Name:_____ **Chem 106 Unit 2 Problems**

Ch 4: Aq soln prop.

4.1 Electrolytes +
4.2 Ppt rxns and net ionic equations

1) Which of the species below isn't an electrolyte?

A) Hydrochloric Acid
B) Sodium Chloride
C) Argon
D) Rb_2SO_4
E) Potassium Hydroxide

2) What is the balanced molecular equation for the complete neutralization of sulfuric acid by potassium hydroxide in aqueous solution?

A) $H_2SO_4\ (aq) + 2KOH\ (aq) \rightarrow 2\ H_2O\ (l) + K_2SO_4\ (aq)$

B) $H_2SO_4\ (aq) + 2KOH\ (aq) \rightarrow 2\ H_2O\ (l) + K_2SO_4\ (s)$

C) $H_2SO_4\ (aq) + 2OH^-\ (aq) \rightarrow 2\ H_2O\ (l) + SO_4^{2-}\ (aq)$

D) $2H^+\ (aq) + 2OH^-\ (aq) \rightarrow 2\ H_2O\ (l)$

E) $2H^+\ (aq) + 2KOH\ (aq) \rightarrow 2\ H_2O\ (l) + 2K^+\ (aq)$

3) Which of the following is insoluble in water?

A) $Ca(OH)_2$
B) $Ba(C_2H_3O_2)_2$
C) Na_2S
D) $Mg_3(PO_4)_2$
E) $(NH_4)_2CO_3$

4) Weak electrolytes tend to be _____ in solution.

5) What happens to a strong electrolyte when it is put in solution?

6) Of the following, which is/are strong electrolytes?

HCl
$HC_2H_3O_2$
NH_3
KCl

7) What is the net ionic equation for the formation of an aqueous solution of NiI_2 and CO_2 gas by mixing solid $NiCO_3$ and aqueous HI?

8) Which combination of compounds will produce a precipitate when mixed together?

A) $Cu(NO_3)_2$ (aq) and $KC_2H_3O_2$ (aq)

B) $Pb(NO_3)_2$ (aq) and HCl (aq)

C) $AgC_2H_3O_2$ (aq) and $HC_2H_3O_2$ (aq)

D)NaOH (aq) and $Sr(NO_3)_2$ (aq)

E) KOH (aq) and HNO_3 (aq)

9) The net ionic equation for the reaction of aqueous nitric acid and aqueous sodium hydroxide is what?

10) What is the balanced net ionic equation for precipitation of $CaCO_3$ when aqueous solutions of Na_2CO_3 and Calcium Chloride are mixed?

4.3 Acid-base rxn

11) Of the following, which is the weakest acid?

A) HCl
B) HI

C) HNO_3

D)$HClO_4$
E) HF

12) Which one of the following is a diprotic acid?

A) hydrochloric acid
B) hydrofluoric acid
C) sulfuric acid
D) nitric acid
E) phosphoric acid

13) Which one of the following solutions will have the greatest concentration of hydroxide ions?

A) 0.200 M magnesium hydroxide
B) 0.150 M rubidium hydroxide
C) 0.100 M hydrochloric acid
D) 0.100 M ammonia
E) 0.120 M beryllium hydroxide

14) What products are formed from a neutralization reaction between a metal hydroxide and an acid?

15) What is/are the spectator ion(s) in the reaction between aqueous hydrochloric acid and aqueous ammonia?

4.4 Redox (PT trends, ox#'s, ID what is ox/red, net ionic, activity series app. Determining relative activity from data,)

16) Determine the charges of each atom in the following equation:

$Ba(NO_3)_2\ (aq) + K_2SO_4\ (aq) \rightarrow BaSO_4\ (s) + 2\ KNO_3\ (aq)$

17) Explain why zinc would be a poor choice for the lining of a tank intended for storing hydrochloric acid.

18) In which example does sulfur have the highest oxidation number?

