29.1 FORMULAE, FUNCTIONAL GROUPS AND NAMING OF ORGANIC COMPOUNDS

Learning outcomes

Candidates should be able to:

1. Understand that the compounds in the table on page 47 contain a functional group that dictates their physical and chemical properties
2. Interpret and use the general, structural, displayed, and skeletal formulas of the classes of compounds stated in the table on page 47
3. understand and use systematic nomenclature of simple aliphatic organic molecules (including cyclic compounds containing a single ring of up to six carbon atoms) with functional groups detailed in the table on page 47, up to six carbon atoms (six plus six for esters and amides, straight chains only for esters and nitriles)
4. understand and use systematic nomenclature of simple aromatic molecules with one benzene ring and one or more simple substituents, for example, 3-nitrobenzoic acid or 2,4,6-tribromophenol

Introduction

1. A group of drugs known as statins are used to lower cholesterol in the blood. A commonly used statin is atorvastatin.

atorvastatin

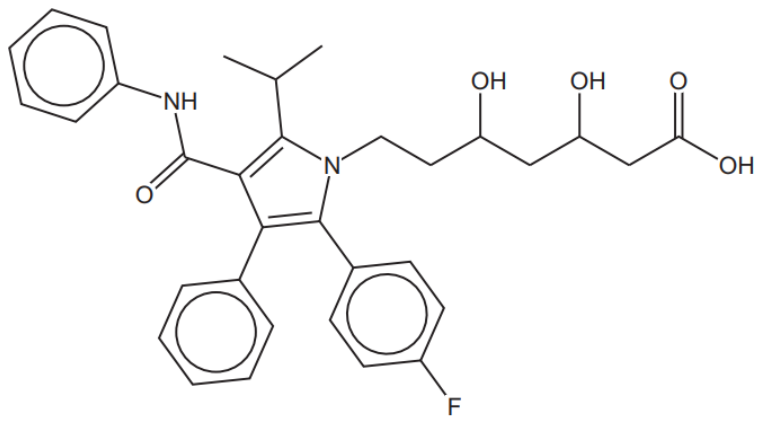
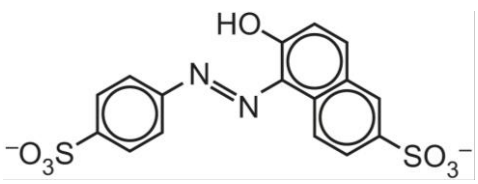


Fig. 5.1

Complete the molecular formula of atorvastatin.

C H_{35}N O F [1]

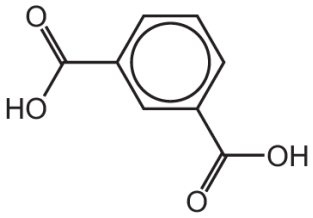
2. State the molecular formula of the Sunset Yellow anion.



..... [1]

3. The structure of benzene-1,3-dicarboxylic acid is shown.

benzene-1,3-dicarboxylic acid



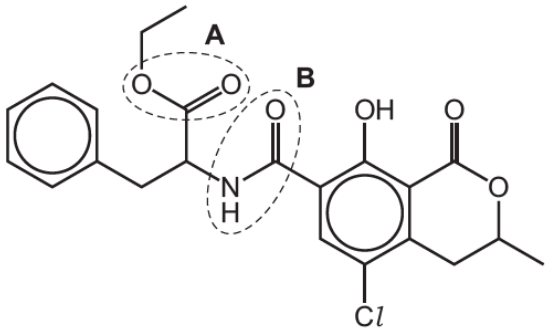
State the empirical formula of benzene-1,3-dicarboxylic acid.

..... [1]

4. Draw the displayed formula of ethanedioic acid. [1]

5. Compound **F** has been found in small quantities in some cereals and dried fruit.

F



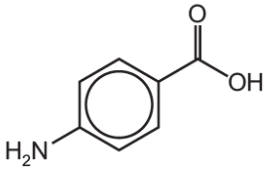
Give the names of the functional groups labelled **A** and **B**.

