

Name of the Student: _____

Max. Marks : 19 Marks

Time : 19 Minutes

Q1.

Salicylic acid can be used to make aspirin. Before using a sample of salicylic acid to make aspirin, a student purified the acid by recrystallisation. The method for recrystallisation is outlined below.

Step 1: The sample is dissolved in a minimum volume of hot water.

Step 2: The solution is filtered hot.

Step 3: The filtrate is cooled in ice to form crystals.

Step 4: The crystals are collected by filtration, washed with cold water and left to dry.

Explain the purpose of each underlined point.

Minimum volume _____

Hot water _____

Filtered hot _____

Cooled in ice _____

Washed with cold water _____

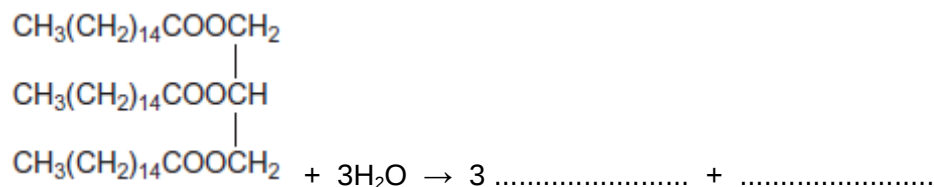
(Total 5 marks)

Q2.

The slowing down of chemical processes is important in food storage. Over time, fats may become rancid. This involves the formation of compounds that have unpleasant odours and flavours within the food.

Hydrolysis of fats is one way in which rancid flavours are formed. Fats break down to long-chain carboxylic (fatty) acids and glycerol.

- (a) Complete the right-hand side of the equation below to show how hydrolysis affects the molecule of fat shown.



(2)

- (b) Other than by cooling, suggest **one** method that would decrease the rate of hydrolysis of fats.

(1)

- (c) Food can also acquire unpleasant flavours when the fatty acids, produced by hydrolysis of fats, are oxidised by air. This oxidation occurs by a free-radical mechanism. Chemicals called anti-oxidants can be added to food to slow down the oxidation. Suggest why anti-oxidants are **not** regarded as catalysts.

(2)

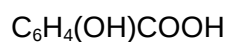
- (d) A student investigated the extent of hydrolysis in an old sample of the fat in part (a). The carboxylic acid extracted from a 2.78 g sample of this fat ($M_r = 806.0$) reacted with 24.5 cm³ of a 0.150 mol dm⁻³ solution of NaOH. Calculate the percentage of the fat that had hydrolysed. Show your working.

(4)
(Total 9 marks)

Q3.

Salicylic acid, $\text{C}_6\text{H}_4(\text{OH})\text{COOH}$, reacts with magnesium to produce magnesium salicylate and hydrogen.

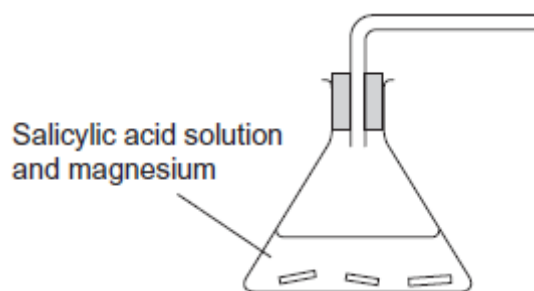
- (a) Complete the equation for this reaction.



(1)

- (b) In an alternative method for determining percentage purity, a student reacted a solution of salicylic acid with an excess of magnesium and collected the hydrogen gas that was released.

Complete the diagram below to show an apparatus that could be used to collect and measure the volume of hydrogen gas produced.



(1)

(Total 2 marks)

Q4.

A student prepared a sample of aspirin (melting point 135 °C) in the laboratory and attempted to purify it by recrystallisation. To check the purity of the aspirin the student determined its melting point.

- (a) State **two** observations, during this melting point determination, that would indicate that the sample is **not** pure.

Observation 1 _____

Observation 2 _____

(2)

- (b) Suggest why a pure sample of aspirin may sometimes appear to melt at a temperature different from 135 °C.

(1)

(Total 3 marks)