

Name _____

Redox Review (Honors)

- ___ 1. Given the redox reaction: $\text{Fe}^{+2}_{(\text{aq})} + \text{Zn}_{(\text{s})} \rightarrow \text{Zn}^{+2}_{(\text{aq})} + \text{Fe}_{(\text{s})}$
Which species is oxidized?
1. $\text{Fe}_{(\text{s})}$ 2. $\text{Fe}^{+2}_{(\text{aq})}$ 3. $\text{Zn}_{(\text{s})}$ 4. $\text{Zn}^{+2}_{(\text{aq})}$
- ___ 2. Given the redox reaction: $2\text{I}^{-1}_{(\text{aq})} + \text{Br}_{2(\text{l})} \rightarrow 2\text{Br}^{-1}_{(\text{aq})} + \text{I}_{2(\text{s})}$
What occurs during this reaction:
1. The I^{-1} ion is oxidized, and its oxidation number increases
2. The I^{-1} ion is oxidized, and its oxidation number decreases
3. The I^{-1} ion is reduced, and its oxidation number increases
4. The I^{-1} ion is reduced, and its oxidation number decreases
- ___ 3. Given the reaction: $\text{Zn}_{(\text{s})} + 2\text{HCl}_{(\text{aq})} \rightarrow \text{ZnCl}_{2(\text{aq})} + \text{H}_{2(\text{g})}$
Which equation represents the correct oxidation half-reaction?
1. $\text{Zn}_{(\text{s})} \rightarrow \text{Zn}^{+2} + 2\text{e}^{-}$ 3. $\text{Zn}^{+2} + 2\text{e}^{-} \rightarrow \text{Zn}_{(\text{s})}$
2. $2\text{H}^{+} + 2\text{e}^{-} \rightarrow \text{H}_{2(\text{g})}$ 4. $2\text{Cl}^{-} \rightarrow \text{Cl}_{2(\text{g})} + 2\text{e}^{-}$
- ___ 4. According to Reference Table J, which redox reaction occurs spontaneously?
1. $\text{Cu}_{(\text{s})} + 2\text{H}^{+} \rightarrow \text{Cu}^{+2} + \text{H}_{2(\text{g})}$ 3. $\text{Ag}_{(\text{s})} + 2\text{H}^{+} \rightarrow 2\text{Ag}^{+} + \text{H}_{2(\text{g})}$
2. $\text{Mg}_{(\text{s})} + 2\text{H}^{+} \rightarrow \text{Mg}^{+2} + \text{H}_{2(\text{g})}$ 4. $\text{Hg}_{(\text{l})} + 2\text{H}^{+} \rightarrow \text{Hg}^{+2} + \text{H}_{2(\text{g})}$
- ___ 5. Which quantities are conserved in all oxidation-reduction reactions?
1. charge, only 2. mass, only 3. both charge & mass 4. neither charge nor mass
- ___ 6. Given the overall reaction for the lead-acid battery: $\text{Pb} + \text{PbO}_2 + 2\text{H}_2\text{SO}_4 \rightleftharpoons 2\text{PbSO}_4 + \text{H}_2\text{O}$
Which element changes oxidation state when electric energy is produced?
1. hydrogen 2. oxygen 3. sulfur 4. lead
- ___ 7. Which reduction half-reaction has a standard electrode potential (E^0) of 1.50 volts?
1. $\text{Au}^{3+} + 3\text{e}^{-} \rightarrow \text{Au}_{(\text{s})}$ 3. $\text{Co}^{2+} + 2\text{e}^{-} \rightarrow \text{Co}_{(\text{s})}$
2. $\text{Al}^{3+} + 3\text{e}^{-} \rightarrow \text{Al}_{(\text{s})}$ 4. $\text{Ca}^{2+} + 2\text{e}^{-} \rightarrow \text{Ca}_{(\text{s})}$
- ___ 8. Given the reaction: $2\text{Li}_{(\text{s})} + \text{Cl}_{2(\text{g})} \rightarrow 2\text{LiCl}_{(\text{s})}$
As the reaction takes place, the $\text{Cl}_{2(\text{g})}$ will:
1. gain electrons 2. lose electrons 3. gain protons 4. lose protons
- ___ 9. Given the balanced equation: $2\text{Al}_{(\text{s})} + 6\text{H}^{+}_{(\text{aq})} \rightarrow 2\text{Al}^{3+}_{(\text{aq})} + 3\text{H}_{2(\text{g})}$
When 2 moles of $\text{Al}_{(\text{s})}$ completely reacts, what is the total number of moles of electrons transferred from $\text{Al}_{(\text{s})}$ to $\text{H}^{+}_{(\text{aq})}$?
1. 5 2. 6 3. 3 4. 4
- ___ 10. What is the oxidation number of P in H_3PO_4 ?
1. -3 2. -2 3. +3 4. +5
- ___ 11. Which species acts as the anode when the reaction $\text{Zn}_{(\text{s})} + \text{Pb}^{+2}_{(\text{aq})} \rightarrow \text{Zn}^{+2}_{(\text{aq})} + \text{Pb}_{(\text{s})}$ occurs in an electrochemical cell?
1. $\text{Zn}_{(\text{s})}$ 2. $\text{Zn}^{+2}_{(\text{aq})}$ 3. $\text{Pb}^{+2}_{(\text{aq})}$ 4. $\text{Pb}_{(\text{s})}$

- ___ 12. In an electrolytic cell, the negative electrode is called the
1. anode, at which oxidation occurs
 2. anode, at which reduction occurs
 3. cathode, at which oxidation occurs
 4. cathode, at which reduction occurs

