HW03

Question 1 1 pts

What is the coefficient of lead (Pb) in the redox reaction after the following half-reactions are balanced?

$$Pb \longrightarrow Pb^{2+} + 2e^-$$
$$Fe^{3+} + 3e^- \longrightarrow Fe$$

Question 2 1 pts

What is the sum of coefficients in the redox reaction after the following half-reactions are balanced?

$$Al \longrightarrow Al^{3+} + 3e^-$$
$$Cu^{2+} + 2e^- \longrightarrow Cu$$

Question 3 1 pts

In the reaction of thiosulfate ion with chlorine gas in an acidic solution, what is the reducing agent?

$$Cl_2(g) + S_2O_3^{2-}(aq) \longrightarrow Cl^-(aq) + SO_4^{2-}(aq)$$

- Cl^-
- S^{2-}
- $S_2O_3^{2-}$
- Cl_2

Question 4 1 pts

Based on the push and pull of electrons in a redox reaction, it can be inferred that the species being oxidized is also the...

- reducing agent
- strong acid
- oxidizer
- oxidizing agent

Question 5 1 pts

What is the change in oxidation number of sulfur when SO_2 reacts to form SO^- in a redox reaction?

Question 6 1 pts

When $Na_2Cr_2O_7$ reacts to form $CrOH_3$, the Cr atom gets _____ and the change in oxidation number is equal to _____.

- reduced; -6
- oxidized; +3
- reduced; +3
- oxidized; -6
- reduced; -3

Question 7 1 pts

What is the oxidation number of chlorine in ClO_4^-?

Question 8 1 pts

What is the oxidation number of sulfur in SO_4^{2-}?

Question 9 1 pts

What is the oxidation number of an individual sulfur in thiosulfate, $S_2O_3^{2-}$?

Question 10 1 pts

What is the oxidation number of phosphorus in hydrogen phosphate, HPO_4^{2-}?

Question 11 1 pts

In this electrochemical cell, what is the reduction half reaction?

- $Zn^{2+}(aq) + 2e^- \longrightarrow Zn(s)$
- $Zn(s) \longrightarrow Zn^{2+}(aq) + 2e^-$
- $Cu^{2+}(aq) + 2e^- \longrightarrow Cu(s)$
- $Cu(s) \longrightarrow Cu^{2+}(aq) + 2e^-$

Question 12 1 pts

Consider the cell reaction represented by the skeletal equation:

$$Mn(s) + Ti^{2+}(aq) \longrightarrow Mn^{2+}(aq) + Ti(s)$$

What is the proper cell diagram for this reaction?

- $Ti^{2+}(aq) \mid Ti(s) \parallel Mn(s) \mid Mn^{2+}(aq)$
- $Mn^{2+}(aq) \mid Mn(s) \parallel Ti(s) \mid Ti^{2+}(aq)$
- $Mn(s) \mid Mn^{2+}(aq) \parallel Ti^{2+}(aq) \mid Ti(s)$
- $Ti(s) \mid Ti^{2+}(aq) \parallel Mn^{2+}(aq) \mid Mn(s)$

Question 13 1 pts

Consider the cell:

$Zn(s) \mid Zn^{2+}(aq) \parallel Cl^-(aq) \mid AgCl(s) \mid Ag(s)$

Calculate E°.

- -1.20 V
- +1.20 V
- +0.96 V
- +0.54 V

Question 14 1 pts

In a working electrochemical cell (a voltaic or a battery), the cations in the salt bridge move toward the cathode.

- It is impossible to tell unless we know if the cathode is "+" or "-".
- True
- It depends on the charge of the cation.
- False

Question 15 1 pts

What is the voltage of a standard voltaic cell made from the following half-reactions?

$$Cu^{2+} + 2e^- \longrightarrow Cu$$
$$Mg^{2+} + 2e^- \longrightarrow Mg$$

- 2.70 V
- -2.02 V
- 2.02 V
- -2.70 V

Question 16 1 pts

For the cell in the previous question, identify the solid anode and cathode.

- Cu: cathode
  Mg: anode
- Cu: anode
  Mg: cathode

Question 17 1 pts

What is the voltage of a standard electrolytic cell made from the following half-reactions?

$$Ag^+ + e^- \longrightarrow Ag$$
$$Al^{3+} + 3e^- \longrightarrow Al$$

- -2.46 V
- -1.66 V
- 0.86 V
- 2.46 V
- -0.86 V

Question 18 1 pts

Use the following table for the next three questions:

$F_2 + 2e^-$	⇌	$2F^-$	+2.87 V
$PbO_2 + SO_4^{2-} + 4H^+ + 2e^-$	⇌	$PbSO_4 + 2H_2O$	+1.67 V
$Cl_2 + 2e^-$	⇌	$2Cl^-$	+1.36 V
$Ag^+ + e^-$	⇌	Ag	+0.80 V
$Fe^{3+} + e^-$	⇌	Fe^{2+}	+0.77 V
$Cu^{2+} + 2e^-$	⇌	Cu	+0.34 V
$2H^+ + 2e^-$	⇌	H_2	**0.000 V**
$Fe^{2+} + 2e^-$	⇌	Fe	-0.04 V
$Pb^{2+} + 2e^-$	⇌	Pb	-0.13 V
$Fe^{3+} + 3e^-$	⇌	Fe	-0.44 V
$Zn^{2+} + 2e^-$	⇌	Zn	-0.76 V
$Al^{3+} + 3e^-$	⇌	Al	-1.66 V
$Mg^{2+} + 2e^-$	⇌	Mg	-2.36 V
$Li^+ + e^-$	⇌	Li	-3.05 V

Which out of the following is the strongest reducing agent?

- Mg
- Ag^+
- Li^+
- Zn
- Ag

Question 19 1 pts

What is the standard cell potential for the strongest battery possible using the table? Note: for this question, only compare standard cell potential to assess the strength of the battery.

- 2.87 V
- 0.00 V
- 3.05 V
- 5.92 V

Question 20 1 pts

If you wanted to spontaneously reduce Al^{3+} to form Al, you should pair it with...

- the oxidation of Pb
- the S.H.E reaction
- the reduction of Mg
- the oxidation of Mg

Question 21 1 pts

In a voltaic cell...

- electrical energy is used to reverse spontaneous chemical reactions
- oxidation takes place at the cathode
- oxidation and reduction take place at the same time, but at different electrodes
- electrolytes are added to carry electrons between electrodes

Question 22 1 pts

A discharging battery is a voltaic cell, meaning it is...

- non-spontaneous with a positive cell potential
- spontaneous with a negative cell potential
- non-spontaneous with a negative cell potential
- spontaneous with a positive cell potential