Name: _____ Section: _____

Data and Calculations for Experiment 1

Mass of $CuSO_4$/sand mixture _____

Mass of empty evaporating dish _____

Mass of evaporating dish and dry $CuSO_4$ _____

Mass of $CuSO_4$ _____

Mass of empty filter paper _____

Mass of filter paper and sand _____

Mass of sand _____

Total mass of products _____

Calculated total percent yield _____

Percent by mass of $CuSO_4$:

Show Calculation _____

Percent by mass of sand:

Show Calculation _____

Name: _____ Section: _____

Questions

1. Many students do NOT recover 100% of the original mixture. Describe at least TWO possible problems that could cause LESS than 100% recovery of the mixture.

2. A student obtained the following data:

Mass of beaker	25.87 g
Mass of beaker with mixture sample	28.12 g
Mass of evaporating dish	146.36 g
Mass of evaporating dish with dried salt	147.10 g
Mass of beaker with dried sand	???

   However, this student spills her sand sample out of the evaporating dish before weighing it. If the student believes in the Law of Conservation of Mass, what should have been the weight of the beaker with the dried sand in it? Show all your work.

3. A student receives a sample of a mixture with three components: (1) solid iodine that is first removed from the mixture by evaporation, (2) solid salt that is dissolved to separate it from the third component, and (3) solid sand. The salt and sand are dried and weighed, but the iodine escapes as a gas and is not recovered. The student starts with 4.25 g of the mixture and recovers 1.16 g of salt and 2.40 g of sand. What is the percent of each component in the original mixture? Show all your work.

Name: _____ Section: _____

Data and Calculations for Experiment 2

Measurements

A. Temperature
   1. Water at room temperature _____ °C
   2. Boiling point _____ °C
   3. Ice water
      Unstirred _____ °C
      Stirred _____ °C
   4. Ice water with salt added _____ °C

B. Mass
   1. 100 mL beaker _____ g
   2. 250 mL Erlenmeyer flask _____ g
   3. Weighing boat _____ g
   4. Mass of weighing boat + sodium chloride _____ g
      Mass of sodium chloride (show calculation setup) _____ g

C. Length
   1. Length of ⟷ _____ cm
   2. Height of 250 mL beaker _____ cm
   3. Length of test tube _____ cm

D. Volume
   1. 200 mL mark (from Erlenmeyer flask) water transfered to graduated cylinder _____ mL
   2. Height of 5.0 mL of water in test tube _____ cm
   3. Height of 10.0 mL of water in test tube _____ cm

