Chemical Detective

Lab Prep Instructions

***GENERAL INFORMATION***

Experiment Day/Date:

Instructions: Write any calculations in the space provided, and check with the lab instructor if you have any questions. Check off each item as you prepare it.

Quantity: Since students will be working individually, please prepare enough solution for 32 students.

***SOLUTIONS***

Solvent for all solutions: **Milli-Q water (**especially non-chlorinated compounds)

 EXCEPTION: ZnCl2, solvent = Tris Buffer

Place 10 mL all solutions into 20 mL vials. One set of 11 vials for each student.

Label each vial & cap with set number 1-16 & letter A-K according to scheme below.

□ 0.1 M Na2C2O4 (sodium oxalate) : need to heat solution to dissolve completely

$$\frac{10 mL 0.1 M Na2C2O4}{student}x \\_\\_\\_ students - \\_\\_\\_\\_\\_\\_ mL 0.1M Na2C2O4 available = \\_\\_\\_\\_\\_\\_ mL 0.1 M Na2C2O4 needed$$

**-please round volume of 0.1 M Na2C2O4 needed to match the nearest volumetric flask volume available** (i.e. to the nearest 500mL or 1L). Amount of 0.1 M Na2C2O4 to prepare:\_\_\_\_\_\_\_\_L 0.1 M Na2C2O4



□ 0.1 M AgNO3 (silver nitrate)

- caution: avoid direct contact, as it will stain skin brown

$$\frac{10 mL 0.1 M AgNO3}{student}x \\_\\_\\_ students - \\_\\_\\_\\_\\_\\_ mL 0.1M AgNO3 available = \\_\\_\\_\\_\\_\\_ mL 0.1 M AgNO3 needed$$

 -**please round volume of 0.1M AgNO3 needed to match the nearest volumetric flask volume** available (i.e. to the nearest 500mL or 1L). Amount of 0.1M AgNO3 to prepare:\_\_\_\_\_\_\_\_L AgNO3



-This calculation must be repeated for each flask size used to prepare the total volume of 0.1 M AgNO3 (i.e. if you must prepare 3L total, repeat this calculation for a 2L volumetric and a 1L volumetric=total 3L.)

□ 0.1 M Na2CO3 (sodium carbonate)

$$\frac{10 mL 0.1 M Na2CO3}{student}x \\_\\_\\_ students - \\_\\_\\_\\_\\_\\_ mL 0.1M Na2CO3 available = \\_\\_\\_\\_\\_\\_ mL 0.1 M Na2CO3 needed$$

**-please round volume of 0.1 M Na2CO3** **needed to match the nearest volumetric flask volume available** (i.e. to the nearest 500mL or 1L). Amount of 0.1 M Na2CO3 to prepare:\_\_\_\_\_\_\_\_L 0.1 M Na2CO3



□ 0.5 M BaCl2 (barium chloride)

$$\frac{10 mL 0.5 M BaCl2 }{student}x \\_\\_\\_ students - \\_\\_\\_\\_\\_\\_ mL 0.5 M BaCl2 available = \\_\\_\\_\\_\\_\\_ mL 0.5 M BaCl2 needed$$

**-please round volume of 0.5 M BaCl2 needed to match the nearest volumetric flask volume available** (i.e. to the nearest 500mL or 1L). Amount of 0.5 M BaCl2 to prepare:\_\_\_\_\_\_\_\_L 0.5 M BaCl2



□ 0.1 M NH4Cl (ammonium chloride)

$$\frac{10 mL 0.1 M NH4Cl }{student}x \\_\\_\\_ students - \\_\\_\\_\\_\\_\\_ mL 0.1 M NH4Cl available = \\_\\_\\_\\_\\_\\_ mL 0.1 M NH4Cl needed$$

**-please round volume of 0.1 M NH4Cl** **needed to match the nearest volumetric flask volume available** (i.e. to the nearest 500mL or 1L). Amount of 0.1 M NH4Cl to prepare:\_\_\_\_\_\_\_\_L 0.1 M NH4Cl



□ 0.1 M Na2S2O3 (sodium thiosulfate)

$$\frac{10 mL 0.1 M Na2S2O3 }{student}x \\_\\_\\_ students - \\_\\_\\_\\_\\_\\_ mL 0.1 M Na2S2O3 available = \\_\\_\\_\\_\\_\\_ mL 0.1 M Na2S2O3 needed$$

**-please round volume of 0.1 M Na2S2O3 needed to match the nearest volumetric flask volume available** (i.e. to the nearest 500mL or 1L). Amount of 0.1 M Na2S2O3 to prepare:\_\_\_\_\_\_\_\_L 0.1 M Na2S2O3



□ 0.1 M MnCl2 (manganese (II) chloride)

$$\frac{10 mL 0.1 M MnCl2 }{student}x \\_\\_\\_ students - \\_\\_\\_\\_\\_\\_ mL 0.1 M MnCl2 available = \\_\\_\\_\\_\\_\\_ mL 0.1 M MnCl2needed$$

