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Centre Number

Chemistry

Section I (continued)

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Student Number

Part B – 60 marks

Attempt Questions 16-29

Allow about 1 hour and 45 minutes for this part

Answer the questions in the spaces provided.

Show all relevant working in questions involving calculations.

Marks

Question 16 (4 marks)

Poly(vinyl chloride) is an addition polymer which has many everyday uses.

(a) Draw the structural formula for the vinyl chloride monomer.

1

(b) Define the term *addition polymer*.

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(c) Explain ONE use of this polymer in terms of its physical properties.

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Question 17 (2 marks)**Marks**

The transuranic element Meitnerium was first detected in Germany in 1982. It existed for five-thousandths of a second. Describe how transuranic elements such as Meitnerium are produced.

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Question 18 (2 marks)**Marks**

Describe the uses of ammonia that made Haber's discovery very important at that time in world history.

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Question 19 (5 marks)

Marks

Assess the viability of the use of cellulose from biomass as a substitute for carbon chain structures obtained from petroleum. **5**

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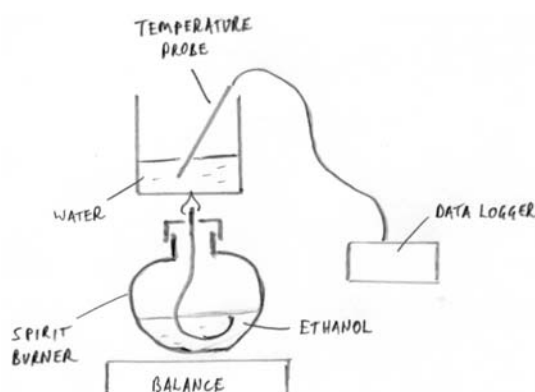
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Question 20 (5 marks)**Marks**

A quantity of ethanol was placed in a spirit burner, the wick lit and the energy produced used to heat 100g of water in a beaker. The change in mass of the spirit burner was measured by placing the burner on an electronic balance. The temperature was measured using a probe attached to a data logger. A diagram of the apparatus is shown.



The results are tabulated below.

Time (mins)	Mass of Burner + Alcohol (g)	Temperature ($^{\circ}\text{C}$)
0	228.3	24
1	227.8	30
2	227.4	37
3	226.9	44
4	226.5	51
5	226.2	58

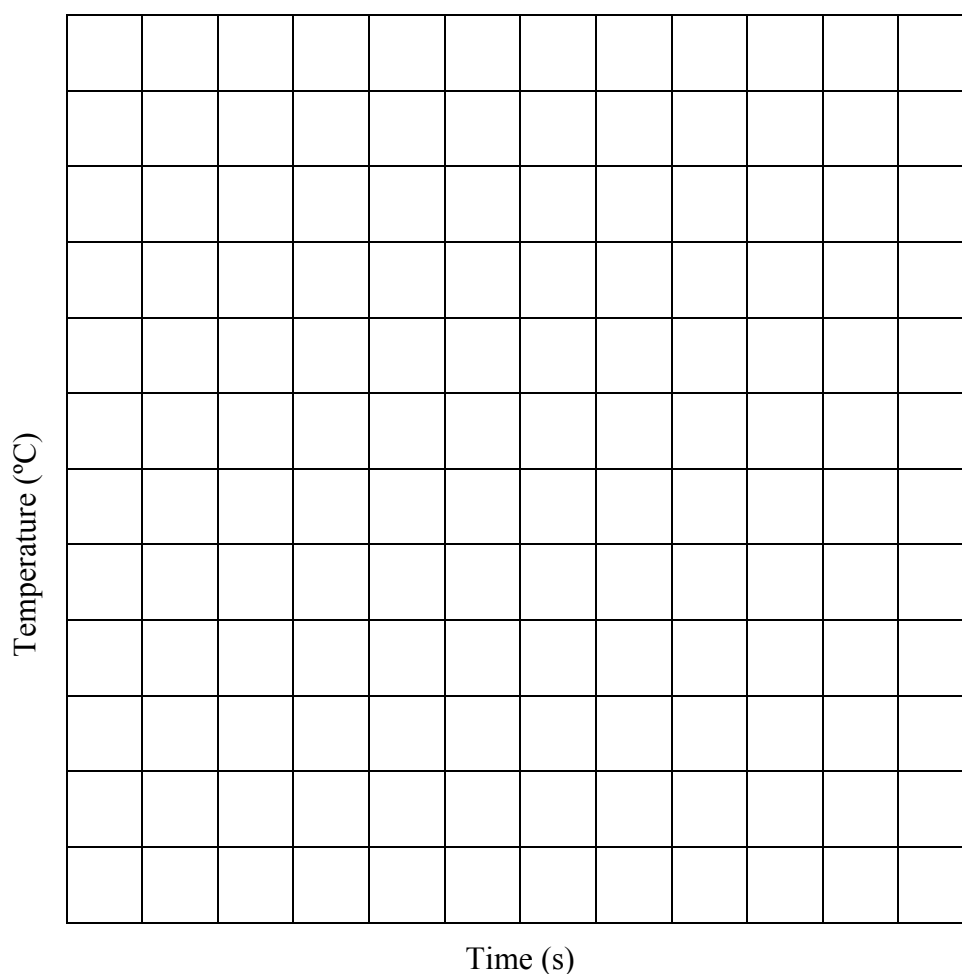
Question 20 continues on page 13

Question 20 (continued)

Marks

- (a) Draw a graph of temperature v time. Use an appropriate scale.