Name: _____

Section: _____

E. Data Sheet for Density of an Object

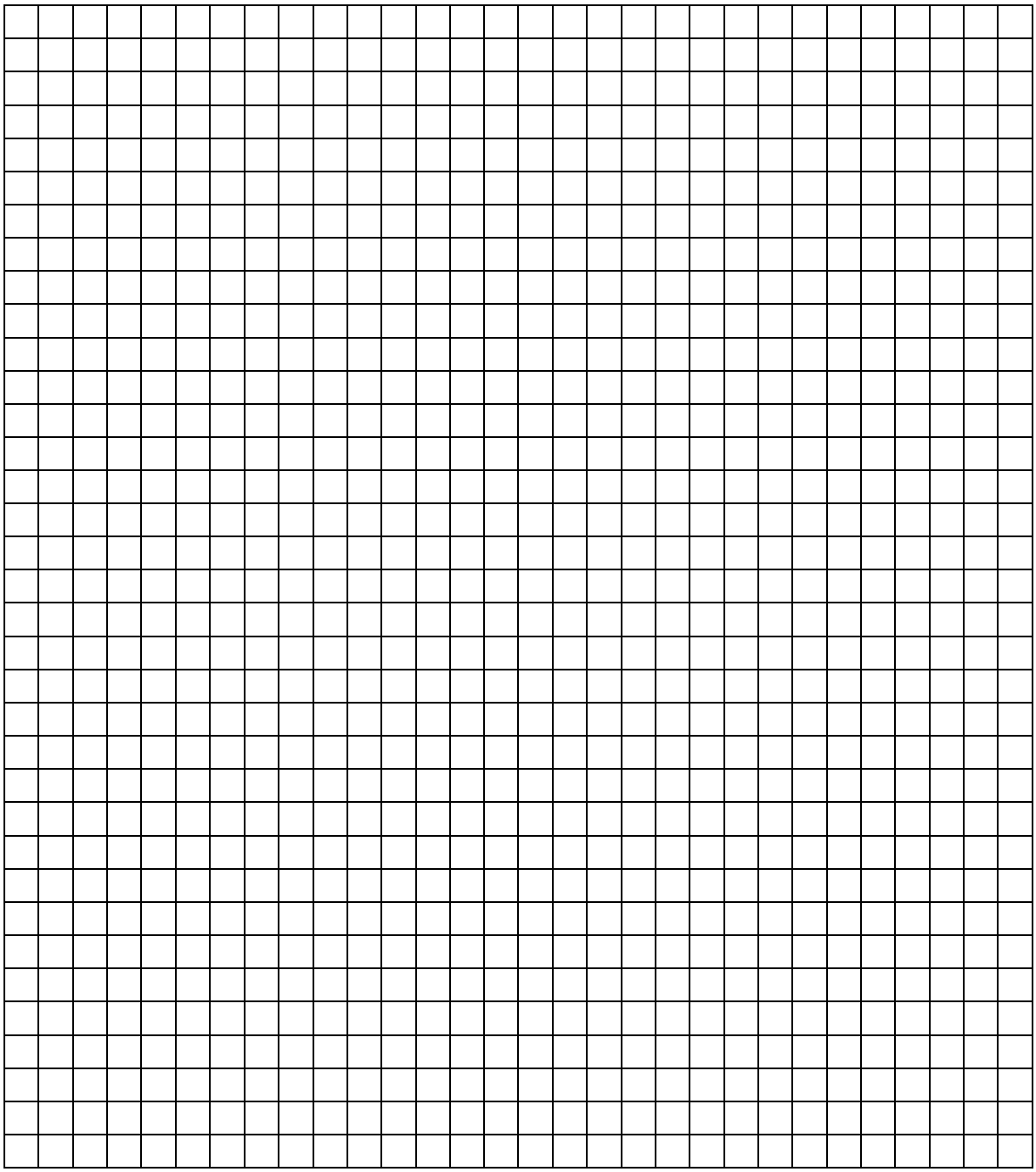
Name of Object _____

Sample #	Object Mass (g)	Initial mL H_2O	mL H_2O w/ Object	Volume object (mL)	Density (g/mL)	Cumulative Sample #s	Graph the following: Cumulative volume (mL) (x-axis)	Graph the following: Cumulative object mass (g) (y-axis)
1	_____	_____	_____	_____	_____	1	_____	_____
2	_____	_____	_____	_____	_____	1 + 2	_____	_____
3	_____	_____	_____	_____	_____	1 + 2 + 3	_____	_____
4	_____	_____	_____	_____	_____	1 + 2 + 3 + 4	_____	_____
5	_____	_____	_____	_____	_____	1 + 2 + 3 + 4 + 5	_____	_____

Average Density = _____

Name: _____ Section: _____

Graph of Cumulative Mass versus Cumulative Volume



Average density of sample from calculated data: _____

Average density from graph: _____

Name: _____ Section: _____

Questions

1. Which would work better in this experiment as an unknown solid whose density is to be determined, wood chips or small quartz rocks? Explain your choice.

2. Why is it best to use a smaller graduated cylinder as opposed to a larger graduated cylinder for this experiment?

3. How well does the average density from the table and density from the slope of the graph compare? Which value is closer to the accepted density of your metal? (Refer to the *Handbook of Chemistry and Physics*). Calculate the percent error between your better value and the handbook value.

4. What is the density of a 9.343 gram piece of metal that causes the level of water in a graduated cylinder to rise from 5.1 to 8.1 mL when the metal is emerged in the water? Consider significant figures when doing the calculation.

Name: _____ Section: _____

Data and Calculations for Experiment 3

A. Concentration of a Saturated Solution (record all masses as x.xxx g)

1. a) Mass of evaporating dish _____

   b) Mass of evap. dish and potassium chloride solution _____

   c) Mass of evap. dish and residue _____

2. Calculate: (show setups)
   a) Mass of potassium chloride solution _____

   b) Mass of residue _____

   c) Mass of water in potassium chloride solution

   _____

   d) Mass percent of potassium chloride in the solution

   _____

   e) Grams of potassium chloride per 100 g of water in the solution

   _____

B. Relative Solubility of a Solute in Two Solvents

1. a) Which liquid is denser, decane or water? _____

   b) How did you decide which layer was water?

2. What is the color of iodine in water? _____

   What is the color of iodine in decane? _____

3. Which solvent dissolves more iodine? How did you decide this?

Name: _____ Section: _____

C. Miscibility of Liquids

1. Which liquids were miscible with each other?

2. Which liquids were immiscible with each other?

D. Particle Size and Dissolution Rates

1. How long did it take the fine salt crystals to dissolve?

2. How long did it take the coarse salt crystals to dissolve?

E. Temperature and Dissolution Rates

1. How long did it take the salt crystals to dissolve in hot water?

2. How long did it take the salt crystals to dissolve in cold water?

F. Temperature and Solubility

1. Was the solution with 1.0 g of NaCl in 5.0 mL water saturated at room temperature?

2. Was the solution with 1.0 g of NH_4Cl in 5.0 mL water saturated at room temperature?

3. Was the solution with 2.4 g of NaCl in 5.0 mL water saturated at room temperature?

Name: _____ Section: _____

4. Was the solution with 2.4 g of NH_4Cl in 5.0 mL water saturated at room temperature?

5. Which salt was least soluble at higher temperatures?

6. At the higher temperatures, was the NaCl solution saturated?

7. At the higher temperatures, was the NH_4Cl solution saturated?

8. What happened to the NaCl solution when it was cooled back to room temperature?

9. What happened to the NH_4Cl solution when it was cooled back to room temperature?

G. Ionic Reactions in Solution

1. Write the formulas for the following:

   barium sulfate _____

   barium chloride _____

   sodium sulfate _____

   sodium chloride _____

2. Write the equation that shows the reaction of barium chloride and sodium sulfate. Use state indicators such as (aq) and (s) for all compounds.

