

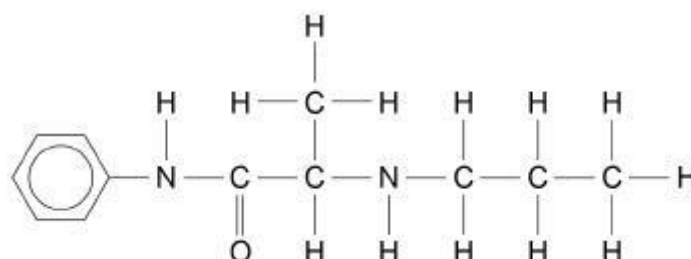
Name of the Student: _____

Max. Marks : 23 Marks

Time : 23 Minutes

Q1.

Prilocaine is used as an anaesthetic in dentistry.

Figure 1 shows the structure of prilocaine.**Figure 1**

- (a) Draw a circle around any chiral centre(s) in
- Figure 1**
- .

(1)

- (b) Identify the functional group(s) in the prilocaine molecule.

Tick (✓) the box(es) corresponding to the functional group(s).

Amide	Amine	Ester	Ketone
☐	☐	☐	☐

(1)

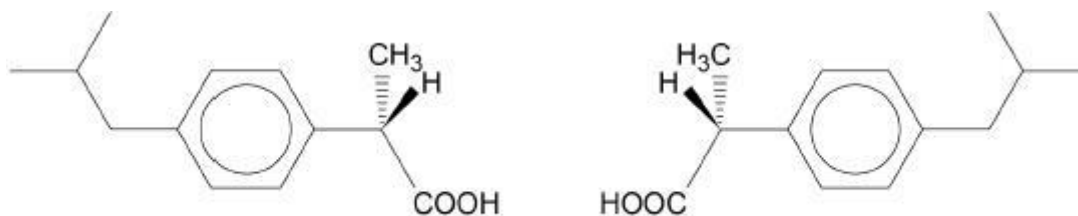
- (c) Prilocaine is completely hydrolysed in the human body to give a mixture of products.

Draw the structures of the two organic products formed in the complete hydrolysis of prilocaine in acidic conditions.

(3)

- (d)
- Figure 2**
- shows optical isomers
- F**
- and
- G**
- .

Figure 2



Isomer **F** is the active compound in the medicine ibuprofen.

In the manufacture of ibuprofen both isomers **F** and **G** are formed. An enzyme is then used to bind to isomer **G** and catalyse its hydrolysis.

After the products of hydrolysis of **G** are removed, a pure sample of isomer **F** is collected.

Explain how a structural feature of this enzyme enables it to catalyse the hydrolysis of isomer **G** but not the hydrolysis of isomer **F**.

(2)
(Total 7 marks)

Q2.

Aspirin can be produced by reacting salicylic acid with ethanoic anhydride.
An incomplete method to determine the yield of aspirin is shown.

1. Add about 6 g of salicylic acid to a weighing boat.
2. Place the weighing boat on a 2 decimal place balance and record the mass.
3. Tip the salicylic acid into a 100 cm³ conical flask.
4. _____
5. Add 10 cm³ of ethanoic anhydride to the conical flask and swirl.
6. Add 5 drops of concentrated phosphoric acid.
7. Warm the flask for 20 minutes.
8. Add ice-cold water to the reaction mixture and place the flask in an ice bath.
9. Filter off the crude aspirin from the mixture and leave it to dry.
10. Weigh the crude aspirin and calculate the yield.

- (a) Describe the instruction that is missing from step 4 of the method.

Justify why this step is necessary.

Instruction _____

Justification _____

(2)

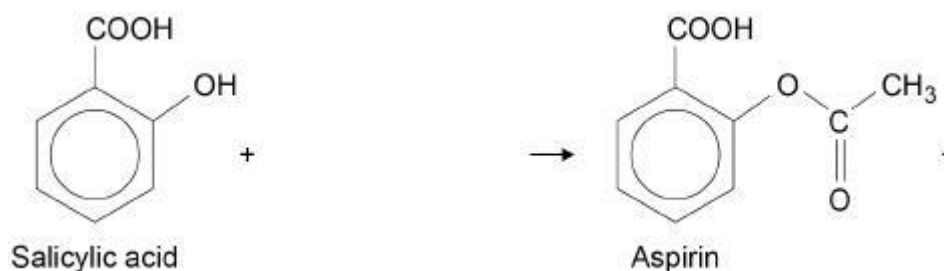
- (b) Suggest a suitable piece of apparatus to measure out the ethanoic anhydride in step 5.

(1)

- (c) Identify a hazard of using concentrated phosphoric acid in step 6.

(1)

- (d) Complete the equation for the reaction of salicylic acid with ethanoic anhydride to produce aspirin.



(1)

- (e) A 6.01 g sample of salicylic acid ($M_r = 138.0$) is reacted with 10.5 cm³ of ethanoic anhydride ($M_r = 102.0$).
In the reaction the yield of aspirin is 84.1%

The density of ethanoic anhydride is 1.08 g cm⁻³

Show by calculation which reagent is in excess.

Calculate the mass, in g, of aspirin ($M_r = 180.0$) produced.

Reagent in excess _____

Mass of aspirin _____ g

(5)

- (f) Suggest **two** ways in which the melting point of the crude aspirin collected in step **9** would differ from the melting point of pure aspirin.

Difference 1 _____

Difference 2 _____

(2)

- (g) The crude aspirin can be purified by recrystallisation using hot ethanol (boiling point = 78 °C) as the solvent.

Describe **two** important precautions when heating the mixture of ethanol and crude aspirin.

Precaution 1 _____

Precaution 2 _____

(2)

- (h) The pure aspirin is filtered under reduced pressure.
A small amount of cold ethanol is then poured through the Buchner funnel.

Explain the purpose of adding a small amount of cold ethanol.

(1)

- (i) A sample of the crude aspirin is kept to compare with the purified aspirin.

Describe **one** difference in appearance you would expect to see between these two solid samples.

(1)

(Total 16 marks)