$$2\ Al(s) + 3\ Zn^{2+}(aq) \rightarrow 2\ Al^{3+}(aq) + 3\ Zn(s)$$

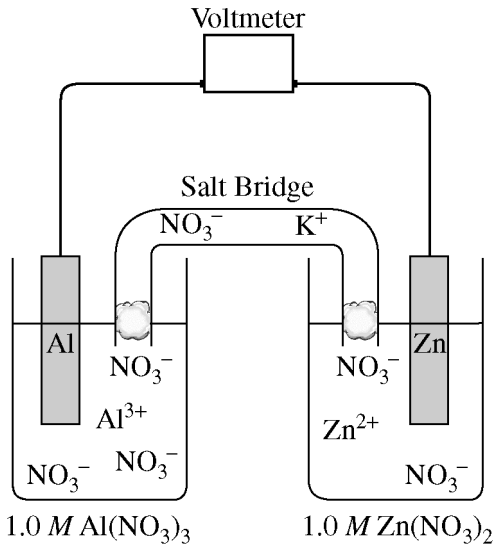
6. Respond to the following statements and questions that relate to the species and the reaction represented above.

   (a) Write the complete electron configuration (e.g., $1s^2\,2s^2\,\ldots$) for Zn^{2+}.

   (b) Which species, Zn or Zn^{2+}, has the greater ionization energy? Justify your answer.

   (c) Identify the species that is oxidized in the reaction.

   The diagram below shows a galvanic cell based on the reaction. Assume that the temperature is 25°C.



   (d) The diagram includes a salt bridge that is filled with a saturated solution of KNO_3. Describe what happens in the salt bridge as the cell operates.

   (e) Determine the value of the standard voltage, $E°$, for the cell.

   (f) Indicate whether the value of the standard free-energy change, $\Delta G°$, for the cell reaction is positive, negative, or zero. Justify your answer.

   (g) If the concentration of $Al(NO_3)_3$ in the $Al(s)/Al^{3+}(aq)$ half-cell is lowered from 1.0 *M* to 0.01 *M* at 25°C, does the cell voltage increase, decrease, or remain the same? Justify your answer.

STOP

END OF EXAM