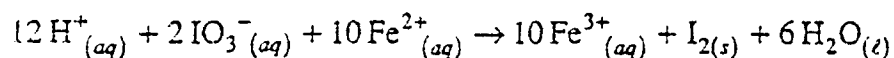


## Electrochemistry 2 Review Worksheet

1. In a redox reaction, the species which loses electrons

- A. is oxidized.
- B. is called the cathode.
- C. gains mass at the electrode.
- D. decreases in oxidation number.

Consider the following redox equation:



2. The reducing agent is

- A.  $\text{I}_2$
- B.  $\text{H}^+$
- C.  $\text{Fe}^{2+}$
- D.  $\text{IO}_3^-$

3. Which of the following is the strongest oxidizing agent?

- A.  $\text{Cu}^{2+}$
- B.  $\text{Pb}^{2+}$
- C.  $\text{Ni}^{2+}$
- D.  $\text{Sn}^{2+}$

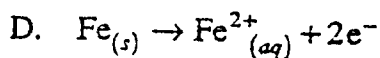
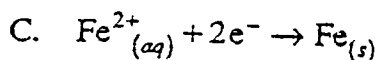
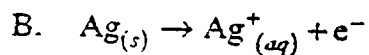
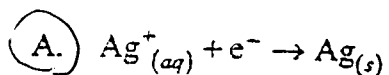
4. Metallic platinum reacts spontaneously with  $\text{Au}^{3+}_{(aq)}$  but does not react with  $\text{Ag}^+_{(aq)}$ . The metals, in order of increasing strength as reducing agents, are

- A. Ag, Pt, Au
- B. Pt, Au, Ag
- C. Au, Ag, Pt
- D. Au, Pt, Ag

5. The electrolysis of a molten salt involves the migration of

- A. anions only.
- B. cations only.
- C. electrons only.
- D. both cations and anions.

6. When electroplating an iron spoon with silver, the half-reaction taking place on the spoon is



7. An oxidizing agent is a substance which

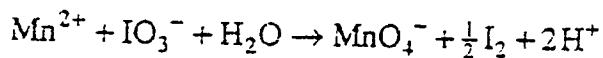
A. accepts protons.

B. donates protons.

C. accepts electrons.

D. donates electrons.

8. Consider the following oxidation-reduction reaction:



The reducing agent is

A.  $\text{I}_2$

B.  $\text{IO}_3^-$

C.  $\text{H}_2\text{O}$

D.  $\text{Mn}^{2+}$

9. A substance that is most likely to gain electrons during a spontaneous redox reaction is

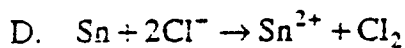
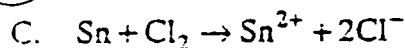
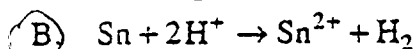
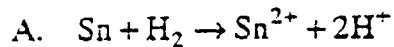
A.  $\text{I}_2$

B. Li

C. Au

D. Hg

10. The equation for the spontaneous reaction between Sn and 1.0 M HCl is



11. A solution of lead(II) nitrate could be safely stored in a container made of

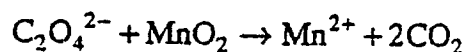
A. Cu

B. Ni

C. Fe

D. Zn

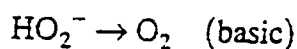
12. Consider this redox equation:



As a result of this reaction the oxidation number of each C atom has

- A. increased by 1.
- B. increased by 2.
- C. decreased by 2.
- D. decreased by 4.

13. Consider the following half-reaction:



The balanced equation is

- A.  $\text{HO}_2^- \rightarrow \text{O}_2 + \text{H}^+ + 2\text{e}^-$
- B.  $2\text{HO}_2^- + 2\text{e}^- \rightarrow \text{O}_2 + 2\text{OH}^-$
- C.  $2\text{HO}_2^- + 2\text{H}^+ \rightarrow 2\text{H}_2\text{O}_2 + \text{O}_2$
- D.  $\text{HO}_2^- + \text{OH}^- \rightarrow \text{O}_2 + \text{H}_2\text{O} + 2\text{e}^-$

14. To determine the  $[\text{Fe}^{2+}]$  in a redox titration, a suitable oxidizing agent is

- A.  $\text{SO}_4^{2-}$  in acid.
- B.  $\text{H}_3\text{PO}_4$  in acid.
- C.  $\text{MnO}_4^-$  in acid.
- D.  $\text{MnO}_4^-$  in base.

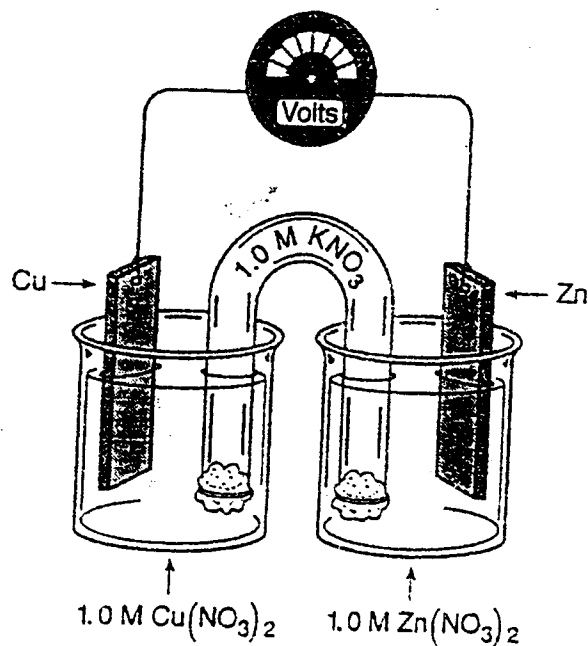
15. Which of the following pairs of ions will react spontaneously in solution?

