Chapter 4
General Chemistry CH115
UMass Boston
Fall 2007

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) The total concentration of ions in a 0.250 M solution of HCl is _____. 1) _____

A) 0.250 M

B) 0.500 M

C) 0.750 M

D) essentially zero.

E) 0.125 M

2) A strong electrolyte is one that _____ completely in solution. 2) _____

A) ionizes B) reacts C) disappears D) decomposes

3) A weak electrolyte exists predominantly as _____ in solution. 3) _____

A) an isotope B) electrons C) ions D) atoms E) molecules

4) Which of the following are strong electrolytes? 4) _____

HCl
$HC_2H_3O_2$
NH_3
KCl

A) HCl, KCl

B) HCl, NH_3, KCl

C) HCl, $HC_2H_3O_2$, KCl

D) $HC_2H_3O_2$, KCl

E) HCl, $HC_2H_3O_2$, NH_3, KCl

5) Which of the following are weak electrolytes? 5) _____

1) HCl
2) $HC_2H_3O_2$
3) NH_3
4) KCl

A) $HC_2H_3O_2$, NH_3

B) HCl , $HC_2H_3O_2$, KCl

C) HCl , $HC_2H_3O_2$, NH_3 , KCl

D) HCl , KCl

E) $HC_2H_3O_2$, KCl

6) What are the spectator ions in the reaction between KOH (aq) and HNO_3 (aq)? 6) _____

A) K^+ and H^+

B) H^+ and OH^-

C) K^+ and NO_3^-

D) OH^- only

E) H^+ and NO_3^-

7) The net ionic equation for the reaction between aqueous solutions of HF and KOH is _____. 7) _____

A) $H^+ + OH^- \rightarrow H_2O$

B) $HF + KOH \rightarrow H_2O + K^+ + F^-$

C) $HF + OH^- \rightarrow H_2O + F^-$

D) $HF + K^+ + OH^- \rightarrow H_2O + KF$

E) $H^+ + F^- + K^+ + OH^- \rightarrow H_2O + K^+ + F^-$

8) Combining aqueous solutions of BaI_2 and Na_2SO_4 affords a precipitate of $BaSO_4$. Which ion(s) is/are spectator ions in the reaction? 8) _____

A) Na^+ and I^-

B) Na^+ only

C) Ba^{2+} only

D) Ba^{2+} and SO_4^{2-}

E) SO_4^{2-} and I^-

9) Which ion(s) is/are spectator ions in the formation of a precipitate of AgCl via combining aqueous solutions of $CoCl_2$ and $AgNO_3$? 9) _____

A) NO_3^-

B) Co^{2+} and NO_3^-

C) Cl^-

D) NO_3^- and Cl^-

E) Co^{2+} and Ag^+

10) The balanced net ionic equation for precipitation of $CaCO_3$ when aqueous solutions of Na_2CO_3 and $CaCl_2$ are mixed is _____. 10) _____

A) $Na_2CO_3\,(aq) + CaCl_2\,(aq) \rightarrow 2NaCl\,(aq) + CaCO_3\,(s)$

B) $2Na^+\,(aq) + CO_3^{2-}\,(aq) \rightarrow Na_2CO_3\,(aq)$

C) $Na^+\,(aq) + Cl^-\,(aq) \rightarrow NaCl\,(aq)$

D) $2Na^+\,(aq) + 2Cl^-\,(aq) \rightarrow 2NaCl\,(aq)$

E) $Ca^{2+}\,(aq) + CO_3^{2-}\,(aq) \rightarrow CaCO_3\,(s)$

11) When aqueous solutions of $AgNO_3$ and KI are mixed, AgI precipitates. The balanced net ionic equation is _____. 11) _____

A) $Ag^+\,(aq) + NO_3^-\,(aq) \rightarrow AgNO_3\,(aq)$

B) $Ag^+\,(aq) + I^-\,(aq) \rightarrow AgI\,(s)$

C) $AgNO_3\,(aq) + KI\,(aq) \rightarrow AgI\,(s) + KNO_3\,(aq)$

D) $AgNO_3\,(aq) + KI\,(aq) \rightarrow AgI\,(aq) + KNO_3\,(s)$

E) $Ag^+\,(aq) + NO_3^-\,(aq) \rightarrow AgNO_3\,(s)$

12) When H_2SO_4 is neutralized by NaOH in aqueous solution, the net ionic equation is _____. 12) _____