3. Which compound is the white precipitate? How do you know this?

Name: _____ Section: _____

Data for Experiment 4

Record your observations for each combination below. If a reaction occurs, write balanced MOLECULAR and NET-IONIC equations. If no reaction occurs, write NR. Make sure to include the physical states of all the products.

1. NaCl(aq) and KNO_3(aq)

   Observations:

   Molecular:

   Net-Ionic:

2. NaCl(aq) and $AgNO_3$(aq)

   Observations:

   Molecular:

   Net-Ionic:

3. NaOH(aq) and HCl(aq)

   Observations:

   Molecular:

   Net-Ionic:

Name: _____ Section: _____

4. $BaCl_2(aq)$ and $H_2SO_4(aq)$

   Observations:

   Molecular:

   Net-Ionic:

5. $NH_4OH(aq)$ and $H_2SO_4(aq)$

   Observations:

   Molecular:

   Net-Ionic:

6. $CuSO_4(aq)$ and $Zn(NO_3)_2(aq)$

   Observations:

   Molecular:

   Net-Ionic:

7. $Na_2CO_3(aq)$ and $CaCl_2(aq)$

   Observations:

   Molecular:

   Net-Ionic:

Name: _____ Section: _____

8. $CuSO_4(aq)$ and $NH_4Cl(aq)$

   Observations:

   Molecular:

   Net-Ionic:

9. $NaOH(aq)$ and $HNO_3(aq)$

   Observations:

   Molecular:

   Net-Ionic:

Questions

1. For each of the reactions listed below, write balanced molecular and net-ionic equations. If no reaction occurs, write NR. Assume all reactants are aqueous unless otherwise noted. Include all physical states.

   A. Lead(II) nitrate and magnesium sulfate solutions are combined.

      Molecular:

      Net-Ionic:

   B. Zinc chloride solution is poured into a solution of ammonium carbonate.

      Molecular:

      Net-Ionic:

C. Magnesium chloride solution is mixed with nickel(II) nitrate solution.

Molecular:

Net-Ionic:

D. Cobalt(II) sulfate and lithium sulfide solutions are combined.

Molecular:

Net-Ionic:

E. Sodium hydroxide solution is poured into a solution of cobalt(II) chloride.

Molecular:

Net-Ionic:

F. Solid zinc bromide is mixed with a solution of potassium phosphate.

Molecular:

Net-Ionic:

G. Solutions of ammonium sulfate and sodium chloride are combined.

Molecular:

Net-Ionic:

Name: _____ Section: _____

Data for Experiment 5

Record your observations for each combination below. If a reaction occurs, write balanced MOLECULAR and NET-IONIC equations. If no reaction occurs, write NR. Make sure to include the physical states of all the products.

1. Cu(s) and $AgNO_3$(aq)

   Observations:

   Molecular:

   Net-Ionic:

2. Pb(s) and $Cu(NO_3)_2$(aq)

   Observations:

   Molecular:

   Net-Ionic:

3. Zn(s) and $Pb(NO_3)_2$(aq)

   Observations:

   Molecular:

   Net-Ionic:

Name: _____ Section: _____

4. Zn(s) and $MgSO_4$(aq)

   Observations:

   Molecular:

   Net-Ionic:

5. Cu(s) and H_2SO_4(aq)

   Observations:

   Molecular:

   Net-Ionic:

6. Zn(s) and H_2SO_4(aq)

   Observations:

   Molecular:

   Net-Ionic:

Questions

1. Complete the following table by writing the symbols of the two elements whose reactivities are being compared in each test:

Well #	**1**	**2**	**3**	**4**	**5**	**6**
Greater Activity						
Lesser Activity						

Name: _____ Section: _____

2. Based upon the comparisons in the table, draw further conclusions by:

   A. arranging Pb, Mg, and Zn in order of decreasing activity (most active first).

   _____ > _____ > _____

   B. arranging Cu, Ag, and Zn in order of decreasing activity (most active first).

   _____ > _____ > _____

   C. arranging Mg, H, and Ag in order of decreasing activity (most active first).

   _____ > _____ > _____

3. Now arrange the five metals from Question #2 above in order of decreasing activity. Explain why the position of hydrogen (H_2) cannot be exactly assigned.

   _____ > _____ > _____ > _____ > _____

4. What additional test(s) would be required to determine the exact position of hydrogen in the activity series of elements in this study?