S_8 H_2S SO_2 H_2SO_3 K_2SO_4

19) Cobalt ions will cause which of the following metals to undergo oxidation?

A) tin
B) silver
C) nickel
D) iron
E) copper

20) Of the following compounds, which has the atom with the highest oxidation number?

A) $Ca(NO_2)_2$
B) NaCl
C) $AlPO_4$
D) $MgSO_3$
E) NH_4Br

21) Based on the activity series, will the following reaction occur? Explain

$2AgNO_3\ (aq) + Pb\ (s) \rightarrow 2Ag\ (s) + Pb(NO_3)_2\ (aq)$

22) What is the net ionic equation for the dissolution of Zn(s) in aqueous hydrobromic acid?

4.5 Molarity + 4.6 Stoich and Titrations

23) What is molarity?

24) How would you make one liter of 0.200 M K_2SO_4 solution? You have a bottle of K_2SO_4 (s), a balance, a graduated cylinder and a gallon of distilled water.

25) How many mL of 0.350 NaOH would you need to neutralize 12.5 mL of .125 M HCl?

26) How many moles of NaOH are in 45.00 mL of .250 M solution of NaOH?

27) What are the concentrations (M) of Mg^{+2} and $C_2H_3O_2^-$ afforded by dissolving 0.500 mol $Mg(C_2H_3O_2)_2$ in water and diluting to a final volume of 240 mL?

28) What are the concentrations (M) of Cu^{+2} and Cl^- afforded by dissolving 0.850 mol $CuCl_2$ in water and diluting to 1045 mL?

29) How many grams of sodium hydroxide are dissolved in 423 mL of a 0.250 M solution of sodium hydroxide?

30) How many grams of silver bromide (AgBr) is formed when 25.0 mL of .176M solution of silver nitrate ($AgNO_3$) is reacted with excess hydrobromic acid (HBr)?

31) What volume of .0500 M nitric acid can be neutralized by 225 mL of .230 M sodium hydroxide?

Chapter 4 answers

1. c
2. A
3. D
4. molecules
5. It completely dissociates into its ions.
6. HCl and KCl
7. $NiCO_3\,(s) + 2H^+\,(aq) \rightarrow H_2O\,(l) + CO_2\,(g) + Ni^{2+}\,(aq)$
8. B
9. $H^+\,(aq) + OH^-\,(aq) \rightarrow H_2O\,(l)$
10. $Ca^{2+}\,(aq) + CO_3^{2-}\,(aq) \rightarrow CaCO_3\,(s)$
11. E
12. C
13. A

14. Water and a salt
15. Chloride ion
16. $Ba^{+2}(N^{+5}O^{-2}{}_3)_2$ (aq) + $K^{+1}{}_2S^{+6}O^{-2}{}_4$ (aq) → $Ba^{+2}S^{+6}O^{-2}{}_4$ (s) + 2 $K^{+1}N^{+5}O^{-2}{}_3$ (aq)
17. Zinc is more active than hydrogen, meaning that it is more likely to oxidize than hydrogen. The acid would react with the zinc, producing zinc ion and hydrogen gas. The Zinc would corrode away.
18. K_2SO_4
19. D
20. C
21. Yes it will occur. Pb is more active than Ag, meaning it will 'want' to be oxidized more than Ag. If a silver ion interacts with a lead atom, the lead atom will give its electrons to the silver ion, reducing it to a silver atom.
22. Zn (s) + $2H^+$ (aq) → Zn^{2+} (aq) + H_2 (g)
23. Moles of solute per liters of solution
24. You would take 34.85 grams of K2SO4 and dissolve it in enough distilled water to make a liter of solution.
25. 4.46 mL
26. 0.0113 moles
27. 2.08 M for Mg^{+2}, 4.17 M for $C_2H_3O_2^-$
28. .813 M for Cu^{+2} and 1.63 M for Cl^-
29. 4.23 grams
30. 0.826 grams
31. 1040 mL