Worksheet: Standard Reduction Potential

Q1: Using the standard electrode potentials shown in the table, determine which of the following metals is the most prone to corrosion.

Half-Equation	$Au^{3+}(aq) + 3e^- \longrightarrow Au(s)$	$Fe^{2+}(aq) + 2e^- \longrightarrow Fe(s)$	$Fe^{3+}(aq) + e^- \longrightarrow Fe^{2+}(aq)$	$Mg^{2+}(aq) + 2e^- \longrightarrow Mg(s)$	$Hg_2^{2+}(aq) + 2e^- \longrightarrow 2Hg(l)$	$Hg^{2+}(aq) + 2e^- \longrightarrow Hg(l)$	$Zn^{2+}(aq) + 2e^- \longrightarrow Zn(s)$
Standard Electrode Potential, $E^\ominus$ (V)	+1.498	−0.447	+0.771	−2.372	+0.7973	+0.851	−0.7618

A Hg

B Au

C Mg

D Zn

E Fe

Q2: Using the standard electrode potentials shown in the table, determine which of the following ions is the strongest oxidizing agent in acidic aqueous solutions.

Half-Equation	$Cr_2O_7^{2-} + 14H^+ + 6e^- \longrightarrow 2Cr^{3+} + 7H_2O$	$MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{2+} + {}_4H_2O$	$TiO_2 + 4H^+ + 2e^- \longrightarrow Ti^{2+} + 2H_2O$
Standard Electrode Potential, $E^\ominus$ (V)	+1.33	+1.51	−0.50

A Chromium(III) ions

B Manganese(II) ions

C Dichromate ions, which contain chromium(VI)

D Titanium dioxide, which contains titanium(IV)

E Permanganate ions, which contain manganese(VII)

Q3: Iron, the major reactive component of steel, has a standard reduction potential of −0.447 V. Using the standard electrode potentials shown in the table, determine which of the following metals could be used as a sacrificial anode in the cathodic protection of an underground steel storage tank.

Half-equation	$Cd^{2+}(aq) + 2e^- \longrightarrow Cd(s)$	$Au^{3+}(aq) + 3e^- \longrightarrow Au(s)$	$Ni^{2+}(aq) + 2e^- \longrightarrow Ni(s)$	$Ag^{+}(aq) + e^- \longrightarrow Ag(s)$	$Zn^{2+}(aq) + 2e^- \longrightarrow Zn(s)$
Standard electrode potential, $E^{\ominus}$ (V)	−0.4030	+1.498	−0.257	+0.7996	−0.7618

A Zn

B Au

C Ni

D Cd

E Ag