

3. Answer the following questions relating to the element aluminum, Al.

- (a) Write the complete ground-state electron configuration of an Al atom.
- (b) Based on principles of atomic structure, explain why the radius of the Al atom is larger than the radius of the Al^{3+} ion.

A student plans to combine solid aluminum with an aqueous solution of silver ions. The student determines the mass of solid AgNO_3 needed to prepare the solution with a specific concentration.

- (c) In the following table, briefly list the steps necessary to prepare 200.0 mL of an aqueous solution of AgNO_3 using only equipment selected from the choices given. Assume that all appropriate safety measures are already in place. Not all equipment or lines in the table may be needed.

- Solid AgNO_3

· Distilled water

· Balance
- Weighing paper and scoop

· 200.00 mL volumetric flask

· 50.0 mL graduated cylinder
- 250 mL beakers

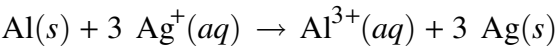
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Step	Step Description
1.	Use weighing paper to measure the determined mass of solid AgNO_3 on a balance.
2.	

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Continue your response to QUESTION 3 on this page.

After preparing the solution, the student places some of the solution into a beaker and adds a sample of aluminum. The reaction represented by the following equation occurs.



- (e) Using the standard reduction potentials, calculate the value of E° for the reaction.
- (f) Based on the value of E° , would the standard free energy change of the reaction under standard conditions, ΔG° , be positive, negative, or zero? Justify your answer.
- (g) Once the reaction appears to stop progressing, would the change in free energy, ΔG , be positive, negative, or zero? Justify your answer.

GO ON TO THE NEXT PAGE.