A) $2H^+\,(aq) + 2NaOH\,(aq) \rightarrow 2H_2O\,(l) + 2Na^+\,(aq)$

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

C) $SO_4^{2-}\,(aq) + 2Na^+\,(aq) \rightarrow Na_2SO_4\,(s)$

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

E) $SO_4^{2-}\,(aq) + 2Na^+\,(aq) \rightarrow Na_2SO_4\,(aq)$

13) The spectator ions in the reaction between aqueous perchloric acid and aqueous barium hydroxide are _____. 13) _____

A) H^+ and Ba^{2+}

B) OH^- and ClO_4^-

C) H^+, OH^-, ClO_4^-, and Ba^{2+}

D) H^+ and OH^-

E) ClO_4^- and Ba^{2+}

14) The spectator ions in the reaction between aqueous hydrofluoric acid and aqueous barium hydroxide are _____. 14) _____

A) H+, OH^-, F^-, and Ba^{2+}

B) F^- and Ba^{2+}

C) OH^-, F^-, and Ba^{2+}

D) Ba^{2+} only

E) OH^- and F^-

15) The spectator ions in the reaction between aqueous hydrochloric acid and aqueous ammonia are _____. 15) _____

A) H^+, Cl^-, NH_3, and NH_4^+

B) Cl^- only

C) Cl^- and NH_4^+

D) H^+, Cl^-, and NH_4^+

E) H^+ and NH_3

16) Which of the following are strong acids? 16) _____

HI

HNO_3

HF

HBr

A) HI , HF , HBr

B) HF , HBr

C) HNO_3 , HF , HBr

D) HI , HNO_3 , HF , HBr

E) HI , HNO_3 , HBr

17) Which hydroxides are strong bases? 17) _____

$Sr(OH)_2$
KOH
NaOH
$Ba(OH)_2$

A) KOH, $Ba(OH)_2$

B) KOH, NaOH, $Ba(OH)_2$

C) $Sr(OH)_2$, KOH, NaOH, $Ba(OH)_2$

D) KOH, NaOH

E) None of these is a strong base.

18) A neutralization reaction between an acid and a metal hydroxide produces _____. 18) _____

A) water and a salt

B) ammonia

C) hydrogen gas

D) oxygen gas

E) sodium hydroxide

19) Of the metals below, only _____ will <u>not</u> dissolve in an aqueous solution containing nickel ions. 19) _____

aluminum
chromium
barium
tin
potassium

A) barium B) potassium C) tin D) chromium E) aluminum

20) Which of these metals is the <u>least</u> easily oxidized? 20) _____

Na
Au
Fe
Ca
Ag

A) Ca B) Au C) Na D) Ag E) Fe

21) Of the following elements, _____ is the only one that cannot be found in nature in its elemental form. 21) _____

Cu
Hg
Au
Ag
Na

A) Hg B) Ag C) Au D) Cu E) Na

22) Of the following elements, _____ is the most easily oxidized. 22) _____

oxygen
fluorine
nitrogen
aluminum
gold

A) nitrogen B) aluminum C) fluorine D) gold E) oxygen

23) Based on the equations below, which metal is the most active? 23) _____

$Pb(NO_3)_2$ (aq) + Ni (s) → $Ni(NO_2)_2$ (aq) + Pb (s)
$Pb(NO_3)_2$ (aq) + Ag (s) → No reaction
$Cu(NO_3)_2$ (aq) + Ag (s) → No reaction

A) Pb B) Ni C) Cu D) N E) Ag

24) Consider the following reactions: 24) _____

$AgNO_3$ (aq) + Zn (s) → Ag (s) + $Zn(NO_3)_2$
$Co(NO_3)_2$ (aq) + Zn (s) → no reaction
$AgNO_3$ (aq) + Co (s) → $Co(NO_3)_2$ (aq) + Ag (s)

Which is the correct order of increasing activity for these metals?

