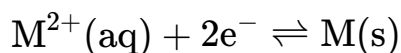


Nernst Equation: Electrode Potential Factors

<https://gemini.google.com/app/fc175b7cce97e79e>

Response: The reduction half-reaction for the given electrode system is:



According to the Nernst equation, the electrode potential E at temperature T is given by:

$$E = E^{\circ} - \frac{RT}{nF} \ln \left(\frac{1}{[\text{M}^{2+}]} \right)$$

where:

- E° is the standard electrode potential.
- R is the universal gas constant.
- T is the absolute temperature.
- n is the number of electrons transferred ($n = 2$).
- F is Faraday's constant.
- $[\text{M}^{2+}]$ is the concentration of the aqueous metal ions.

Analysis of Factors

- **(a) Surface area of $\text{M}(\text{s})$:** Electrode potential is an intensive property and does not depend on the surface area or mass of the solid electrode. (Pure solids have an activity of 1).
- **(b) Concentration of $\text{M}^{2+}(\text{aq})$:** As shown in the Nernst equation, changing $[\text{M}^{2+}]$ directly alters the value of E .
- **(c) Temperature:** Temperature T appears directly in the Nernst equation (and affects E°), so E changes with temperature.
- **(d) Volume of $\text{M}^{2+}(\text{aq})$ solution:** Changing the volume without changing concentration has no effect on the electrode potential (an intensive property).

Correct Factors: (b) and (c)