5. Would silver react with dilute hydrochloric acid? Briefly explain why or why not.

6. Would magnesium react with dilute sulfuric acid? Briefly explain why or why not.

Name: _____ Section: _____

Data and Calculations for Experiment 6

1. Weight of empty beaker _____
2. Weight of beaker and sodium sulfate _____
3. Weight of sodium sulfate

   Show Calculation _____

4. Moles of sodium sulfate

   Show Calculation _____

5. Moles of strontium chloride
   moles $SrCl_2$ = (5 mL)(10^{-3}/m)(0.5 M)

   Show Calculation _____

6. Write a balanced MOLECULAR equation for the reaction:

7. Write a balanced NET-IONIC equation for the reaction:

8. Weight of empty filter paper _____
9. Weight of filter paper and dried precipitate (first time) _____

   Weight of filter paper and dried precipitate (second time) _____

   Weight of filter paper and dried precipitate (third time) _____
10. Weight of precipitate

    Show Calculation _____

Name: _____ Section: _____

11. Determine the theoretical yield (in grams) of strontium sulfate. What is your limiting reactant and excess reactant?

    Limiting Reactant: _____ Excess Reactant: _____

    Show Calculation (theoretical product yield) _____

12. Determine the percentage yield of your reaction.

    Show Calculation _____

13. What would have resulted from using half as much $SrCl_2(aq)$?

    Show Calculation _____

14. What would have resulted from using twice as much $SrCl_2(aq)$?

    Show Calculation _____

15. Briefly describe how you could have improved your percentage yield in this experiment.

16. In your own words, write a cohesive, well-written summary of the background material and underlying chemical principles pertinent to this experiment. If additional space is needed, please use the back of this page. (For additional guidelines on writing this introduction, please refer to the **Moorpark College Chemistry Department Laboratory Report Rubric** found in the lab manual and department website.)

Name: _____ Section: _____

Data and Calculations for Experiment 7

A. Electrolytes and Instructor Demo
Place an "X" on the label that properly describes each compound below:

	Non-Electrolyte	Strong Electrolyte	Weak Electrolyte
1. Tap water			
2. Distilled water			
3. Sugar solution			
4. NaCl solution			
5a. Pure (glacial) acetic acid			
5b. Diluted acetic acid			
5c. Twice diluted acetic acid			
6a. 1 M acetic acid			
6b. 1 M HCl			
6c. 1 M NH_4OH			
6d. 1 M NaOH			
7a. $NaNO_3$			
7b. NaBr			
7c. $Ni(NO_3)_2$			
7d. $CuSO_4$			
7e. NH_4Cl			

1. What reaction occurs when barium sulfate and sulfuric acid are mixed?

2. Explain why the light becomes dimmer as two strong electrolytes are mixed with each other.

3. Why does the light come back on after more of the electrolyte is added?

4. What happens to the glacial acetic acid as it is diluted? How does this explain the changes in light intensity?

Name: _____ Section: _____

B. Properties of Acids

1. Reactions of Acids with Metals

   a) Which acids reacted with the magnesium?

   b) Represent the reaction between the metal and ONE acid that occurred with an equation.

2. Measurement of pH and Acidity

   a) Acids turned the red litmus paper _____ .

   b) Acids turned the blue litmus paper _____ .

   c) What is the color of phenolphthalein in acidic solution? _____

   d) What is the pH of the 0.1 M solution? _____

      What is the pH of the 0.01 M solution? _____

      What is the pH of the 0.001 M solution? _____

   e) Which solution has the greatest concentration of H^+?

   f) Calculate the H^+ concentration of a pH = 4.6 solution. Write the answer in scientific notation.

3. Reactions of Acids with Carbonates and Bicarbonates

   a) What is the name and formula of the gas formed in this reaction?

   b) What happened to the burning stick when it was placed in the beaker?

c) Write out the products of the reactions in a balanced equation:

$NaHCO_3$ + HCl →

$CaCO_3$ + HCl →

4. Neutralizing Acids with Base: Using Indicators

a) Write a balanced equation for the reaction of HCl and NaOH.

b) What happened when the acid was all neutralized?

5. Reaction of a Non-Metal Oxide and Water

a) Write a balanced equation for the reaction of sulfur and oxygen.

b) What happens when the product of the above reaction reacts with water? Write a balanced equation that represents this reaction.

c) Write a balanced equation for the reaction of carbon dioxide and water.

d) How do you know that the product in the reaction above is acidic?

Name: _____ Section: _____

C. Properties of Bases

1. Properties of ammonium and sodium hydroxides

   a) What did the sodium hydroxide feel like?

   b) What did the ammonium hydroxide feel like?

   c) Bases turned the red litmus paper _____ .

   d) Bases turned the blue litmus paper _____ .

   e) What is the pH of the ammonium hydroxide solution? _____

   f) What is the pH of the sodium hydroxide solution? _____

   g) What is the concentration of H^+ in the more basic solution? _____

2. The Reaction of Metal Oxides and Water

   a) What is the color of phenolphthalein with CaO? _____

      What is the color of phenolphthalein with MgO? _____

      What is the color of phenolphthalein with $Ca(OH)_2$? _____

   b) Write the balanced equations for the following reactions:

      $CaO + H_2O \rightarrow$

      $MgO + H_2O \rightarrow$

   c) Marble is calcium carbonate ($CaCO_3$). Write a balanced equation for the reaction that occurs when you heat the marble chip.

   d) Write a balanced equation for the reaction that occurs when you put the heated marble chip in water.