**-please round volume of 0.1 M MnCl2 needed to match the nearest volumetric flask volume available** (i.e. to the nearest 500mL or 1L). Amount of 0.1 M MnCl2 to prepare:\_\_\_\_\_\_\_\_L 0.1 M MnCl2



□ 0.1 M ZnCl2 (zinc chloride)

$$\frac{10 mL 0.1 M ZnCl2 }{student}x \\_\\_\\_ students - \\_\\_\\_\\_\\_\\_ mL 0.1 M ZnCl2 available = \\_\\_\\_\\_\\_\\_ mL 0.1 M ZnCl2needed$$

**-please round volume of 0.1 M ZnCl2 (needed to match the nearest volumetric flask volume available** (i.e. to the nearest 500mL or 1L). Amount of 0.1 M ZnCl2 (to prepare:\_\_\_\_\_\_\_\_L 0.1 M ZnCl2)



NOTE: **Prepare in Tris buffer, NOT MILLI-Q Water**

(700 mL of 0.50 M Tris Acid and 100 mL of 0.50 M Tris Base for a pH of about 7.4. Both should be prepared from solid Tris Acid or Tris Base.)

NOTE: solution needs to be heated to dissolve completely

□ 0.5 M KCl (potassium chloride)

$$\frac{10 mL 0.5 M KCl }{student}x \\_\\_\\_ students - \\_\\_\\_\\_\\_\\_ mL 0.5 M KCl available = \\_\\_\\_\\_\\_\\_ mL 0.5 M KCl needed$$

**-please round volume of 0.5 M KCl** **needed to match the nearest volumetric flask volume available** (i.e. to the nearest 500mL or 1L). Amount of 0.5 M KCl to prepare:\_\_\_\_\_\_\_\_L 0.5 M KCl



□ 0.1 M HCl (hydrochloric acid)

* Can use either a concentrated, 6M HCl or 12M HCl solution as starting solution

 $\frac{10 mL 0.1 M HCl}{student}x \\_\\_\\_ students - \\_\\_\\_\\_\\_\\_ mL 0.1M HCl available = \\_\\_\\_\\_\\_\\_ mL 0.1 M HCl needed $



□ 3% H2O2 hydrogen peroxide

Use household peroxide. Notify instructor if additional is needed.

$$\frac{10 mL 3\% H\_{2}O\_{2} }{student}x \\_\\_\\_ students - \\_\\_\\_\\_\\_\\_ mL 3\% H\_{2}O\_{2} available = \\_\\_\\_\\_\\_\\_ mL 3\% H\_{2}O\_{2} needed$$

***CHEMICALS***

***EQUIPMENT & GLASSWARE***

**In bins: (1 bin per person)**

□ 2 or 3 watch glasses

□ 11 vials labeled A – K (1 set with ~10ml of each solution)

□ Small test tubes (11) with test tube rack (1)

□ 24 well plate (1)

□ Spray bottle (1)

**Set-up in Lab:**

□ Spray bottles with BaCl2, KCl & MnCl2 (in hood)

□ Bunsen burners (in hood)

□ strikers (in hood)

□ Plastic transfer pipets

□ Plastic wrap

□ pH paper (red & blue)

***SPECIAL INSTRUCTIONS***

**prep 2 sets 1-14 & 1 set each 15 & 16**

**Table 1.** Identification key*.*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ID\set # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| HCl | A | B | C | D | E | F | G | H | I | J | K | G | F | E | D | C |
| KCl  | B | C | D | E | F | G | H | I | J | K | A | H | G | F | E | D |
| H2O2 | C | D | E | F | G | H | I | J | K | A | B | I | H | G | F | E |
| Na2C2O4 | D | E | F | G | H | I | J | K | A | B | C | J | I | H | G | F |
| Na2CO3 | E | F | G | H | I | J | K | A | B | C | D | K | J | I | H | G |
| AgNO3 | F | G | H | I | J | K | A | B | C | D | E | A | K | J | I | H |
| BaCl2 | G | H | I | J | K | A | B | C | D | E | F | B | A | K | J | I |
| NH4Cl | H | I | J | K | A | B | C | D | E | F | G | C | B | A | K | J |
| Na2S2O8 | I | J | K | A | B | C | D | E | F | G | H | D | C | B | A | K |
| MnCl2 | J | K | A | B | C | D | E | F | G | H | I | E | D | C | B | A |
| ZnCl2 | K | A | B | C | D | E | F | G | H | I | J | F | E | D | C | B |

***WASTE DISPOSAL CONTAINERS***

Large 4 L plastic waste bottles

€ Building: Dana

€ Room #: 201

€ Waste Accumulation Start Date:

€ Date Container Filled: leave blank

€ Date moved to MAA: leave blank

€ Physical State(s): liquid & solid

€ Chemical Waste Composition: ammonium chloride (<1%), barium chloride dehydrate (<1%), manganese (II) chloride hydrate (<1%), potassium chloride (<1%), silver nitrate (<1%), sodium carbonate (<1%), sodium oxalate (<1%), sodium thiosulfate, pentahydrate (<1%), zinc chloride (<1%), hydrochloric acid (<1%), hydrogen peroxide (<1%), water (~89%)

€ Hazards: oxidizer, corrosive, toxic, irritant