A) Ag < Co < Zn
B) Co < Zn < Ag
C) Co < Ag < Zn
D) Ag < Zn < Co
E) Zn < Co < Ag

25) When gold dissolves in aqua regia, what is reduced 25) _____

H^+
NO_3^-
Cl^-
H_2O
Au

A) NO_3^- B) Au C) H_2O D) H^+ E) Cl^-

26) What is the concentration (M) of KCl in a solution made by mixing 25.0 mL of 0.100 M KCl with 50.0 mL of 0.100 M KCl? 26) _____

A) 125 B) 0.100 C) 0.0500 D) 0.0250 E) 0.0333

27) What is the concentration (M) of CH_3OH in a solution prepared by dissolving 11.7 g of CH_3OH in sufficient water to give exactly 230 mL of solution? 27) _____

A) 1.59
B) 1.59×10^{-3}
C) 11.9×10^{-3}
D) 11.9
E) 0.0841

28) How many grams of H_3PO_4 are in 175 mL of a 3.5 M solution of H_3PO_4? 28) _____

A) 60 B) 612 C) 20 D) 4.9 E) 0.61

29) What is the concentration (M) of a NaCl solution prepared by dissolving 9.3 g of NaCl in sufficient water to give 350 mL of solution? 29) _____

A) 0.16 B) 0.45 C) 18 D) 2.7×10^{-2} E) 27

30) How many grams of NaOH (MW = 40.0) are there in 500.0 mL of a 0.175 M NaOH solution? 30) _____

A) 114
B) 3.50×10^3
C) 14.0
D) 2.19×10^{-3}
E) 3.50

31) How many grams of CH_3OH must be added to water to prepare 150 mL of a solution that is 2.0 M CH_3OH? 31) _____

A) 9.6×10^3 B) 4.3×10^2 C) 4.3 D) 9.6 E) 2.4

32) There are _____ mol of bromide ions in 0.500 L of a 0.300 M solution of $AlBr_3$. 32) _____

A) 0.450 B) 0.167 C) 0.0500 D) 0.500 E) 0.150

33) How many moles of Co^{2+} are present in 0.200 L of a 0.400 M solution of CoI_2? 33) _____

A) 0.0400 B) 0.500 C) 2.00 D) 0.160 E) 0.0800

34) How many moles of K^+ are present in 343 mL of a 1.27 M solution of K_3PO_4? 34) _____

A) 1.31 B) 0.436 C) 0.145 D) 11.1 E) 3.70

35) What are the respective concentrations (M) of Na^+ and SO_4^{2-} afforded by dissolving 0.500 mol Na_2SO_4 in water and diluting to 1.33 L? 35) _____

A) 0.665 and 1.33

B) 0.665 and 0.665

C) 1.33 and 0.665

D) 0.752 and 0.376

E) 0.376 and 0.752

36) Calculate the concentration (M) of sodium ions in a solution made by diluting 50.0 mL of a 0.874 M solution of sodium sulfide to a total volume of 250.0 mL. 36) _____

A) 0.525 B) 0.175 C) 0.874 D) 4.37 E) 0.350

37) An aqueous ethanol solution (400 mL) was diluted to 4.00 L, giving a concentration of 0.0400 M. The concentration of the original solution was _____ M. 37) _____

A) 0.200 B) 2.00 C) 4.00 D) 0.400 E) 1.60

38) The concentration (M) of an aqueous methanol produced when 0.200 L of a 2.00 M solution was diluted to 0.800 L is _____. 38) _____

A) 0.200 B) 0.500 C) 0.400 D) 0.800 E) 8.00

39) The molarity (M) of an aqueous solution containing 22.5 g of sucrose ($C_{12}H_{22}O_{11}$) in 35.5 mL of solution is _____. 39) _____

A) 1.85

B) 0.104

C) 3.52

D) 1.85×10^{-3}

E) 0.0657

40) The molarity (M) of an aqueous solution containing 52.5 g of sucrose ($C_{12}H_{22}O_{11}$) in 35.5 mL of solution is _____. 40) _____

A) 1.48 B) 0.104 C) 1.85 D) 4.32 E) 5.46

41) The molarity (M) of an aqueous solution containing 22.5 g of glucose ($C_6H_{12}O_6$) in 35.5 mL of solution is _____. 41) _____

A) 1.85 B) 3.52 C) 0.197 D) 0.125 E) 0.634

42) The molarity of an aqueous solution containing 75.3 g of glucose ($C_6H_{12}O_6$) in 35.5 mL of solution is _____. 42) _____

A) 11.8 B) 0.197 C) 3.52 D) 2.12 E) 1.85

43) How many grams of sodium chloride are there in 55.0 mL of a 1.90 M aqueous solution of sodium chloride? 43) _____