A .....

B ..... [2]

6. Compounds F and J are shown in Fig. 4.1.

F



J

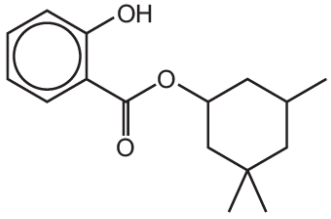


Fig. 4.1

F and J both contain the arene functional group.
Identify the other functional groups in F and J.

F: .....

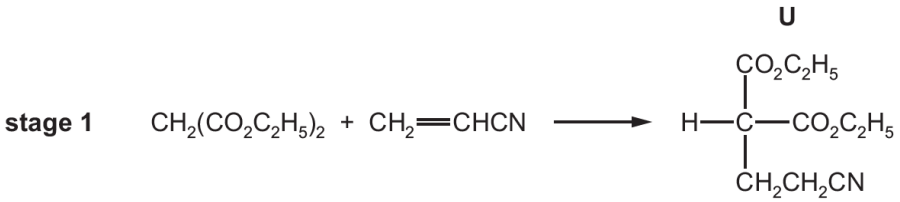
J: ..... [2]

7. Compound **H** has the structural formula CH_2=CHCH(NH_2)COOH.
Name all the functional groups in **H**.

.....

..... [2]

8. Proline was first synthesised in the laboratory using a multi-stage synthetic route.
In stage 1, $CH_2(CO_2C_2H_5)_2$ and CH_2=CHCN react to form a single product U.



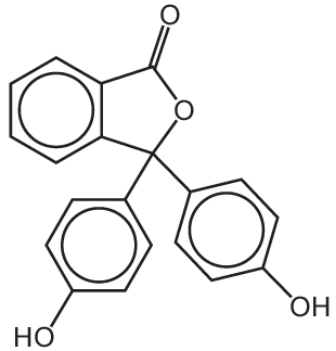
Name all the functional groups present in the reactants of stage 1.

$CH_2(CO_2C_2H_5)_2$ .....

CH_2=CHCN .....[2]

9. Name the functional groups, in addition to the benzene ring, present in a phenolphthalein molecule.

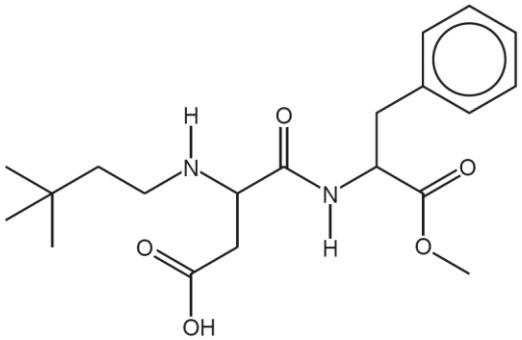
phenolphthalein



..... [1]

10. Neotame is an artificial sweetener added to some foods.

neotame

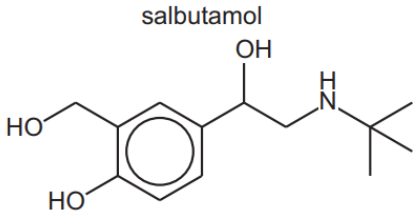


Neotame contains the arene functional group.
Identify all the other functional groups present in neotame.

.....