Name: _____ Section: _____

Data and Calculations for Experiment 8

A. Standardization of NaOH(aq)

Data Table for Part A

	Sample 1	**Sample 2**
Mass of flask and KHP		
Mass of empty flask		
Mass of KHP		
Initial buret reading		
Final buret reading		
Volume of base used		

1. Moles of acid (KHP, Molar mass = 204.2)

   Sample 1:

   Sample 2:

2. Moles of base used to neutralize acid

   Sample 1:

   Sample 2:

3. Molarity of base (NaOH)

   Sample 1:

   Sample 2:

4. Average Molarity of Base (to be used in Part B)

Name: _____ Section: _____

B. Molarity Determination of HCl(aq)

Volume of HCl solution used: _____

Data Table for Part B

	Sample 1	**Sample 2**
Initial buret reading		
Final buret reading		
Volume of base used		

1. Moles of base (NaOH) used

   Sample 1:

   Sample 2:

2. Moles of acid used to neutralize base

   Sample 1:

   Sample 2:

3. Molarity of acid (HCl)

   Sample 1:

   Sample 2:

4. Average Molarity of Acid

Name: _____ Section: _____

Questions

1. A titration required 13.42 mL of 0.1638 M NaOH solution. How many moles of NaOH were in this volume?

2. A student weighed a sample of KHP and found it weighed 1.396 g. Titration of this KHP required 21.36 mL of base (NaOH). Calculate the molarity of the base.

3. Write and balance the equation for the neutralization of a sulfuric acid solution of unknown concentration by sodium hydroxide. Calculate the molarity of an unknown sulfuric acid solution if a 25.0 mL sample of the acid solution consumes 27.2 mL of 0.138 M NaOH solution in a titration.

4. What might happen to your calculated NaOH molarity if you used tap water instead if D.I. water to dissolve the KHP crystals or to rinse down the walls of the flask during the titration? *Hint: Tap water contains some calcium carbonate*.

5. In your own words, use the back of this page to write a cohesive, well-written summary of the background material and underlying chemical principles pertinent to this experiment. (For additional guidelines on writing this introduction, please refer to the **Moorpark College Chemistry Department Laboratory Report Rubric** found in the lab manual and department website.)

Name: _____ Section: _____

Formula	Number of valence electrons	Lewis dot structure (including ALL resonance)	VSEPR structure (with dipole moments)	Molecular Geometry	Polar? Nonpolar? Ionic?	Bond angle on central atom(s)
I_2						
NO^-						
CO						
CH_3NH_2						

Name: _____ Section: _____

Formula	Number of valence electrons	Lewis dot structure (including ALL resonance)	VSEPR structure (with dipole moments)	Molecular Geometry	Polar? Nonpolar? Ionic?	Bond angle on central atom(s)
H_2S						
PBr_3						
ClO_4^-						
CS_2						

Name: _____ Section: _____

Formula	Number of valence electrons	Lewis dot structure (including ALL resonance)	VSEPR structure (with dipole moments)	Molecular Geometry	Polar? Nonpolar? Ionic?	Bond angle on central atom(s)
$CHCl_3$						
PO_3^{-3}						
PO_4^{-3}						
CH_2O						

Name: _____ Section: _____

Formula	Number of valence electrons	Lewis dot structure (including ALL resonance)	VSEPR structure (with dipole moments)	Molecular Geometry	Polar? Nonpolar? Ionic?	Bond angle on central atom(s)
SO_3						
SO_3^{-2}						
SO_4^{-2}						
SCN^{-1}						

Name: _____ Section: _____

Formula	Number of valence electrons	Lewis dot structure (including ALL resonance)	VSEPR structure (with dipole moments)	Molecular Geometry	Polar? Nonpolar? Ionic?	Bond angle on central atom(s)
NO_2^-						
HCOOH						
BrO_3^-						
IO_2^-						

Name: _____ Section: _____

Formula	Number of valence electrons	Lewis dot structure (including ALL resonance)	VSEPR structure (with dipole moments)	Molecular Geometry	Polar? Nonpolar? Ionic?	Bond angle on central atom(s)
CH_2Cl_2						
C_2F_2						
C_2F_4						
C_2F_6						

Name: _____ Section: _____

Formula	Number of valence electrons	Lewis dot structure (including ALL resonance)	VSEPR structure (with dipole moments)	Molecular Geometry	Polar? Nonpolar? Ionic?	Bond angle on central atom(s)
$C_2H_2Br_2$ (3 isomers)						
C_2H_6O (2 isomers)						
C_5H_{12} (3 isomers)						

Name: _____ Section: _____

Data and Questions for Experiment 10

1. Using wedges and dashes, draw this molecule in at least four different orientations. In each orientation that you draw, the same two atoms should NOT both be on wedges and dashes. Practice rotating the molecule in your hands and on paper, until you are comfortable with viewing molecules in three dimensions.