2



- (b) Calculate the molar heat of combustion of ethanol using these data.

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End of Question 20

Question 21 (5 marks)**Marks**

A student constructed an electrochemical cell using nickel, nickel nitrate, silver and silver nitrate. This can be represented by the following chemical shorthand:



(a) Draw a diagram of this electrochemical cell and label the following parts: **3**

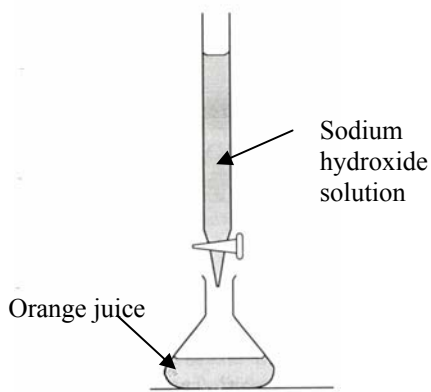
1. anode and cathode
2. the direction of electron flow

(b) Write half equations for each reaction and calculate the cell potential. **2**

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Question 22 (3 marks)**Marks**

To find the citric acid content of some orange juice, a student used the following equipment.



- (a) Identify the piece of equipment that holds the sodium hydroxide solution. **1**

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- (b) Outline the procedure required to rinse this piece of equipment before use. **1**

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- (c) Identify a potential source of error in this experiment. **1**

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Question 23 (3 marks)**Marks**

- (a) Identify a practising Australian scientist you have studied during this Chemistry course. **1**

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- (b) Describe his/her work. **2**

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Question 24 (4 marks)**Marks**

Two identical bottles of soda water (carbonated water), one at room temperature (25°C) and one just out of the refrigerator, had their pH determined using a probe and data logger. The results are tabulated below.

4

Soda Water	pH	Temperature (°C)
Bottle A	5.21	25
Bottle B	4.63	4

Account for the difference in pH in terms of Le Chatelier's principle.

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Question 25 (4 marks)**Marks**

The presence of pairs of chemicals eg $\text{CO}_3^{2-} / \text{HCO}_3^{1-}$, or, $\text{H}_2\text{PO}_4^{1-} / \text{HPO}_4^{2-}$, in the blood is essential to the proper functioning of the body. Describe the action of these chemical pairs using equations.

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Question 26 (7 marks)**Marks**

A 500mL bottle of concentrated sulfuric acid (18 molL^{-1}) was dropped in a laboratory accident. Solid sodium hydrogen carbonate (NaHCO_3) was used to neutralize the spilled acid.

- (a) Justify the choice of the solid sodium hydrogen carbonate to clean up the spill. Include relevant equation(s). **4**

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- (b) Calculate the minimum mass of sodium hydrogen carbonate needed to neutralise the spilled acid completely. **3**

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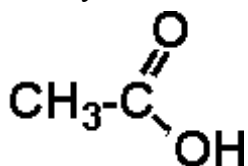
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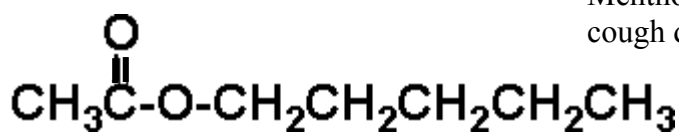
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Question 27 (3 marks)**Marks**

Many organic compounds, other than esters, are responsible for the distinctive aromas or flavours of foods. The following molecules are ‘active’ ingredients in various foods. Only ONE of these is an ester.

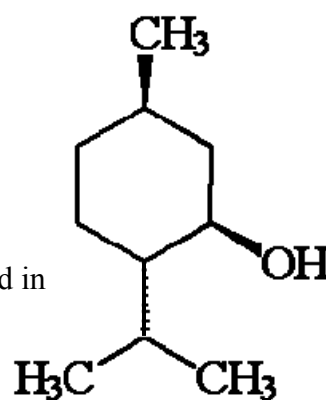


Acetic acid - found in salad dressing



Pentyl ethanoate - found in lollies

Menthol - found in
cough drops



(a) Identify the ester.

1

(b) Outline how this ester could be produced in a school laboratory.

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Question 28 (6 marks)

Marks

- (a) Identify your local catchment area.

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- (b) Outline a chemical test that is carried out to test for a possible named contaminant in a water sample from your local catchment area.

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- (c) Describe the methods used to purify and sanitise the drinking water supplied from your catchment area.

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Question 29 (7 marks)

Marks

Evaluate the effectiveness of the steps taken to alleviate the problems associated with the use of CFCs.

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