

# 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.

---

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

Medicine, Gamma rays used to treat skin  
cancer for those ~~with~~ with cancer and also  
with other medical problems.

.....

.....

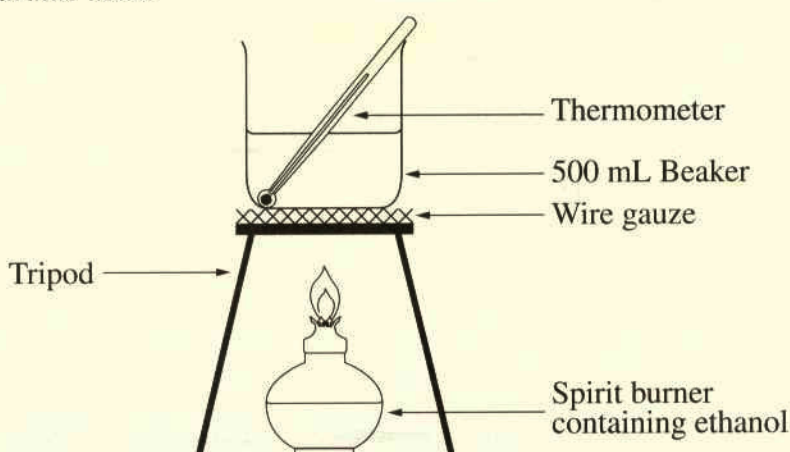
.....

**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

They..... probably..... didn't..... have..... the..... exact..... amount..... of..... a..... particular..... substance..... which..... would..... change..... the..... results.....

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

- raise the spirit burn so no heat is lost to the surrounding.....  
 - make sure all accurate amount of substances are added.....

Question 17 continues on page 11

## Question 17 (continued)

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

$$\text{mass of H}_2\text{O} = 250 \text{ g.}$$

$$\text{mass of burner} = 221.4 - 219.1 = 2.3 \text{ g.}$$

$$\text{temp. of H}_2\text{O} = 59 - 19 = 40.$$

$$\Delta H = mc\Delta T$$

$$= 250 \times 4.18 \times 2.3 \times 40.$$

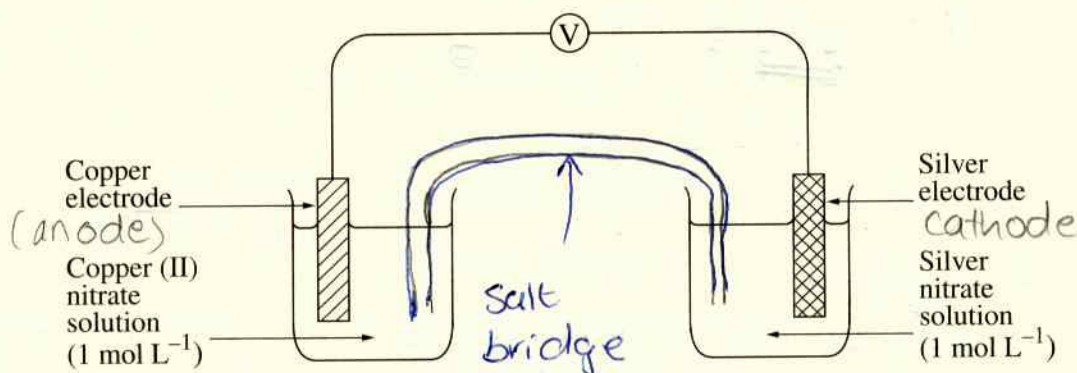
$$= 96140 \text{ kJ}$$

End of Question 17

Please turn over

Question 18 (6 marks)

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

$$E_{\text{cell}}^{\circ} = E_{\text{reduc}}^{\circ} + E_{\text{oxid}}^{\circ}$$

$$= 0.77 - 0.52 = 0.25 \text{ volt}$$

(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

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

The copper electrode will increase in mass because of deposits of the impure copper <sup>electrode</sup> (cathode) at the pure copper electrode (anode)