A) 0.105 B) 6.11×10^3 C) 6.11 D) 12.2 E) 3.21

44) How many grams of sodium chloride are there in 550 mL of a 1.90 M aqueous solution of sodium chloride? 44) _____

A) 122 B) 61.1 C) 1.05 D) 30.5 E) 6.11×10^4

45) The molarity of a solution prepared by diluting 43.72 mL of 1.005 M aqueous $K_2Cr_2O_7$ to 500 mL is _____. 45) _____

A) 0.0115 B) 0.0218 C) 87.9 D) 0.870 E) 0.0879

46) The molarity of a solution prepared by diluting 43.72 mL of 5.005 M aqueous $K_2Cr_2O_7$ to 500 mL is _____. 46) _____

A) 0.438 B) 0.0044 C) 0.870 D) 0.0879 E) 57.2

47) The concentration of chloride ions in a 0.193 M solution of potassium chloride is _____. 47) _____

A) 0.193 M B) 0.386 M C) 0.579 M D) 0.0643 M E) 0.0965 M

48) The concentration of iodide ions in a 0.193 M solution of barium iodide is _____. 48) _____

A) 0.386 M B) 0.0965 M C) 0.579 M D) 0.193 M E) 0.0643 M

49) The concentration of species in 500 mL of a 2.104 M solution of sodium sulfate is _____ M sodium ion and _____ M sulfate ion. 49) _____

A) 2.104, 1.052

B) 2.104, 4.208

C) 2.104, 2.104

D) 4.208, 2.104

E) 1.052, 1.052

50) When 0.500 mol of $HC_2H_3O_2$ is combined with enough water to make a 300 mL solution, the concentration of $HC_2H_3O_2$ is _____ M. 50) _____

A) 0.150 B) 3.33 C) 0.835 D) 0.00167 E) 1.67

51) In a titration of 35.00 mL of 0.737 M H_2SO_4, _____ mL of a 0.827 M KOH solution is required for neutralization. 51) _____

A) 35.0 B) 1.12 C) 25.8 D) 39.3 E) 62.4

52) Oxalic acid is a diprotic acid. Calculate the percent of oxalic acid ($H_2C_2O_4$) in a solid given that a 0.7984 g sample of that solid required 37.98 mL of 0.2283 M NaOH for neutralization. 52) _____

A) 97.78 B) 28.59 C) 1.086 D) 22.83 E) 48.89

53) A 17.5 mL sample of an acetic acid (CH_3CO_2H) solution required 29.6 mL of 0.250 M NaOH for neutralization. The concentration of acetic acid was _____ M. 53) _____

A) 6.8 B) 0.21 C) 0.42 D) 130 E) 0.15

54) A 25.5 mL aliquot of HCl (aq) of unknown concentration was titrated with 0.113 M NaOH (aq). It took 51.2 mL of the base to reach the endpoint of the titration. The concentration (M) of the acid was _____. 54) _____

A) 0.227 B) 0.114 C) 0.113 D) 0.454 E) 1.02

55) A 31.5 mL aliquot of HNO_3 (aq) of unknown concentration was titrated with 0.0134 M NaOH (aq). It took 23.9 mL of the base to reach the endpoint of the titration. The concentration (M) of the acid was _____. 55) _____

A) 0.0051 B) 1.02 C) 0.0102 D) 0.227 E) 0.0204

56) A 31.5 mL aliquot of H_2SO_4 (aq) of unknown concentration was titrated with 0.0134 M NaOH (aq). It took 23.9 mL of the base to reach the endpoint of the titration. The concentration (M) of the acid was _____. 56) _____

A) 0.227 B) 0.0102 C) 0.0051 D) 0.0204 E) 0.102

Answer Key
Testname: SAMPLE QUESTIONS CHAPTER 4

1) B
2) A
3) E
4) A
5) A
6) C
7) C
8) A
9) B
10) E
11) B
12) D
13) E
14) D
15) B
16) E
17) C
18) A
19) C
20) B
21) E
22) B
23) B
24) A
25) A
26) B
27) A
28) A
29) B
30) E
31) D
32) A
33) E
34) A
35) D
36) E
37) D
38) B
39) A
40) D
41) B
42) A
43) C
44) B
45) E
46) A
47) A
48) A
49) D
50) E

51) E
52) E
53) C
54) A
55) C
56) C