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

Iodine is used in medicine for testing glands.
Iodine has a short half-life, and therefore
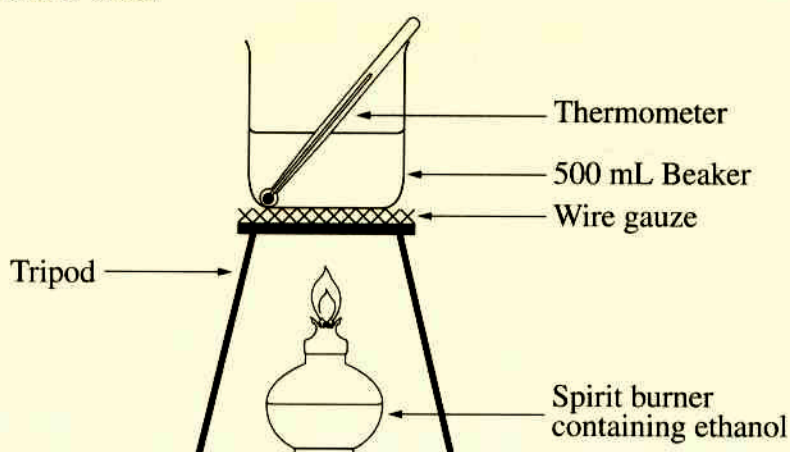_breaks down quickly, which is makes it safer to_
use with people.

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   1
did not agree with the value found in data books. Suggest ONE reason for this.

The heat was able to escape use The amount of ethanol
used in the students experiment can differ to the data books experiment.

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

The distance of the burner and the beaker can result in heat loss, so find
found out the distance that the book used to ensure minimum heat loss
The initial temperature of water and mass of water can vary from the
2 experiment so adjust the temperature and mass of water so you would get the
correct value of the book

Question 17 continues on page 11

– 10 –

Question 17 (continued)

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

$\Delta H =$ $H = mc \, \ell g \quad m = 250.0g$

for water

$H = m \times C \times temp \quad C = 2.4$

$= 250 \times 4.2 \times 40 \quad temp = 40°C$
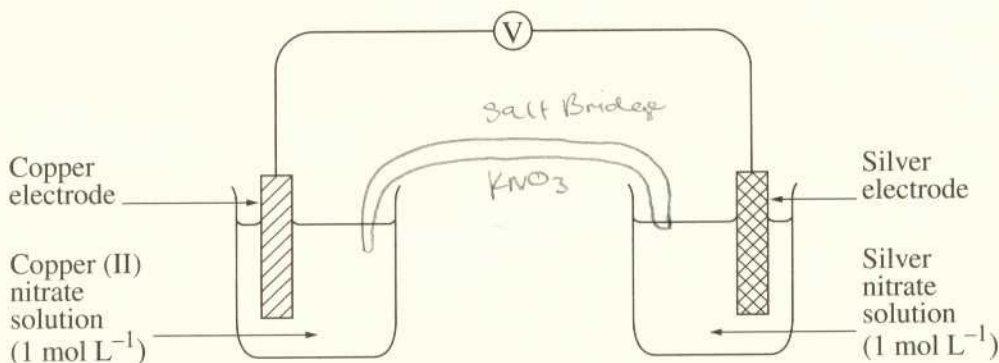
$= 42000$

**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

$$Ag^+ + e^- \rightarrow Ag_{(s)} \qquad E^\circ = +0.80$$
$$Cu_{(s)} \rightarrow Cu^+ + e^- \qquad E^\circ = -0.52$$
$$E^\circ = 0.28 \checkmark$$
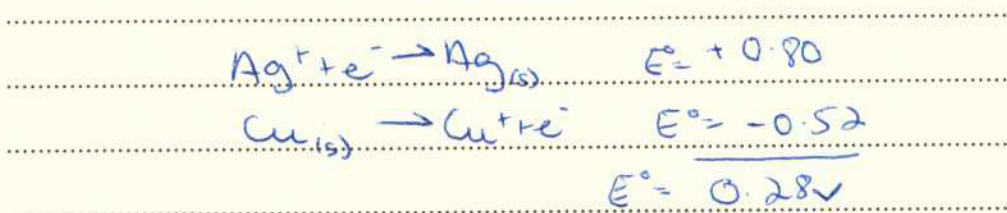
(c) A student removes the voltmeter from the circuit and replaces it with an electrical generator. The generator causes the copper electrode to increase in mass.

3

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

It will increase in mass as the silver will ~~restore~~ ~~~~ ~~will be silver plated~~ plate the copper so that it is silver plated. As the silver oxidises first or in ~~the~~ preference.