

1. A bottle of sulfuric acid containing 1567 grams of  $\text{H}_2\text{SO}_4$  (molar mass 98.077 g/mol) was spilled in a laboratory. The emergency spill kit contained a full 2.0 kg bottle of sodium carbonate. Is this enough sodium carbonate (molar mass 105.99 g/mol) to neutralize the acid according to the reaction below?



- A. Yes, there is more than enough sodium carbonate.  
B. Yes, there is exactly enough sodium carbonate-but no excess.  
C. No, there is not enough sodium carbonate, but the amount is only about 10% too small.  
D. No, there is not nearly enough sodium carbonate.  
E. No, the reaction will start going backwards.
2. A mass of 11.60 g of phosphoric acid was produced from the reaction of 10.00 grams of  $\text{P}_4\text{O}_{10}$  with 12.0 grams water. What was the percent yield for this reaction?
- A. 101.1%      B. 118.3%      C. 92.70%      D. 84.00%      E. 78.62%
3. A 50.0 mL sample of 0.436 M  $\text{NH}_4\text{NO}_3$  is diluted with water to a total volume of 250.0 mL. What is the ammonium nitrate concentration in the resulting solution?
- A.  $8.72 \times 10^{-2}$  M      B. 21.8 M      C. 0.109 M  
D.  $2.18 \times 10^{-2}$  M      E. 0.459 M
4. Calculate the molality of 6.0 M  $\text{H}_2\text{SO}_4$  solution. The molar mass of  $\text{H}_2\text{SO}_4$  is 98.077 g/mol. The density of the solution is 1.34 g/mL.
- A. 10.2 m      B. 7.98 m      C. 8.43 m      D. 8.10 m      E. 4.48 m
5. A  $2.00 \times 10^{-3}$  M  $\text{CaCl}_2$  solution in water is used as a standard for chloride testing. What is the ppm  $\text{Cl}^-$  in this solution? At this low concentration the density is 1.00 g/mL.
- A. 142 ppm      B.  $2.23 \times 10^{-4}$  ppm      C. 223 ppm  
D. 70.9 ppm      E.  $1.42 \times 10^{-4}$  ppm
6. What mass of  $\text{K}_2\text{CO}_3$  is needed to prepare 200. mL of a solution having a potassium ion concentration of 0.150 M?
- A. 2.07 g      B. 10.4 g      C. 13.8 g      D. 4.15 g      E. 1.49 g
7. Calculate the molality of a solution containing 14.3 g of NaCl in 42.2 g of water.
- A.  $2.45 \times 10^{-1}$  m      B.  $5.80 \times 10^{-4}$  m  
C.  $2.45 \times 10^{-4}$  m      D. 5.80 m  
E. 103 m

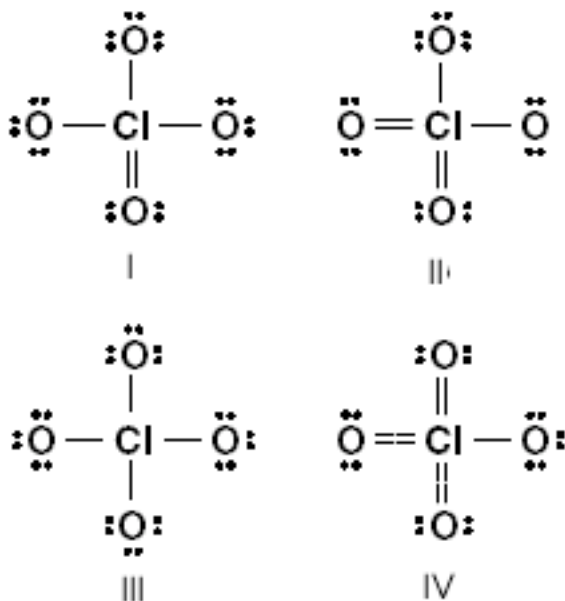
8. During osmosis
- A. pure solvent diffuses through a membrane but solutes do not.
  - B. gases diffuse through a membrane into a solution and build up pressure.
  - C. pure solvent and a solution both diffuse at the same time through a membrane.
  - D. pure solutes diffuse through a membrane but solvent does not.
9. What is the freezing point of a solution prepared from 50.0 g ethylene glycol ( $C_2H_6O_2$ ) and 85.0 g  $H_2O$ ?  $K_f$  of water is  $1.86^\circ C/m$ . Molar mass of ethylene glycol ( $C_2H_6O_2$ ) is 62.067 g/mol. Ethylene glycol is commonly used as automobile antifreeze.
- A.  $-17.6^\circ C$       B.  $17.6^\circ C$       C.  $-1.50^\circ C$       D.  $1.50^\circ C$       E.  $-176^\circ C$
10. Determination of molar mass of an unknown sample by an osmotic pressure measurement assumes
- A. the molecules of the unknown do not pass through the semi-permeable membrane.
  - B. the unknown is a non-electrolyte.
  - C. the unknown in the solution is pure.
  - D. all of the above.
  - E. none of the above.
11. The osmotic pressure of a 0.010 M  $MgSO_4$  solution at  $25^\circ C$  is 0.318 atm. Calculate  $i$ , the van't Hoff factor, for this  $MgSO_4$  solution.
- A. 1.3      B. 1.5      C. 76.8      D. 0.013      E. 2.0
12. Given the following solubilities what will precipitate out if a solution is made by dissolving enough  $K_2CO_3$  and  $Cu(NO_3)_2$  to make them both 1.0 M concentrations.

Salt	Solubility (M)
$K_2CO_3$	11
$Cu(NO_3)_2$	7
$KNO_3$	3
$CuCO_3$	$1 \times 10^{-5}$

- A.  $Cu(NO_3)_2$
- B.  $KNO_3$
- C.  $CuCO_3$
- D.  $K_2CO_3$
- E. nothing will precipitate out



21. A substance that increases the rate of a chemical reaction without being consumed in the reaction is a(n)
- allotrope.
  - isotope.
  - enhancer.
  - catalyst.
  - reactant.
22. Sulfur trioxide ( $\text{SO}_3$ ), which dissolves in water to form sulfuric acid, is formed in the atmosphere when sulfur dioxide is released into the atmosphere as sulfur-containing coals are burned. How many resonance structures are there for  $\text{SO}_3$ ? Count all that satisfy the octet rule and the expanded octet rule.
- four
  - one
  - three
  - two
  - five
23. Which of the following covalent bonds is most polar?
- B-N
  - Li-B
  - B-F
  - B-C
  - Be-B
24. Using the attached copy of the bond-type triangle determine the type of bonding expected between Y and Al, which are components in the gemstones garnets. Electronegativities are Y(1.2) and Al(1.5).
- Aqueous
  - Ionic
  - Semimetallic
  - Metallic
  - Covalent
25. On the basis of formal charge, which of the following possible resonance structures of the perchlorate ion ( $\text{ClO}_4^-$ ) is most stable?



- III
- II
- I
- IV

Answer Key for Test "Chem 105 Exam 3 S07 Form A.mtp", 3/13/08

No. in Q-Bank	No. on Test	Correct Answer
4 73	1	A
4 75	2	D
5 117	3	A
5 115	4	B
5 116	5	A
5 113	6	A
5 114	7	D
5 124	8	A
5 119	9	A
5 33	10	D
5 118	11	A
5 122	12	C
5 121	13	A
5 120	14	E
5 63	15	D
6 113	16	A
6 112	17	A
6 5	18	B
6 21	19	D
6 97	20	B
6 60	21	D
6 64	22	E
6 54	23	C
6 114	24	D
6 84	25	D