

Printed Name: _____

Student Number: _____

Signature: _____

CHEMISTRY 1420

PRACTICE QUESTIONS - ELECTROCHEMISTRY

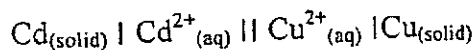
Question 1: What is the oxidation number of sulfur in H_2SO_4 ?

- (a) -2
- (b) +2
- (c) -6
- (d) +6
- (e) +4

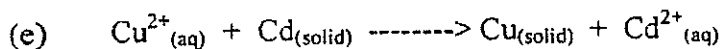
Question 2: Which of the following is not an example of an oxidation-reduction reaction?

- (a) $\text{N}_{2(\text{g})} + 0.5 \text{O}_{2(\text{g})} \rightarrow \text{N}_2\text{O}_{(\text{g})}$
- (b) $\text{Al}_{(\text{s})} + \text{KOH}_{(\text{aq})} \rightarrow \text{KAl}(\text{OH})_4 + \text{H}_{2(\text{gas})}$
- (c) $\text{N}_2\text{H}_{4(\text{liq})} \rightarrow 2 \text{H}_{2(\text{g})} + \text{N}_{2(\text{g})}$
- (d) $2 \text{Na}_{(\text{s})} + 2 \text{H}_2\text{O}_{(\text{liq})} \rightarrow 2 \text{NaOH}_{(\text{aq})} + 2 \text{H}_{2(\text{g})}$
- (e) None of the above answers are correct. All four reactions involve the transfer of electrons.

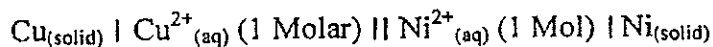
Question 3: In the following electrochemical cell, what is the half-reaction pertaining to the anode?



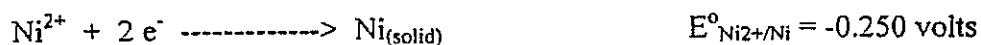
- (a) $\text{Cu}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Cu}_{(\text{solid})}$
- (b) $\text{Cd}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Cd}_{(\text{solid})}$
- (c) $\text{Cu}_{(\text{solid})} \rightarrow \text{Cu}^{2+}_{(\text{aq})} + 2 \text{e}^-$
- (d) $\text{Cd}_{(\text{solid})} \rightarrow \text{Cd}^{2+}_{(\text{aq})} + 2 \text{e}^-$



Question 4: In the following electrochemical cell, what is the E°_{cell} ?

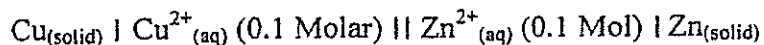


The standard reduction potentials for



- (a) -0.087 volts
- (b) 0.087volts
- (c) 0.587 volts
- (d) - 0.587 volts
- (e) 0 volts as the system is at equilibrium

Question 5: In the following electrochemical cell, what is the E°_{cell} ?



The standard reduction potentials for



- (a) -0.426 volts
- (b) 0.426 volts
- (c) 1.100 volts
- (d) - 1.100 volts
- (e) None of the answers are correct

Question 6: What is the oxidation number of arsenic in H_3AsO_4 ?

- (a) +4
- (b) +5
- (c) -2
- (d) -4
- (e) None of the above answers are correct

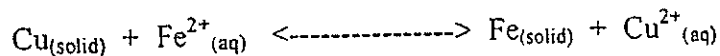
Question 7: Which of the following is an example of an oxidation-reduction reaction

- (a) $\text{Na}_2\text{CO}_{3(\text{aq})} + 2 \text{HCl}_{(\text{aq})} \rightarrow 2 \text{NaCl}_{(\text{aq})} + \text{CO}_{2(\text{gas})} + \text{H}_2\text{O}_{(\text{liq})}$
- (b) $\text{AgNO}_{3(\text{aq})} + \text{NaCl}_{(\text{aq})} \rightarrow \text{AgCl}_{(\text{s})} + \text{NaNO}_2$
- (c) $2 \text{Ag}^+_{(\text{aq})} + \text{Cu}_{(\text{s})} \rightarrow 2 \text{Ag}_{(\text{s})} + \text{Cu}^{2+}_{(\text{aq})}$
- (d) $2 \text{LiOH}_{(\text{aq})} + \text{H}_2\text{SO}_{4(\text{aq})} \rightarrow 2 \text{H}_2\text{O}_{(\text{liq})} + \text{Li}_2\text{SO}_{4(\text{aq})}$
- (e) $\text{FeS}_{(\text{aq})} + 2 \text{HCl}_{(\text{aq})} \rightarrow \text{FeCl}_2 + \text{H}_2\text{S}_{(\text{aq})}$

Question 8: Use the table of standard reduction potentials at the back of the exam to answer this question. Which of the following ions will Pb metal be able to displace from an aqueous solution?

- (a) K^+
- (b) Zn^{2+}
- (c) Cu^{2+}
- (d) Ni^{2+}
- (e) Mg^{2+}

Question 9: Calculate the equilibrium constant for the following reaction:

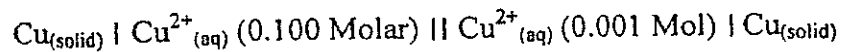


Given that $E^\circ_{\text{cell}} = 0.78$ volts

- (a) 2.2×10^{26}
- (b) 2.2×10^{-26}

- (c) 1.1×10^{22}
- (d) 6.5×10^{20}
- (e) 4.55×10^{-23}

Question 10: In the following electrochemical concentration cell, what is the E_{cell} ?



The standard reduction potentials for

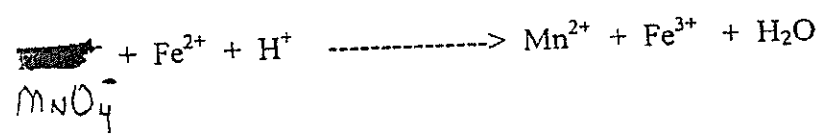


$$E^{\circ}_{\text{Cu}^{2+}/\text{Cu}} = 0.337 \text{ volts}$$

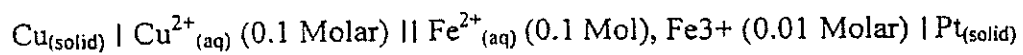
- (a) 0.0592 volts
- (b) -0.0592 volts
- (c) 0.337 volts
- (d) 0.278 volts
- (e) 0.306 volts

NON-MULTIPLE CHOICE QUESTIONS

Question 11: Balance the following chemical reaction



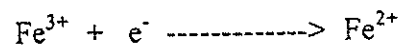
Question 16: Calculate the potential of the following electrochemical cell:



The standard reduction potentials for



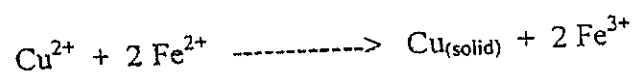
$$E^{\circ}_{\text{Cu}^{2+}/\text{Cu}} = 0.337 \text{ volts}$$



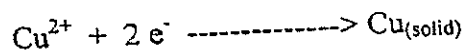
$$E^{\circ}_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771 \text{ volts}$$

Question 18:

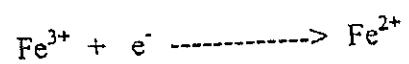
What is the equilibrium constant for the following reaction



Information given:



$$E^{\circ}_{\text{Cu}^{2+}/\text{Cu}} = 0.337 \text{ volts}$$



$$E^{\circ}_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771 \text{ volts}$$