..... [2]

11. Salbutamol is a pharmaceutical drug that contains a phenol functional group.



Name and classify the three other functional groups in salbutamol in Table 6.1. [2]

Table 6.1

name of functional group	classification of functional group

12. Fig. 9.2 shows compound H which is a useful starting material in organic synthesis.

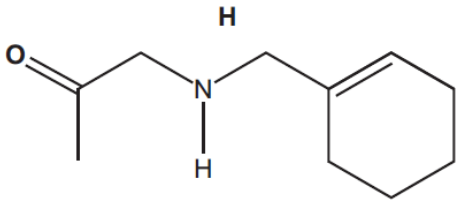


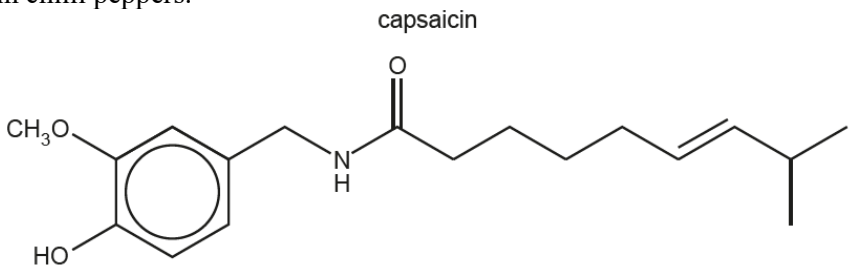
Fig. 9.2

H contains an alkene and an amine functional group.
Name the other functional group and give the classification of the amine group in H.

other functional group in H .....

classification of amine ..... [1]

13. Capsaicin is found in chilli peppers.

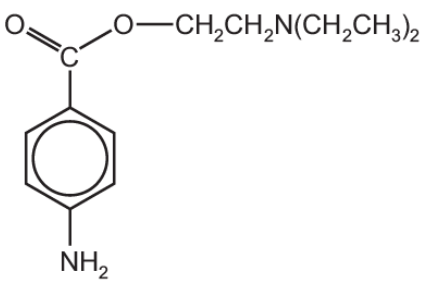


Name all the functional groups in capsaicin in addition to the CH_3O group.

..... [1]

14. Name all the functional groups present in procaine.

procaine



..... [1]

15. Perindopril is a drug used to treat heart disease.

perindopril

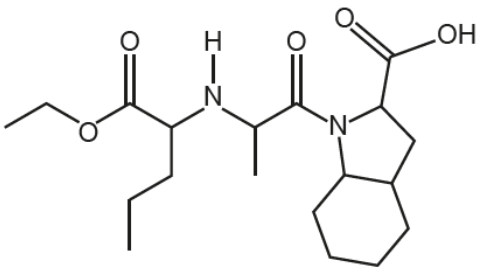


Fig. 6.1

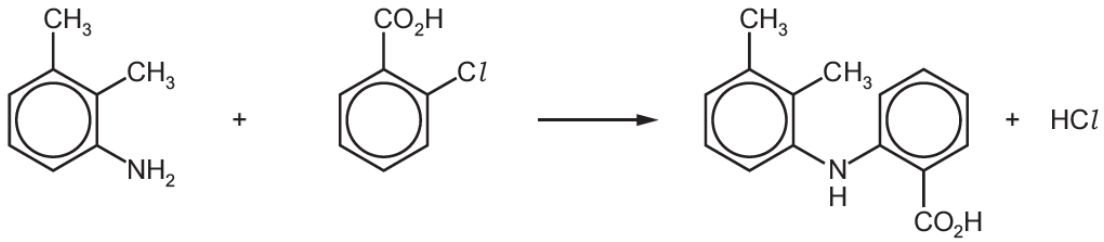
Name all the functional groups in perindopril.

.....

..... [2]

16. The drug mefenamic acid can be made using 2,3-dimethylphenylamine in an excess of 2-chlorobenzoic acid.

2,3-dimethylphenylamine + 2-chlorobenzoic acid → mefenamic acid + HCl



(i) Deduce the molecular formula of mefenamic acid.

..... [1]

(ii) Name the functional groups, apart from the benzene ring, in mefenamic acid.

..... [1]

(iii) Calculate the maximum mass of mefenamic acid that could be formed from 5.00 g of 2,3-dimethylphenylamine in this reaction. Give your answer to three significant figures.

mass of mefenamic acid = ... g [2]

*****This is not a complete note. It is to guide you. It is recommended to study the prescribed textbooks along with this material. *****