2. Does molecule **A** have a plane of symmetry? Briefly explain.

3. Does the revised model have a plane of symmetry now? Find an orientation in which it is easy to draw this plane of symmetry, then draw the molecule using wedges and dashes and draw a dotted line representing the plane of symmetry.

4. Try superposing (aligning) all five atoms at the same time. Can you superpose structure **B** and structure **A**? How many atoms can you superpose at one time? Try to improve on this number until you think that you cannot get any more atoms to superpose at any one time.

5. Are structure **A** and structure **B** identical? Mark ONE: ☐Yes ☐ No

6. How do the structures differ?

7. Are structures **C** and **D** still mirror images of each other? ☐Yes ☐ No

8. Do **C** and **D** have internal planes of symmetry? ☐Yes ☐ No

Name: _____ Section: _____

9. Can you superpose structures **C** and **D**? ☐ Yes ☐ No

   Are these molecules identical or different? ☐ Identical ☐ Different

10. Using wedges and dashes, draw molecules **A** and **B**.

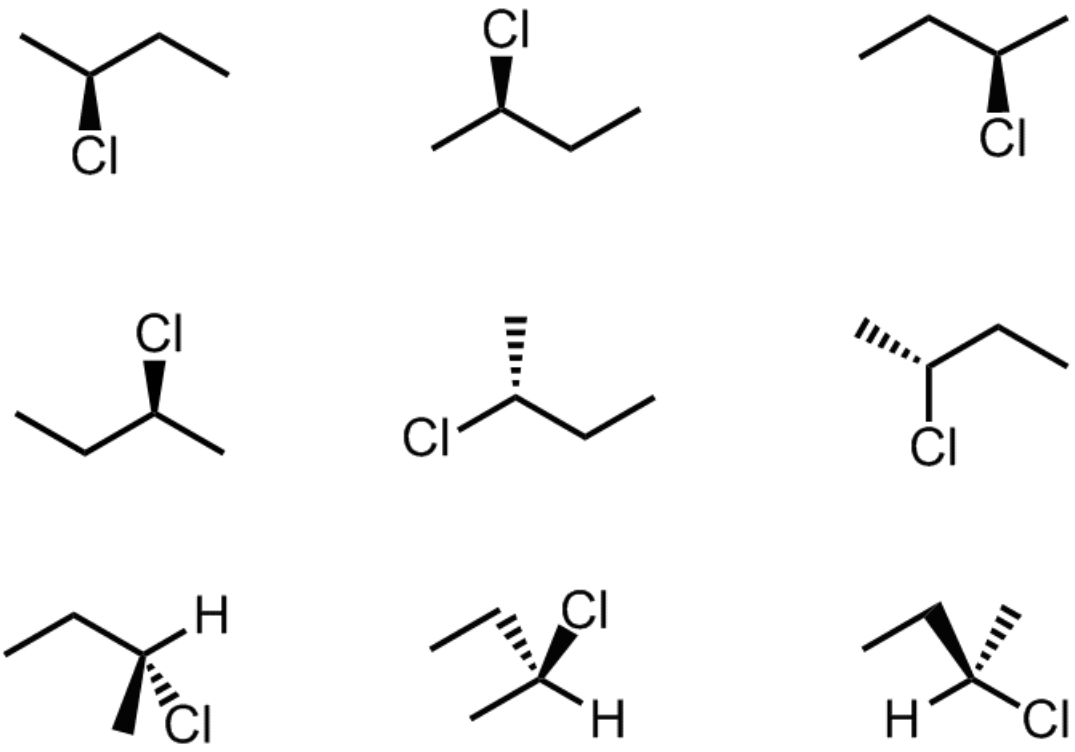
11. What happened to the configuration at the stereocenter? How does molecule **E** compare to molecule **B**?

12. How does molecule **F** compare to molecule **B**? How does it compare to your original molecule **A**?

13. Repeat this process by swapping two groups at a time several more times. How many different stereoisomers do you find through this process?

Name: _____ Section: _____

14. Using your models, determine which of the structures below have the *R* configuration and which have the *S* configuration. Label each structure below with the appropriate *R* or *S* designations.



15. Determine the relationship between molecules **G** and **H**.

Name: _____ Section: _____

Data and Calculations for Experiment 11

UNKNOWN CODE: _____

Solution	**Distance Traveled by Amino Acid (cm)**	**Distance Traveled by Solvent (cm)**	**R_f value**
Aspartic Acid			
Glycine			
Tyrosine			
Unknown			

Post-lab Questions

1. How might it be possible to quantitatively determine the composition of an amino acid mixture? You may need to research this question a bit!

2. If two amino acids have the same R_f values in 2-propanol, how might they be separated?

3. Identify the component(s) of your mixture, then draw the structure(s) of the amino acid(s) present. Refer to your Biochemistry notes from lecture for the structures of the various amino acids.

