Chemistry

S	3	7		

Centre Number

Section I (continued)

1	1	2	1	8	3	6	9	

Student Number

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 – The radioisotopes used for medical treatments, such as for cancer patients, need to have a relatively low half life. A balance needs to be struck between half life and ionising power. A radioisotope with a half life of 6000 year, used for carbon dating would not be used, but more likely, one with less power, and a shorter half life of around 12 - 24 hours.

–9–

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:

Thermometer

500 mL Beaker

Wire gauze

Tripod

Spirit burner containing ethanol
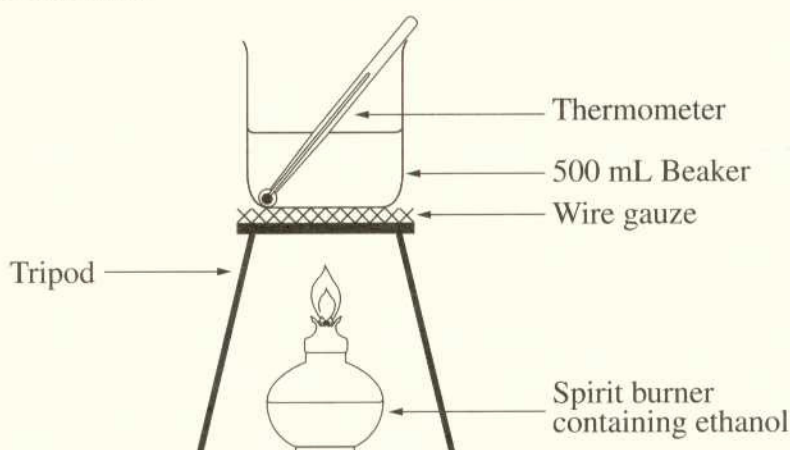
Lab data:

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

One reason for this is ~~because~~ because the beaker has absorb some of the heat from the spirit burner

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

2

One adjustment is to do the experiment in a suitable environment such as no wind etc. this would mean that the experiment should be done indoors & windows close & doors to prevent the lose of heat, The distance of the flame to the beaker to be kept constant.

Question 17 (continued)

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

$$\Delta H = ^- m C \Delta T$$

$$\Delta H = -(2.3 \times 4.18 \times 10^3 \times 40)$$

$$= -384.56 \; J/g$$

This means that the lost of cooler

This suggest that heat is lose since is negative

& an exothermic reaction with 384.56 J/g

lost of heat.

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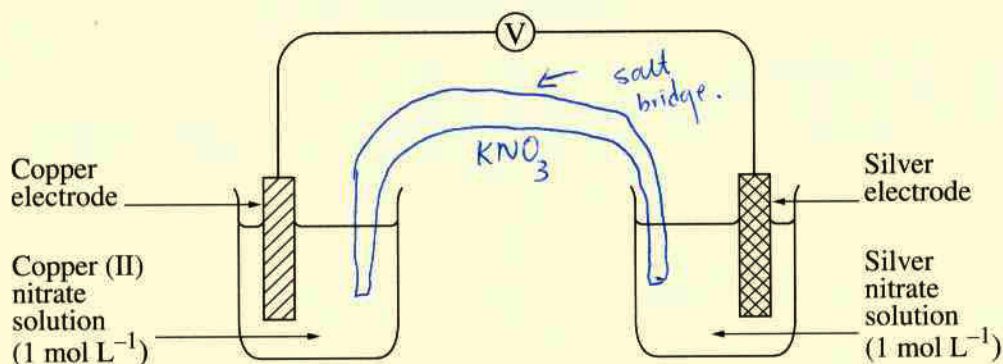
(a) Complete the above diagram by drawing a salt bridge.

1

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

2

Cu 0.34v $Cu \rightarrow Cu^{2+} + e^-$ 0.34v

Ag 0.80v $Ag^+ + e^- \rightarrow Ag(s)$ 0.80v

= 0.34v + 0.80v = 1.14v

(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.

A electrical generator generates electricity. The mass of elec produce at the electrode is proportional to the amount of electricity put in. Therefore, by replacing the voltmeter with generator, you are adding electricity and thus increase mass at the copper electrode.