BRITISH
COLUMBIA

Chemistry 12
Resource Exam A
Response Booklet

Instructions

Answer the following questions in the space provided in this **Response Booklet**.
You are expected to communicate your knowledge and understanding of chemical
principles in a clear and logical manner. Your steps and assumptions leading to a
solution must be written in this **Response Booklet**. Answers must include units where
appropriate and be given to the correct number of significant figures. **For questions
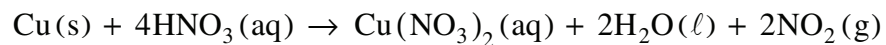involving calculations, full marks will NOT be given for providing only an answer.**

PART B: WRITTEN RESPONSE
Value: 37.5% of the examination

Suggested Time: 40

1. **(4 marks)**

In a fume hood, a student reacted copper and nitric acid in a flask according to the following equation:

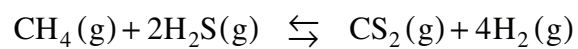$$Cu(s) + 4HNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2H_2O(\ell) + 2NO_2(g)$$

The following data was collected:

Time (min)	Mass of flask and contents (g)
0.0	250.50
2.5	249.25
5.0	248.24
7.5	247.44

Calculate the overall rate of reaction in grams NO_2 per minute.

How much time will it take to react 0.50 g of Cu at this rate?

2. **(4 marks)**

   Consider the following equilibrium:

$$CH_4(g) + 2H_2S(g) \leftrightarrows CS_2(g) + 4H_2(g)$$

   Initially, 0.120 mol CH_4 and 0.280 mol H_2S were placed in a 2.00 L flask. At equilibrium, $[CS_2] = 0.030 \frac{mol}{L}$. Calculate K_{eq}.

3. **(4 marks)**

Write the net ionic equation for the reaction that occurs when 40.0 mL of 1.50 M $AgNO_3$ mixed with excess Na_2SO_4 solution, and calculate the mass of the precipitate that forms.

4. **(3 marks)**

   Identify an amphiprotic substance and write two balanced equations that demonstrate its amphiprotic nature.

5. **(5 marks)**

A 2.00 M diprotic acid (H_2X) has a pH of 0.60. Calculate its K_a value. Start by writing general equation for the predominant equilibrium.
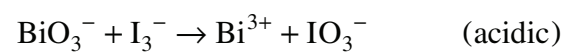
6. **(3 marks)**

A titration was performed by adding 0.125 M NaOH to a 25.00 mL sample of H_2SO_4.
Calculate the $[H_2SO_4]$ from the following data.

	Trial #1	Trial #2	Trial #3
Initial volume of NaOH (mL)	4.00	17.05	8.00
Final volume of NaOH (mL)	17.05	28.00	19.05

7. **(4 marks)**

Balance the following in acidic solution.

$$BiO_3^- + I_3^- \rightarrow Bi^{3+} + IO_3^- \qquad (acidic)$$

8. **(3 marks)**

Draw an operating electrolytic cell used in the electrolysis of molten sodium chloride, NaCl. Label the anode and cathode.