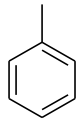
Name: _____ Section: _____

Data and Calculations for Experiment 12

Physical Properties of Hydrocarbons

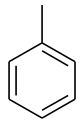
Solubility: Does the hydrocarbon mix with the solvent, *soluble,* or not mix with solvent, *insoluble*? Use the observations you make for the solubility tests and determine whether the hydrocarbons are polar or nonpolar substances.

Density: For water, is the density *greater* than water (sinks) or *less* than water (floats)? For ligroin, can you tell anything about the relative densities?

	H_2O		**Ligroin**	
Hydrocarbon	*Solubility*	*Density*	*Solubility*	*Density*
Hexane				
Cyclohexene				
Toluene, 				
Unknown A				
Unknown B				
Unknown C				

Name: _____ Section: _____

Chemical Properties of Hydrocarbons

Hydrocarbon	*Bromine Test**	*$KMnO_4$ Test*	*H_2SO_4 Test*
Hexane	Red		
Cyclohexene	Colorless		
Toluene, 	Red		
Unknown A	Red		
Unknown B	Colorless		
Unknown C	Red		

**The results of the bromine test have been provided for you.*

Unknown A is _____.

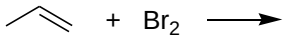
Unknown B is _____.

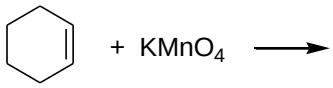
Unknown C is _____.

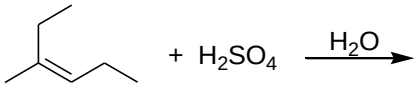
Name: _____ Section: _____

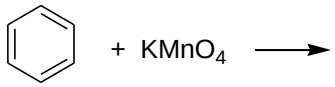
Questions

1. Below are four organic compounds. The reagent shown is added to the compound. Based on your studies in this lab, determine the products (if any) that you should observe when the reactants below are mixed together:

   A. 

   B. 

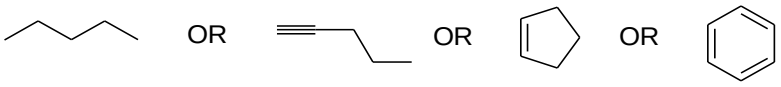
   C. 

   D. 

2. A student has two compounds in two separate bottles but with no labels on either one. One is an alkane, octane (C_8H_{18}); the other is 1-hexene (C_6H_{12}), an alkene. Based on your observations in this experiment, what should you see in the following tests?

	Octane	1-Hexene
A. Water solubility		
B. Ligroin solubility		
C. Density versus water		
D. Bromine test		
E. Permanganate test		

3. An unknown compound, believed to be a hydrocarbon, showed the following behavior: no heat or color appeared when sulfuric acid was added; permanganate solution remained purple; and the red color of bromine solution was lost only after a catalyst was added. From the compounds below, circle the ONE that fits the observations.

4. In your own words, write a one-half page, well-written abstract of the entire experiment, making sure to briefly state the overall purpose or goal as well as any conclusions. (For additional guidelines on writing this abstract, please refer to the **Moorpark College Chemistry Department Laboratory Report Rubric** found in the lab manual and department website.)

Name: _____ Section: _____

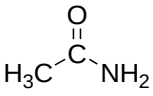
Data and Calculations for Experiment 13

Properties of amines

	Odor		Solubility		pH	
	Original Soln	*with HCl*	*H_2O*	*Ether*	*HCl*	*H_2O*
6 M NH_3						
Triethylamine						
Aniline						
N,N – Dimethylaniline						
Acetamide						

Triethylamine and concentrated hydrochloric acid observation:

Write the chemical equation for the reaction of triethylamine with concentrated hydrochloric acid:

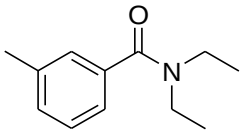
Hydrolysis of Acetamide, 

Solution	*pH Reading*	*Odor Noted*
1. Acid		
2. Base		

Name: _____ Section: _____

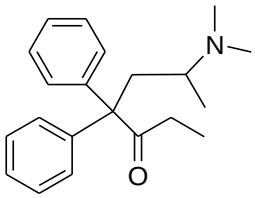
Questions

1. Effective mosquito repellents contain DEET (N,N–diethyl–3–methylbenzamide). If you were to synthesize this compound, what carboxylic acid and amine would you begin with?



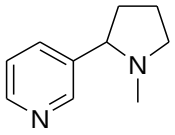
DEET

2. Metadone, a narcotic analgesic shown below, is dispensed as its hydrochloride salt. Explain the usefulness of the salt rather than the amine.



Metadone

3. Nicotine is an alkaloid, meaning base-like. What structural feature is present in the molecule that would make it react as a base?



Nicotine

4. Write the equations that account for what happens in the hydrolysis of the acetamide solution in (A) acid and in (B) base. See the data sheet for the structure of acetamide.

   A.

   B.

