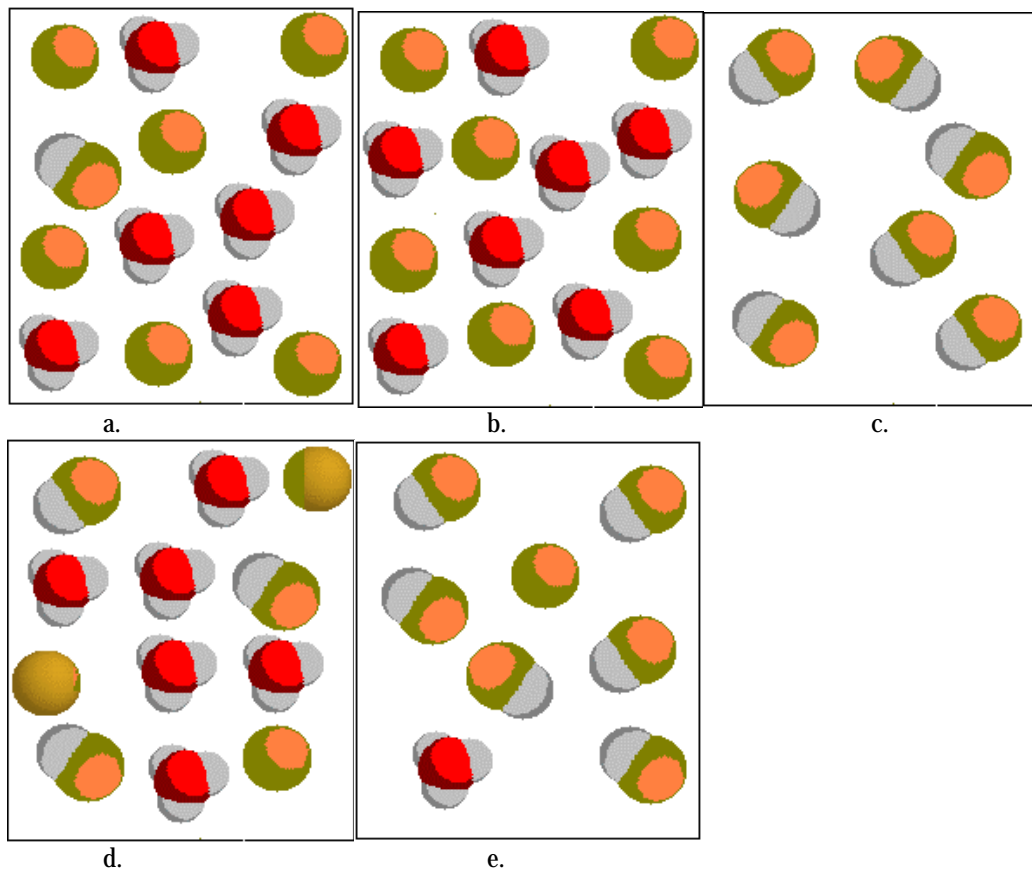
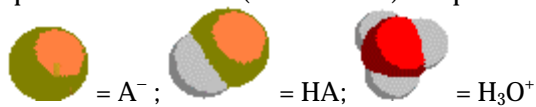


	Answers
1. The conjugate acid of hydrogen carbonate ion, HCO_3^- , in aqueous solution is a. H_2O b. H_3O^+ c. H_2CO_3 d. CO_3^{2-} e. OH^-	1. c
2. The pOH of a 0.150 M HI aqueous solution equals a. 0.15 b. 0.823 c. 7.00 d. 13.2 e. 13.9	2. d
3. What oxide, when dissolved in water, produces a basic solution? a. oxide of radium b. oxide of carbon c. oxide of sulfur d. oxide of nitrogen e. oxide of arsenic	3. a
4. Which of the following weak acids has the anion that is the strongest base? a. $\text{CH}_3\text{CO}_2\text{H}$, $K_a = 1.7 \times 10^{-5}$ b. HF , $K_a = 6.8 \times 10^{-4}$ c. HCO_2H , $K_a = 1.8 \times 10^{-4}$ d. HCN , $K_a = 4.8 \times 10^{-10}$ e. HOCl , $K_a = 3.0 \times 10^{-8}$	4. d
5. A polyprotic acid, H_5Y , dissociates in five consecutive steps. Which is the strongest acid? a. HY^{4-} b. H_2Y^{3-} c. H_3Y^{2-} d. H_4Y^- e. H_5Y	5. e
6. Which of the following is true concerning a 0.10 M solution of the weak acid HF? a. $\text{pH} < 7.00$ b. $\text{pH} > 7.00$ c. $[\text{OH}^-] > [\text{H}^+]$ d. $[\text{H}^+] = [\text{OH}^-]$ e. the concentration of F^- is 0.10 M	6. a
7. Calculate the pH of a 0.010 M HOCN solution. $K_a = 2.19 \times 10^{-4}$. a. 2.48 b. 2.82 c. 3.19 d. 4.66 e. 7.00	7. b