- A.  $\text{Cu}^{2+}$  and  $\text{Fe}^{2+}$
- B.  $\text{Pb}^{2+}$  and  $\text{Sn}^{2+}$
- C.  $\text{Co}^{2+}$  and  $\text{Cr}^{2+}$
- D.  $\text{Mn}^{2+}$  and  $\text{Cr}^{2+}$

16. When  $\text{NO}_2$  reacts to form  $\text{N}_2\text{O}_4$  the oxidation number of nitrogen

- A. increases by 2.
- B. increases by 4.
- C. increases by 8.
- D. does not change.

Use the following electrochemical cell diagram to answer questions 17. and 18.



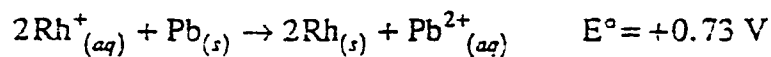
17. As the above cell operates,

- A. copper ions migrate into the salt bridge.
- B. cations migrate towards the zinc electrode.
- C. the mass of the copper electrode increases.
- D. anions migrate towards the copper electrode.

18. The initial cell voltage is

- A. 0.42 V
- B. 0.91 V
- C. 1.10 V
- D. 1.28 V

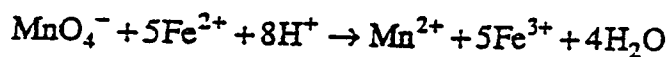
19. Consider the following overall reaction:



The  $E^\circ$  for the half-reaction  $\text{Rh}^+_{(aq)} + e^- \rightleftharpoons \text{Rh}$  is

- A. -0.86 V
- B. -0.60 V
- C. +0.60 V
- D. +0.36 V

20. Hydrogen and oxygen react to provide energy in a(n)
- dry cell.
  - fuel cell.**
  - alkaline cell.
  - lead-acid storage cell.
21. The corrosion of iron can be prevented by attaching a piece of zinc to the iron because
- iron acts as an anode.
  - zinc reduces more readily than iron.
  - electrons flow from the zinc to the iron.**
  - iron ions form more readily than zinc ions.
22. An impure sample of iron was dissolved in acid. The  $\text{Fe}^{2+}$  in this solution was titrated with  $0.0210 \text{ M KMnO}_4$ . Use the following data table and redox equation to determine the moles of  $\text{Fe}^{2+}$  in the sample. (3 marks)



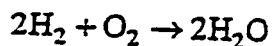
TRIAL	VOLUME $\text{KMnO}_4$
1	37.26 mL
2	35.18 mL
3	35.22 mL

$$\text{Average volume} = \frac{35.18 + 35.22}{2} = 35.20 \text{ mL}$$

$$\text{mols MnO}_4^- = 35.20 \text{ mL} \times 0.0210 \text{ M} = 0.7392 \text{ mmol}$$

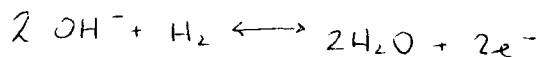
$$\text{mols Fe}^{2+} = 0.7392 \text{ mmol} \left( \frac{5 \text{ mol Fe}^{2+}}{1 \text{ mol MnO}_4^-} \right) = 3.70 \times 10^{-3} \text{ mol Fe}^{2+}$$

23. The overall reaction in a fuel cell is:



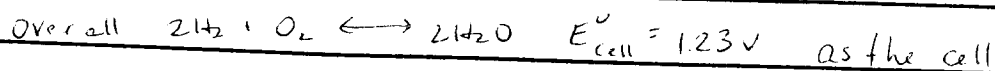
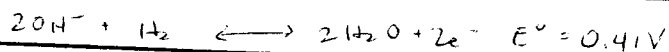
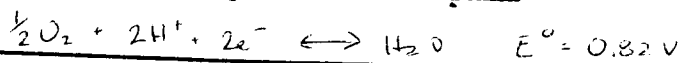
- a) Write the equation for the half-reaction at the anode.

(1 mark)



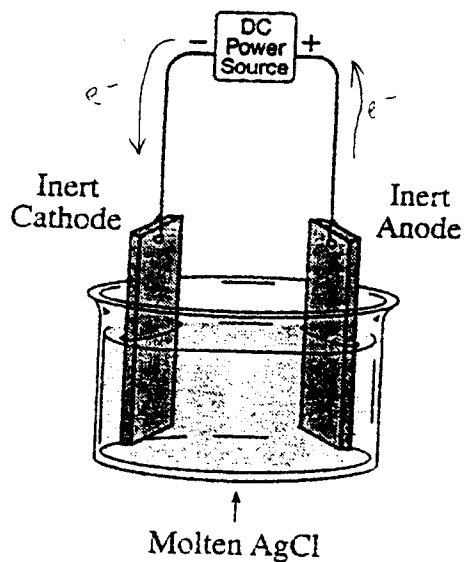
- b) Is the overall reaction spontaneous? Explain.

(1 mark)



potential is positive the <sup>-5-</sup> reaction is spontaneous

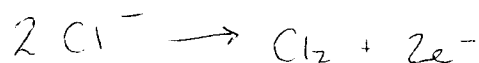
24. Consider the following electrolytic cell used for the electrolysis of molten AgCl.



- a) Clearly indicate on the diagram above, the direction of the electron flow through the wire. (1 mark)

See above (from anode to cathode)

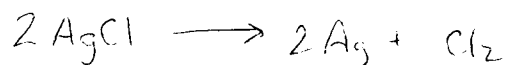
- b) Write the equation for the half-reaction taking place at the anode. (1 mark)



- c) Write the equation for the half-reaction taking place at the cathode. (1 mark)



- d) Write the equation for the overall reaction. (1 mark)



or

