactive Period 3 element.

(c) Triphenylphosphine is used in a type of reaction known as a *Wittig reaction*.

triphenylphosphine

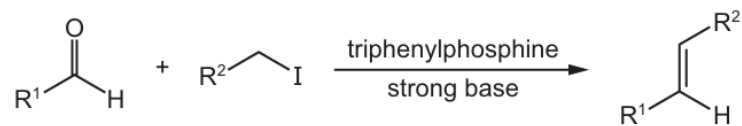


where = $-C_6H_5$

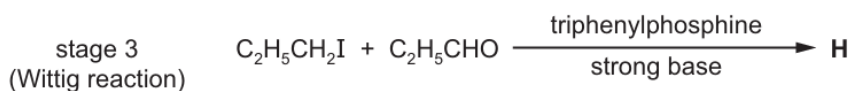
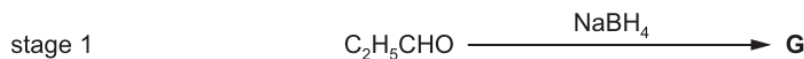
(i) Give the empirical formula of triphenylphosphine.

..... [1]

In a Wittig reaction, an aldehyde reacts with a halogenoalkane to form an alkene. The conversion is shown in the following unbalanced equation.



Compound **H** can be made from propanal, $\text{C}_2\text{H}_5\text{CHO}$. Stage 3 in the reaction scheme is a Wittig reaction.



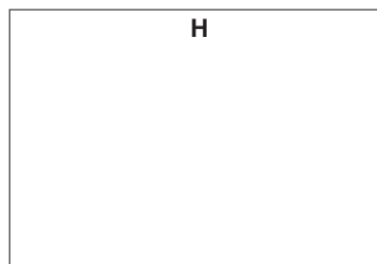
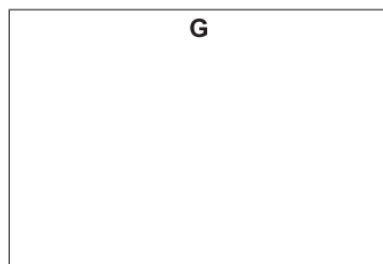
(ii) State the types of reaction that occur in stages 1 and 2.

stage 1

stage 2

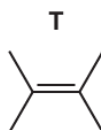
[2]

(iii) Draw the structures of **G** and **H** in the boxes provided.



[2]

8 Compound **T** is an isomer of C_6H_{12} .

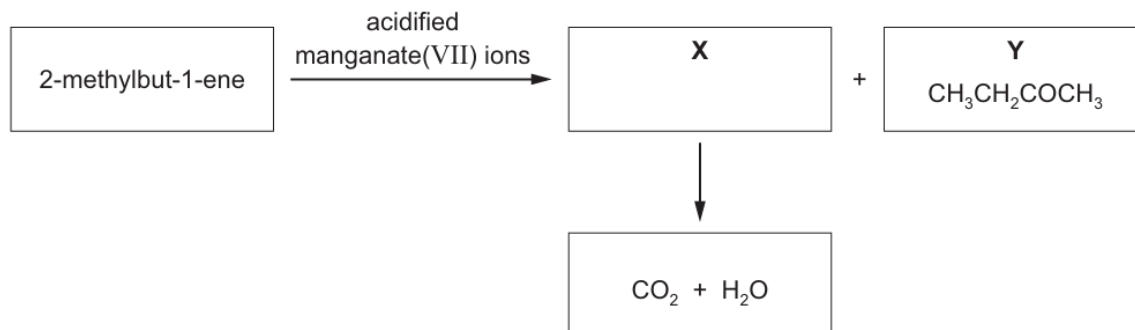


(a) Name **T**.

..... [1]

- 9** 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 $\text{CH}_3\text{CH}_2\text{COCH}_3$.

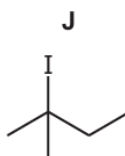


- (a) Draw the skeletal formula of 2-methylbut-1-ene.

[1]

- 10** Iodine is used in many inorganic and organic reactions.

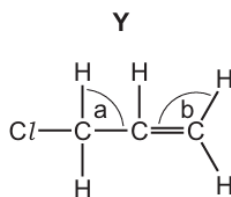
(c) **J** reacts with NaOH, forming different products dependent on the conditions used.



- (i) Name **J**.

..... [1]

- 11 The structure of compound **Y** is shown.

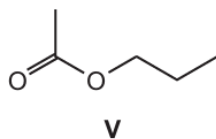


- (a) Give the systematic name for **Y**.

..... [1]

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

- (a) The structure of ester **V** is shown.

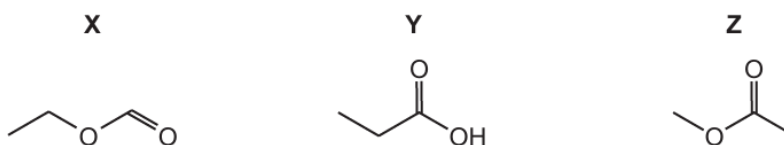


- (i) Name **V**.

..... [1]

13 Many naturally occurring esters are used as flavourings in food.

(c) Compounds **X**, **Y** and **Z** are shown. They all have the same molecular formula.



(i) Deduce the molecular formula of **X**, **Y** and **Z**.

..... [1]

14 $(\text{CH}_3)_3\text{CCHO}$ is used in the synthesis of some antibiotics.

(a) (i) Give the name of $(\text{CH}_3)_3\text{CCHO}$.

..... [1]