8. Which of the following pictures best represents a weak acid (with $K_a \ll 1$) in aqueous solution?

8. e

(H_2O molecules are not represented.)



9. Which of the following aqueous solutions could form a buffer when mixed in appropriate amounts?

9. d

- HNO_3 and HCl
- HCN and KCl
- KCN and $NaCl$
- $NaCN$ and HCN
- HCl and $NaCl$

10. A 0.10 M KF solution is basic. Suppose that 0.1 mole of KCN is added to this solution, with no volume change. What change in pH is to be expected? $K_a = 4.0 \times 10^{-4}$ for HF and $K_a = 4.9 \times 10^{-10}$ for HCN .

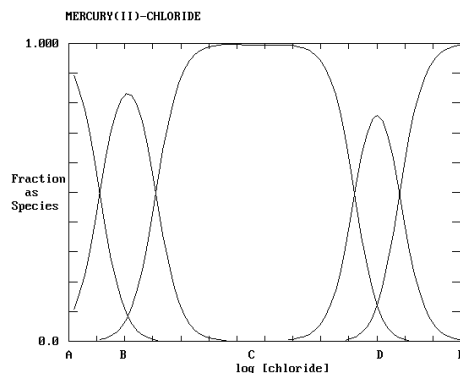
10. a

- the pH will rise because KCN is a strong base
- the pH will rise because KCN is a weak base
- no change in pH
- the pH will drop drastically because both KF and KCN are bases
- the pH will drop because both HF and HCN are acids

11. Which of the following salts has a metal ion that is likely to undergo the most extensive hydrolysis? 11. e
- a. CaBr_2
 - b. KF
 - c. BaS
 - d. MgO
 - e. AlCl_3
12. What is the pH of a solution composed of 0.15 mol of HCN and 0.25 mol of NaCN ? $\text{p}K_a = 9.40$ 12. c
- a. 4.40
 - b. 9.18
 - c. 9.62
 - d. 6.65
 - e. 7.00
13. Calculate the molar solubility of BaCO_3 in water. $K_{sp} = 8.1 \times 10^{-9}$ 13. c
- a. 4.0×10^{-9}
 - b. 4.5×10^{-5}
 - c. 9.0×10^{-5}
 - d. 8.1×10^{-9}
 - e. 2.9×10^{-5}
14. You have a saturated solution of PbI_2 in water. What happens to the solubility if enough NaI is added to the solution to make the iodide ion concentration equal to 0.100 M? 14. a
- a. a decrease in the solubility of PbI_2
 - b. an increase in the solubility of PbI_2
 - c. does not affect the solubility of PbI_2
 - d. a slight decrease due to a change in the volume of the solution
 - e. need to know the value of K_{sp} to answer this question
15. All of the following ionic salts are more soluble at pH 4 than at pH 7 **except** 15. c
- a. $\text{ZnCO}_3(\text{s})$
 - b. $\text{Fe}(\text{OH})_3(\text{s})$
 - c. $\text{PbCl}_2(\text{s})$
 - d. $\text{PbSO}_3(\text{s})$
 - e. $\text{FeS}(\text{s})$
16. What is the pH of 1.0×10^{-10} M HCl ? 16. d
- a. 0
 - b. 1
 - c. 4
 - d. 7
 - e. 10

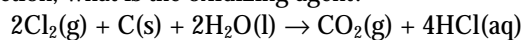
17. The drawing shows the distribution of various species in a mixture of Hg^{2+} and Cl^- . At which point on the diagram does the solution contain predominantly HgCl_4^{2-} ?

