Electrochemistry Worksheet 1

I. For the reaction: $2\ Fe + 3\ CdCl_2 \Longleftrightarrow 2\ FeCl_3 + 3\ Cd$, which statement is true?
(A) Fe is the oxidizing agent
(B) Cd undergoes oxidation
(C) Cd is the reducing agent
(D) Fe undergoes oxidation

2. What is the potential in volts for the spontaneous reaction between the Ag/Ag^+ and Zn/Zn^+ half-cells?
$Zn^{2+} + 2\ e^- \longrightarrow Zn$ $E° = -0.763$ V; $Ag^+ + e^- \longrightarrow Ag$ $E° = 0.799$ V

   (A) -2.361 V   (B) -1.562 V   (C) 1.562 V   (D) 2.361 V

3. What is the oxidation state of arsenic in H_3AsO_3?

   (A) +1   (B) +3   (C) +5   (D) +7

4. When the reaction below is balanced, what is the coefficient of H^+?
        $MnO_4^- + NO_2^- + H^+ \longrightarrow MnO_2 + NO_3 + H_2O$

   (A) 2   (B) 4   (C) 6   (D) 8

5. What is the $[Cu^{2+}]$ in the cell Zn / Zn^{2+} (O.O5M) // Cu^{2+} (? M) / Cu if the cell voltage is 1.03V?
        $Zn^{2+} + 2\ e^- \longrightarrow Zn$ $E° = -0.763$ V $Cu^{2+} + 2\ e^- \longrightarrow Cu$ $E° = 0.337$ V
(A) 0.12 M
(B) 0.0002 M
(C) 0.05 M
(D) 0.0035 M

6. 10 amps are passed through molten aluminum chloride for 5.5 hours. How many grams of aluminum metal could be produced by this electrolysis?
(A) 18.5g
(B) 55.4g
(C) 91.2g
(D) 273g

7. Select the set of coefficients which balance the chemical equation:
        $B_3N_3H_6 + O_2 \longrightarrow N_2O_5 + B_2O_3 + H_2O$

   (A) 1,5,1,1,2   (B) 1,15,3,3,6   (C) 2,5,3,3,3   (D) 2,15,3,3,6

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8. In the electroplating of silver from cyanide solution, the cathode reaction is:

    $$Ag(CN)_2{}^+ + e^- \text{-----> } Ag_{(s)} + 2\ CN^-$$
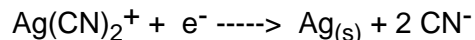
    How many grams of silver should be deposited by a current of 4.5 A in 28.0 minutes?

    (A) 0.141 g   (B) 4.23 g   (C) 8.45 g   (D) 12.53 g

10. Given the standard electrode potentials:

    $Cu^{2+} + 2\ e^- \text{-----> } Cu_{(s)}$ $E° = 0.337V$
    $Al^{3+} + 3\ e^- \text{-----> } Al_{(s)}$ $E° = -1.66V$
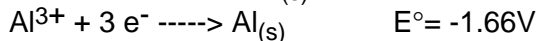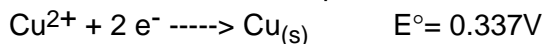
    The voltage of the cell: Cu / $CuSO_4$ (O.5M) // $Al_2(SO_4)_3$ (0.1 M) / Al would be:

    (A) 0.00 V   (B) 0.72 V   (C) 2.01 V   (D) 5.70 V

11. In the reaction: $SO_2 + 2\ H_2S \text{-----> } 3\ S + 2\ H_2O$
    (A) S is oxidized and H is reduced.
    (B) S is reduced and there is no oxidation.
    (C) S is reduced and H is oxidized.
    (D) S is both reduced and oxidized.

12. Which ion can be oxidized by appropriate chemical means but also can be reduced by a different chemical reaction?

    (A) Fe^{2+} (B) F^- (C) $CO_3{}^{2-}$ (D) $NO_3{}^-$

13. Given the standard electrode potentials:
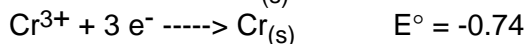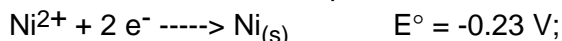
    $Ni^{2+} + 2\ e^- \text{-----> } Ni_{(s)}$ $E° = -0.23\ V;$
    $Cr^{3+} + 3\ e^- \text{-----> } Cr_{(s)}$ $E° = -0.74$
    Which pair of substances with react spontaneously?

    (A) Ni^{2+} with Cr^{3+} (B) Ni with Cr^{3+} (C) Ni^{2+} with Cr   (D) Ni with Cr

14. Aluminum oxide may be electrolyzed at 1000°C to furnish aluminum metal.
        The cathode reaction is: $Al^{3+} + 3\ e^- \text{------> } Al$.
    To prepare 5.12 kg of aluminum metal by this method would require how many coulombs of electricity?
    (A) 5.49×10^7 C
    (B) 1.83×10^7 C
    (C) 5.49×10^4 C
    (D) 5.49×10^1 C