Your responses to the rest of the questions in this part of the examination will be graded on the basis of the accuracy and relevance of the information cited. Explanations should be clear and well organized. Examples and equations may be included in your responses where appropriate. Specific answers are preferable to broad, diffuse responses.

Answer BOTH Question 5 below AND Question 6 printed on page 12. Both of these questions will be graded. The Section II score weighting for these questions is 30 percent (15 percent each).

$$2\ Al(s)\ +\ 2\ KOH(aq)\ +\ 4\ H_2SO_4(aq)\ +\ 22\ H_2O(l)\ \rightarrow\ 2\ KAl(SO_4)_2{\cdot}12H_2O(s)\ +\ 3\ H_2(g)$$

5. In an experiment, a student synthesizes alum, $KAl(SO_4)_2{\cdot}12H_2O(s)$, by reacting aluminum metal with potassium hydroxide and sulfuric acid, as represented in the balanced equation above.

   (a) In order to synthesize alum, the student must prepare a 5.0 *M* solution of sulfuric acid. Describe the procedure for preparing 50.0 mL of 5.0 *M* H_2SO_4 using any of the chemicals and equipment listed below. Indicate specific amounts and equipment where appropriate.

10.0 *M* H_2SO_4	50.0 mL volumetric flask
Distilled water	50.0 mL buret
100 mL graduated cylinder	25.0 mL pipet
100 mL beaker	50 mL beaker

   (b) Calculate the minimum volume of 5.0 *M* H_2SO_4 that the student must use to react completely with 2.7 g of aluminum metal.

   (c) As the reaction solution cools, alum crystals precipitate. The student filters the mixture and dries the crystals, then measures their mass.

      (i) If the student weighs the crystals before they are completely dry, would the calculated percent yield be greater than, less than, or equal to the actual percent yield? Explain.

      (ii) Cooling the reaction solution in an ice bath improves the percent yield obtained. Explain.

   (d) The student heats crystals of pure alum, $KAl(SO_4)_2{\cdot}12H_2O(s)$, in an open crucible to a constant mass. The mass of the sample after heating is less than the mass before heating. Explain.

GO ON TO THE NEXT PAGE.