Do You Ever Feel Like A Sacrificial Anode?

[17 marks]

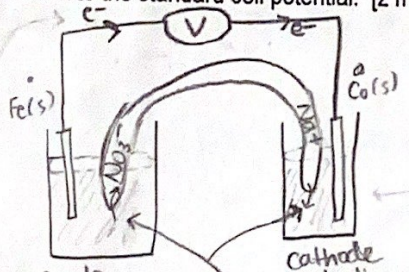
33/42 79%

20/25

Written

1. In an experiment, the following galvanic cell is set up, $Fe(s)\,|\,Fe^{2+}(aq)\,||\,Co^{2+}(aq)\,|\,Co(s)$.
   - i. Draw a diagram of this galvanic cell. Include the beakers, salt bridge (containing sodium nitrate), specific electrodes, specific electrolytes, external circuit and voltmeter. [4 marks]
   - ii. Indicate the direction of electron flow on the diagram. [1 mark]
   - iii. Indicate the direction of ion flow from the salt bridge on the diagram. [2 mark]
   - iv. Label the anode and cathode on the diagram. [2 marks]
   - v. Write out the half cell reactions occurring at each electrode, under the appropriate compartment. Include the standard half cell potentials with the half cell reactions. [4 marks]
   - vi. Write out the overall net cell reaction. [2 marks]
   - vii. Calculate the standard cell potential. [2 marks]

i)



anode
oxidation

$Fe^{2+}(aq) + 2e^- \rightleftarrows Fe(s)$ $E^\circ_{ox} = 0.440$

cathode
reduction

$Co^{2+}(aq) + 2e^- \rightarrow Co(s)$ $E^\circ_{red} = -0.277$

ii) going towards cathode, on diagram

iii) on diagram

iv) on diagram

v) on diagram

vi) $Fe^{2+}(aq) + 2e^- \rightleftarrows Fe(s)$ $E^\circ_{ox} = 0.440\,V$

$Co^{2+}(aq) + 2e^- \rightarrow Co(s)$ $E^\circ_{red} = -0.277\,V$

$= Fe^{2+}(aq) + Co^{2+}(aq) + 4e^- \rightarrow Fe(s) + Co(s)$

vii) $0.440 + (-0.277) = 0.163\,V$