Question:

Calculate the potential for each cell as shown below and indicate whether the metal electrode in the half-reaction opposite the standard hydrogen electrode, S.H.E., would be the anode or the cathode if the cell was shorted and electrons were allowed to flow freely at 25 °C.

A) S.H.E. || Zn2 (aq, 0.0520 M) | Zn(s)

E°Zn2+/Zn= -0.762 V

E Cell= ? V

The Zn electrode is:
a. anode
b. cathode

B) Pt(s) | V3 (aq, 0.355 M), V2 (aq, 0.00700 M) || S.H.E.

E°V3+/V2+ = 0.255 V

Ecell= ? V

The Pt electrode is:
a. anode
b. cathode

Solution:

$$E^0_{cell} = E^0_{cathode} - E^0_{anode};$$

$$E^0_{S.H.E.} = 0\ V;$$

    A) The Zn electrode is anode;
        S.H.E is cathode;

$$E^0_{cell} = E^0_{cathode} - E^0_{anode} = 0 - (-0.762) = 0.762\ V;$$

    B) The Pt electrode is cathode;
        S.H.E is anode;

$$E^0_{cell} = E^0_{cathode} - E^0_{anode} = 0.255 - (0) = 0.255\ V.$$

  Answer:

    A) The Zn electrode is anode, E_{cell} = 0.762 V;
    B) The Pt electrode is cathode, E_{cell} = 0.255 V.