SCH 4U

Name:	ANSWERS
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/50

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question. (20 marks)

1. What is the purpose of a salt bridge in a galvanic cell? a. to balance charge c. to absorb electrons b. to complete the circuit d. to release electrons 2. Which is the correct net ionic equation for the following reaction $MgSO_4(aq) + Cu(s) \rightarrow Mg(s) + CuSO_4(aq)$ \sqrt{a} $Mg^{2+}(aq) + Cu(s) \rightarrow Cu^{2+}(aq) + Mg(s)$ $A \rightarrow MgSO_4(aq) + Cu(s) \rightarrow Mg(s) + CuSO_4(aq)$ c. $Mg^{2+}(aq) \rightarrow Cu^{2+}(aq)$ d. $Mg^{2+}(aq) + SO_4^{2-}(aq) + Cu(s) \rightarrow Cu^{2+}(aq) + SO_4^{2-}(aq) + Mg(s)$ 3. Identify the oxidizing agent in the reaction: $\operatorname{Sn}^{2+}(\operatorname{aq}) + \operatorname{Cl}_2(\operatorname{g}) \to \operatorname{Sn}^{4+}(\operatorname{aq}) + 2\operatorname{Cl}^{-}(\operatorname{aq})$ c. Sn2+(aq) a. Sn2+(aq) d. Sn4+(aq) 16 Cl2(8) 4. Identify the reducing agent in the reaction: $2Fe(s) + O_2(g) + 2H_2O(el) \rightarrow 2Fe(OH)_2(s)$ a. H2O(el) b. Fe(s) and O₂(g) 5. In the reaction: $Al(s) + O_2(g) \rightarrow Al_2O_3(s)$, how many electrons does an atom of aluminum lose or gain? a. aluminum loses 1 electron c. aluminum loses 3 electrons d. aluminum gains 3 electrons b. aluminum gains 1 electron 6. Which of the following is a stronger reducing agent than Mg(s)? a. Ca(s) b. Pt(s) c. Sn(s) d. Fe(s) 7. Which of these reactions will proceed spontaneously, based on relative strength of reducing agents? a $Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$ c. $Cd(s) + Al^{3+}(aq) \rightarrow Cd^{2+}(aq) + Al(s)$ d. $Ag(s) + Zn^{2+}(aq) \rightarrow Ag^{+}(aq) + Zn(s)$ 8. What must be added to the following half-reaction for it to be balanced? $A^{3*}(aq) \rightarrow Al(s)$ c.\3 electrons to the left side a. I electron to the left side b. I electron to the right side d. 3 electrons to the right side 9. What must be added to the following half-reaction for it to be balanced? $10H^+ + NO_3^-(aq) + 8e^- \rightarrow NH_4^+(aq) + 3H_2O_3^-(aq) + 8e^- \rightarrow NH_4^+(aq) + 8e^- \rightarrow$ c.3 water molecules on the right side a. 3 water molecules to the left side b. I water molecule to the left side d. I water molecule to the left side 10. How many hydrogen ions must be added to the half-reaction to balance the mass of hydrogen atoms? $H_10 + CN^-(aq) \rightarrow CNO^-(s) + 2H^+$ a. 1 on the left side c. 2 on the left side b. I on the right side d. 2 on the right side 11. Which of the following reactions is an example of a disproportionation reaction? a. $PbCl_2(s) \rightarrow Pb(s) + Cl_2(g)$ c. $NO_{3}(aq) + NH_{3}(g) \rightarrow 2NO_{3}(s)$ b. $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$ d. $3Cl_2(g) + 6OH^-(aq) \rightarrow 5Cl^-(aq) + ClO_3^-(aq) + 3H_2O(l)$ one reactant element is both oxidized + reduced.

a. the inert electrode b. the salt bridge 3. Which of the following statements is correct for an electrochemical cell? a. the anode and cathode both increase in mass b. the anode increase in mass while the cathode decreases in mass c. the anode increase in mass while the cathode decreases in mass c. the anode increase in mass while the cathode decreases in mass c. the anode increase in mass while the cathode increases in mass c. the anode decreases in mass while the cathode increases in mass c. the anode decreases in mass while the cathode increases in mass c. the anode mode and a silver and silver nitrate? a. sodium chloride would not complete the circuit c. silver and sodium should not exist in the same solution together d. sodium nitrate would interfere with the reaction d. sodium nitrate would interfere with the reaction d. Aluminum is a stronger reducing agent than zinc. With this in mind, which metals would be used as the anode and anothed for a spontaneous galvanic cell involving aluminum and zinc? a. a platinum anode and a zinc cathode b. an aluminum anode and a zinc cathode b. an aluminum anode and a zinc cathode b. an aluminum anode and a platinum cathode d. a zinc anode and an aluminum cathode d. a zinc anode and	12. Which electrode is the site of re	ction?
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21. For the following reaction, write the half-reactions and state which is the reduction and which is the oxidation half-reaction also identify the oxidizing agent and the reducing agent [/6]

22. Balance the following redox reaction in acidic conditions using the half-reaction method.

$$MnO_{\epsilon}^{-}(aq) + I^{-}(aq) \rightarrow IO_{\epsilon}^{-}(aq) + MnO_{\epsilon}(s)$$

23. Use the oxidation number method to balance the following redox reactions in basic conditions. [/6] $S_2O_4^2$ (aq) + Ag₂O \rightarrow SO_3^2 (aq) + Ag(s)

24. Use the following information to determine the galvanic cell potential of each indicated reaction. [/6]

$$Br_2(1) + 2e^- \rightarrow 2Br^-(aq)$$
 $E^0 = +1.07V$

$$I_2(s) + 2e^- \rightarrow 2I^-(aq)$$
 $E^\circ = +0.54V$

$$Cu^{2+}(aq) + 2e^{-} \rightarrow Cu(s)$$
 $E^{\circ} = +0.34V$

$$Fe^{2+}(aq) + 2e^{-} \rightarrow Fe(s)$$
 $E^{\circ} = -0.45V$

$$Zn^{2+}(aq) + 2e^- \rightarrow Zn(s)$$
 $E^{\circ} = -0.76V$

Al³⁺(aq) + 3e⁻
$$\rightarrow$$
 Al(s) E° = -1.66V
a. aluminum/zinc=10.9Vd, aluminum/bromine = +3.73V
b. copper/bromine=+0.73V

- c. iron/iodine = +0.99V f. zinc/iron = +0.31V
- 25. With the following half reactions, describe the galvanic cell that would generate the largest cell potential. Be sure to indicate such items as the anode, cathode, choice of electrolyte, overall cell potential calculation and the overall redox reaction for the cell.

$$Br_2(1) + 2e^- \rightarrow 2Br^-(aq)$$
 $E^0 = +1.07V$

$$I_2(s) + 2e^- \rightarrow 2I^-(aq)$$
 $E^0 = +0.54V$

$$Cu^{2+}(ag) + 2e^{-} \rightarrow Cu(s)$$
 $E^{\circ} = +0.34V$

$$Fe^{2+}(aq) + 2e^{-} \rightarrow Fe(s)$$
 $E^{0} = -0.45V$

$$Zn^{2+}(aq) + 2e^{-} \rightarrow Zn(s)$$
 $E^{0} = -0.76V$

$$Al^{3+}(aq) + 3e^{-} \rightarrow Al(s)$$
 $E^{0} = -1.66V$

