**Aranmore Catholic College**

**CHEMISTRY 3A3B - 2012**

**TEST 2: SOLUTIONS AND STOICHIOMETRY**

**NAME \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DATE** \_\_\_4/4/12\_\_

**INSTRUCTIONS**

1. Time allowed: 55 minutes

2. Total marks: 50 marks

3. Complete all answers and working in the spaces provided.

4. A Chemical Data Sheet is provided

5. A Curriculum Council approved calculator is required.

### PART 1 MULTIPLE CHOICE 10 MARKS

Circle or cross the letter of your answer to the questions below.

1. 1.0 mol of an unknown metal reacts with excess hydrochloric acid to produce 1.5 mol of hydrogen gas. What is the charge on the metal ion?
2. + 1
3. + 2
4. + 3
5. + 4
6. Which of the following fertilizers has the greatest percentage of nitrogen by mass?
7. (NH4)2SO4
8. NH2CONH2
9. NH4NO3
10. (NH4)2CO3
11. A solution of nitric acid is produced by adding 1.00 L of 3.00 mol L-1 HNO3(aq) to 2.00 L of distilled water. Choose the correct statement regarding the resulting solution.
12. The concentration of nitric acid is 6.00 mol L-1
13. The moles of nitric acid will now be 1.00 mol
14. The concentration of nitric acid is 3.00 mol L-1
15. The moles of nitric acid are the same as in the original 1.00 L of solution
16. Which of the following 1.0 mol L-1 solutions has the greatest total concentration of ions?
17. CaCl2
18. KNO3
19. AlCl3
20. Na2SO4
21. A one litre solution contains 1.5 mol of Ca(NO3)2 and 2.0 mol of NaNO3. What is the concentration of NO3-(aq) ions in this solution?
22. 5.0 mol L-1
23. 3.5 mol L-1
24. Less than 3.5 mol L-1
25. Greater than 5.0 mol L-1

End of Multiple Choice

### PART 2 SHORT ANSWERS 40 MARKS

**Answer each of the following questions in the spaces provided.**

1. Write ionic equations for any reactions that occur in the following procedures. If no reaction occurs write 'no reaction'.

In each case describe **in full** what you would observe; including any colours, odours, precipitates (give the colour), gases evolved (give the colour or describe as colourless). If no change is observed, you should state this.

1. Dilute sulfuric acid is added to a solution of barium nitrate

**Equation**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Observation**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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[3 marks]

1. Solutions of copper(II) nitrate and sodium phosphate are mixed.

**Equation**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Observation**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[3 marks]

1. 5.00 g of sodium sulfate is added to 50.0 mL of pure water. Density water (1.0g/L)

What is the concentration of **sodium** ions in:

|  |  |
| --- | --- |
| 1. g/L | 1. ppm |
| 1. % w/w | 1. molL-1 |

[5 marks]

1. 26.0 ml of 4.50 % cloudy ammonia is dissolved in 50.0 ml of water. What is the final concentration of ammonia in molL-1? Density of cloudy ammonia = 0.977 g/mL.

[4 marks]

1. 5.00 g of magnesium metal is added to phosphoric acid according to this unbalanced equation.

Mg + H3PO4 ------> Mg3(PO4)2 + H2

1. Write a balanced equation in the space below.
2. What volume of H2 gas is produced at STP?

[4 marks]

1. The labels have fallen off 5 identical bottles, each of which contains clear solutions. The labels read:

Sodium carbonate, potassium nitrate, copper (II) nitrate, magnesium nitrate, zinc sulfate.

Briefly describe any method which could be used in turn to identify the contents of each of the four bottles. You may use any reagents. Please write down any relevant equations and observations.

|  |  |  |  |
| --- | --- | --- | --- |
| **Test** | **Observation** | **Substance Identified** | **Equation** |
| Observe the solutions | One of the solutions is blue, the rest are colorless. | Copper Nitrate | No equation. |
|  |  |  |  |

[8 marks]

1. 20.0 mL of C5H12 is added to 80.0 mL of 02 to produce CO2 and H2O at STP.
   1. What is the limiting reagent?
   2. What volume of CO2 is produced at STP?
   3. What volume of:
      1. C5H12 remains at STP?
      2. O2 remains at STP?

[9 marks]

1. A student had a sample of malachite, which is impure copper (II) carbonate. To determine the purity of the malachite he dissolved 2.50 g of the malachite in excess sulfuric acid. After filtering out undissolved solids, he added excess sodium hydroxide solution to the filtrate and produced 1.69 g of a copper (II) hydroxide.

Calculate the % purity of the malachite.

[5 marks]

END OF PAPER