___ 13. A student wishes to set up an electrochemical cell. The following list of materials and equipment will be used:

- two 250-mL beakers
- wire
- one piece of Zn metal
- 125 mL of 0.01 M $Zn(NO_3)_2$
- voltmeter
- switch
- one piece of Pb metal
- 125 mL of 0.01 M $Pb(NO_3)_2$

For the cell to operate properly, the student will also need:

1. an anode
2. a cathode
3. an external path for electrons
4. a salt bridge

___ 14. Which balanced equation represents a redox reaction?

1. $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$
2. $BaCl_2 + K_2CO_3 \rightarrow BaCO_3 + 2 KCl$
3. $CuO + CO \rightarrow Cu + CO_2$
4. $HCl + KOH \rightarrow KCl + H_2O$

___ 15. Where does oxidation occur in an electrochemical cell?

1. at the cathode in both an electrolytic cell and voltaic cell
2. at the cathode in an electrolytic cell and at the anode in a voltaic cell
3. at the anode in both an electrolytic cell and a voltaic cell
4. at the anode in an electrolytic cell and the cathode in a voltaic cell

___ 16. Which energy transformation occurs when an electrolytic cell is in operation?

1. chemical energy \rightarrow electrical energy
2. electrical \rightarrow chemical energy
3. light energy \rightarrow heat energy
4. light energy \rightarrow chemical energy

___ 17. Which statement describes an voltaic cell?

1. chemical energy is used to produce an electrical change
2. chemical energy is used to produce a thermal change
3. electrical energy is used to produce a chemical change
4. thermal energy is used to produce a chemical change

Short Answer:

18. Given the reaction: $\underline{\hspace{1cm}} Sn^{+4}_{(aq)} + \underline{\hspace{1cm}} Cr_{(s)} \rightarrow \underline{\hspace{1cm}} Sn^{+2}_{(aq)} + \underline{\hspace{1cm}} Cr^{+3}_{(aq)}$

a) Write the half reactions and calculate the E° for each half cell.

Ox: _____ $E^\circ =$ _____ V

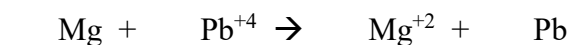
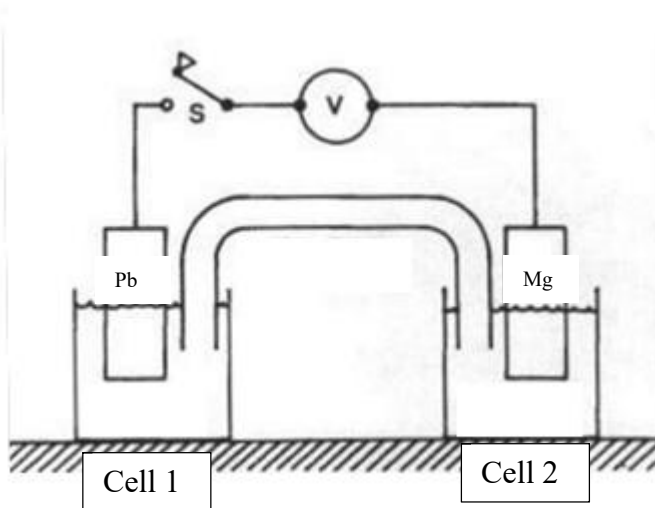
Red: _____ $E^\circ =$ _____ V

$E_{cell}^\circ =$ _____ V

c) Write the balanced redox reaction:

19. Using a Mg/Pb battery, label all the appropriate parts on the diagram at the right, and then use the unbalanced redox reaction to answer the following questions:

- anode
- cathode
- “-“ charge
- “+” charge
- voltmeter
- salt bridge
- direction of e- flow



- a) Which cell is the oxidation half cell? _____
- b) Which cell is the reduction half cell? _____
- c) Write the oxidation half reaction. _____
- d) Write the reduction half reaction. _____
- e) Write the balanced net reaction. _____
- f) What happens to the mass of the anode? _____ cathode? _____
- g) Positive ions from the salt bridge migrate into the _____ half cell.
- h) Negative ions from the salt bridge migrate into the _____ half cell.
- i) What is one reason this reaction will stop? _____

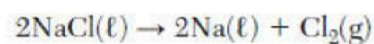
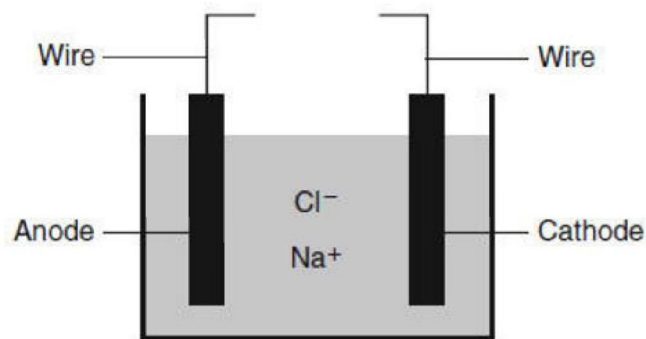
20. Use the diagram to the right to answer the following questions.

- a) What is missing from this setup?

- b) Write the oxidation half reaction.

- c) What is the change in oxidation number for the Na?
_____ to _____

- d) Why is this setup considered non-spontaneous?



21) A student wishes to electroplate a metal spoon with Nickel(s).

a) What part of the setup must be included in order get the nickel metal plated onto the spoon?

b) When plating any object, what is the one requirement of that object?

c) Label the following using the electrolytic cell below:

- the anode
- positive charge
- the cathode
- negative charge
- Draw the flow of electrons.
- Draw an arrow pointing to where the $\text{Ni}^{2+}(\text{aq})$ ions will be attracted to

d) Write the half reaction that occurs at the anode:

Write the half reaction that occurs at the cathode:

