2001 HIGHER SCHOOL CERTIFICATE EXAMINATION

# Chemistry

## Section I (continued)

**Part B – 60 marks**
**Attempt Questions 16–27**
**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.

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**Marks**

**Question 16** (3 marks)

Radioisotopes are used in industry, medicine and chemical analysis. For ONE of these fields, relate the use of a named radioisotope to its properties. **3**

Carbon-14 used in the dating of old artifacts. As it has a very long half life and is in all living things once they are dead.

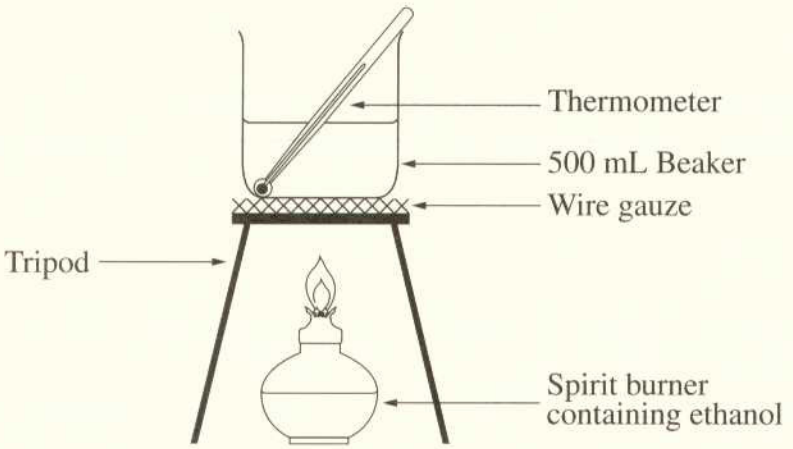
**Marks**

**Question 17** (6 marks)

Students were asked to perform a first-hand investigation to determine the molar heat of combustion of ethanol.

The following extract is from the practical report of one student.

*Apparatus used:*




*Lab data:*

| | | |
|---|---|---|
| Mass of water | = | 250.0 g |
| Initial mass of burner | = | 221.4 g |
| Final mass of burner | = | 219.1 g |
| Initial temperature of water | = | 19.0°C |
| Final temperature of water | = | 59.0°C |

(a) After completing the calculations correctly, the student found that the answer did not agree with the value found in data books. Suggest ONE reason for this. **1**

Excess oxygen may have been let in, causing the results to differ

(b) Propose TWO adjustments that could be made to the apparatus or experimental method to improve the accuracy of the results. **2**

* A shield could be placed around the spirit burner to prevent oxygen coming in.
* Measure temperature of ethanol.

**Question 17 continues on page 11**

**Marks**

Question 17 (continued)

(c) Calculate the molar heat of combustion of ethanol, using the student's data. **3**

$q = m\,SH\Delta T$

$= 250 \times 4.18 \times 40$

$= 41800$

$= 41.8\ kJ/mol$

**End of Question 17**

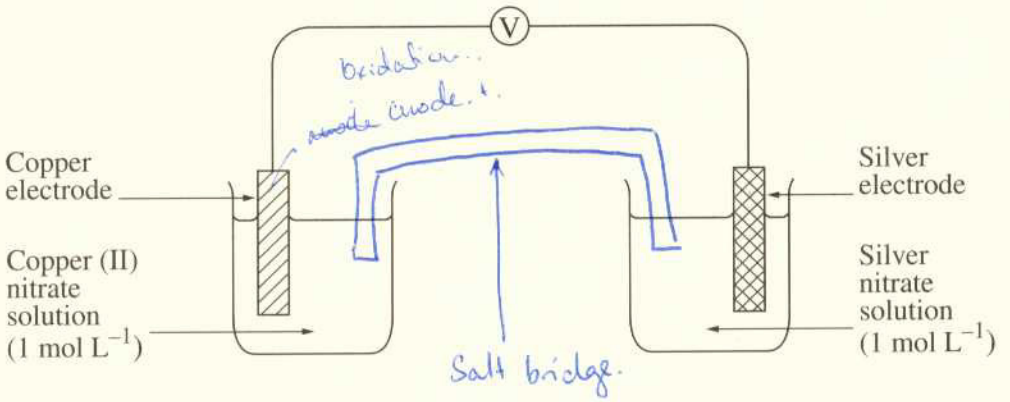
**Please turn over**

**Marks**

**Question 18** (6 marks)

anode −

A galvanic cell was made by connecting two half-cells. One half-cell was made by putting a copper electrode in a copper (II) nitrate solution. The other half-cell was made by putting a silver electrode in a silver nitrate solution. The electrodes were connected to a voltmeter as shown in the diagram.




(a) Complete the above diagram by drawing a salt bridge. **1**

(b) Using the *standard potentials* table in the data sheet, calculate the theoretical voltage of this galvanic cell. **2**

Voltage = 0.34 V

(c) A student removes the voltmeter from the circuit and replaces it with an electrical generator. The generator causes the copper electrode to increase in mass. **3**

electrolysis anode +.

Explain, using an equation, why the copper electrode will increase in mass.

The copper electrode will increase in mass due to do this being a electrolic cell, this means that the power electrical generator is pumping e's into the anode, forcing it to be positive. e.g. $Cu_{(s)} \rightarrow Cu^{2+} + 2e^-$

∴ in electrolytic cell the anode is positive and in galvanic cell the anode is negative.