- A
- B
- C
- D
- E



17. e

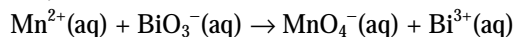
18. For the following reaction, what is the oxidizing agent?



- Cl_2
- C
- H_2O
- CO_2
- HCl

18. a

19. If the following equation is properly balanced with the smallest whole-number coefficients, what is the coefficient of Bi^{3+} ?



- 1
- 2
- 3
- 4
- 5

19. e

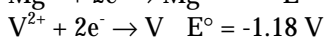
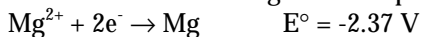
20. Some metallic elements are arranged at the right in an activity series. Select a substance that will reduce Ag^+ to Ag, but will not reduce Zn^{2+} to Zn.

- sodium (Na)
- magnesium (Mg)
- iron (Fe)
- aluminum (Al)
- gold (Au)

K
Na
Ca
Mg
Al
Zn
Fe
Sn
Cu
Ag
Au

20. c

21. Consider the following reduction potentials:

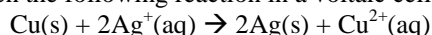


Which one of the following reactions will proceed spontaneously?

- $\text{Mg}^{2+} + \text{V} \rightarrow \text{V}^{2+} + \text{Mg}$
- $\text{Mg}^{2+} + 2\text{Cu}^+ \rightarrow 2\text{Cu}^{2+} + \text{Mg}$
- $\text{V}^{2+} + 2\text{Cu}^+ \rightarrow \text{V} + 2\text{Cu}^{2+}$
- $\text{V} + 2\text{Cu}^{2+} \rightarrow \text{V}^{2+} + 2\text{Cu}^+$
- none of the above

21. d

22. Given the following reaction in a voltaic cell:



Which of the following statements is correct?

- Cu(s) is the anode.
- Oxidation occurs at the silver electrode.
- There is no cathode for this cell.
- Ag(s) is the anode.
- One mole of electrons is transferred in the reaction as written.

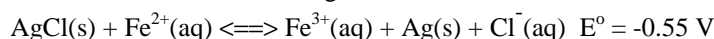
22. a

23. The products of the electrolysis of molten magnesium chloride are

- $\text{H}_2(\text{g})$ and $\text{O}_2(\text{g})$
- $\text{Mg}(\text{l})$ and $\text{OH}^-(\text{aq})$
- $\text{Mg}(\text{l})$ and $\text{Cl}_2(\text{g})$
- $\text{H}_2(\text{g})$ and $\text{Cl}_2(\text{g})$
- $\text{Mg}(\text{l})$ and $\text{O}_2(\text{g})$

23. c

24. A cell is constructed based on the following reaction:



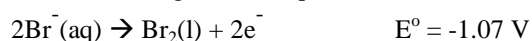
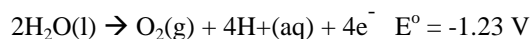
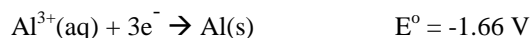
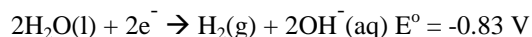
Calculate the $[\text{Cl}^-]$ concentration in the cathode compartment if the cell potential is measured to be

-0.52 V when $[\text{Fe}^{2+}] = 0.70 \text{ M}$ and $[\text{Fe}^{3+}] = 0.35 \text{ M}$ at this unknown $[\text{Cl}^-]$.

- 1.5 M
- 0.38 M
- 2.3 M
- 0.60 M
- 0.075 M

24. d

25. Predict the products obtained from electrolysis of 1 M $\text{AlBr}_3(\text{aq})$ in neutral solution, given the following half-reactions:



- Al and Br_2
- Al and O_2
- H_2 and O_2
- Al and H_2
- H_2 and Br_2

25. e