Name: _____ Section: _____

Data and Calculations for Experiment 14

Weight of salicylic acid added _____

Volume of acetic anhydride _____

Density of acetic anhydride from CRC _____

Molecular Weight of acetic anhydride _____

Molecular Weight of salicylic acid _____

Theoretical Yield of aspirin _____

Actual Yield of crude aspirin _____

Actual Yield of recrystallized aspirin _____

Percent Yield of recrystallized aspirin _____

Test Tube No.	Sample	Color	Intensity
1	Salicylic acid		
2	Your synthesized aspirin		
3	Commercial aspirin		

Questions

1. Determine the percentage yield of your crude product.

Name: _____ Section: _____

2. 2.0 grams of salicylic acid and 5.0 mL of acetic anhydride (density = 1.08 g/mL) are mixed to produce aspirin. Determine the percentage yield of the reaction if 1.9 g of aspirin is actually obtained in this experiment.

3. In your own words, write a one-half page, well-written abstract of the entire experiment, making sure to briefly state the overall purpose or goal as well as any conclusions. (For additional guidelines on writing this abstract, please refer to the **Moorpark College Chemistry Department Laboratory Report Rubric** found in the lab manual and department website.)

Name: _____ Section: _____

Data and Calculations for Experiment 15

Reducing or Nonreducing Carbohydrates

Test Tube No.	*Substance*	*Color Observation*	*Reducing or Nonreducing Carbohydrates*
1	Glucose		
2	Fructose		
3	Sucrose		
4	Lactose		
5	Starch		

Hydrolysis of Carbohydrates

Hydrolysis of Sucrose (Acid versus Base Catalysis)

Sample	*Condition of Hydrolysis*	*Color Observation*	*Fehling's Test (positive or negative)*
1	Acidic (H_2SO_4)		
2	Basic (NaOH)		

Acid-Catalyzed Hydrolysis of Starch

Sample	*Heating Time (min)*	*Color Observation*	*Iodine Test (positive or negative)*
1	5		
2	10		
3	15		
4	20		
5	25		
6	30		

Name: _____ Section: _____

Questions

1. How does the iodine test distinguish between amylose and amylopectin?

2. Why is sucrose a nonreducing sugar? Identify the glycosidic linkage present.

3. How can you tell when the hydrolysis of starch is complete? Why does the test work this way? What is the monosaccharide that results at the end?

4. Why does amylose give a negative test with Fehling's solution?

5. In your own words, write a logical, coherent conclusion on the back of this page which demonstrates a thorough working knowledge and understanding of important concepts and underlying chemical principles pertinent to this experiment, forms appropriate conclusions based on interpretations of results, includes applications of and improvements in the experiment, and demonstrates accountability by providing justification for any errors. If additional space is needed, please use additional paper. (For additional guidelines on writing this conclusion, please refer to the **Moorpark College Chemistry Department Laboratory Report Rubric** found in the lab manual and department website.)

Name: _____ Section: _____

Data and Calculations for Experiment 16

Test	*Cholesterol*	*Lecithin*	*Glycerol*	*Corn Oil*	*Butter*	*Egg Yolk*	*Sucrose*
A. Acrolein a. Odor							
b. Color							
c. Conclusions							
B. Lieberman–Burchard a. Initial color							
b. Color after 5 min							
c. Conclusions							

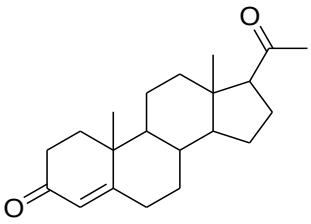
Questions

1. From your results, what is present in corn oil? Is it a pure triglyceride?

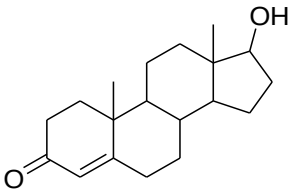
2. Based on the intensity of the color in your test for cholesterol, which food showed the most cholesterol present? Which food showed the least cholesterol present?

Name: _____ Section: _____

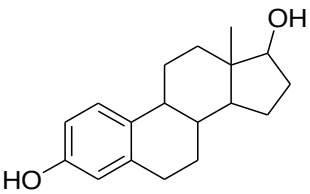
3. Consider the steroid structures shown below. Would any of these structures give a positive Lieberman-Burchard test? Briefly explain.



Progesterone



Testosterone



Estradiol

4. Cholesterol is an alcohol that can dehydrate to form a carbon-carbon double bond. Draw the structure cholesterol forms upon dehydration. Would this dehydration compound give a positive Lieberman-Burchard test? Briefly explain.

Name: _____ Section: _____

Data and Calculations for Experiment 17

Viscosity of DNA solutions

(1) pH of acidified buffer _____
(2) Efflux time of acidified buffer (t_0) _____ sec
(3) pH of acidified DNA solution _____
(4) Concentration of DNA solution _____
(5) Efflux time of acidified DNA solution _____ sec
(6) Efflux time of neutralized DNA solution at time of neutralization _____ sec
(7) 20 min. later _____ sec
(8) 40 min. later _____ sec
(9) 60 min. later _____ sec
(10) 80 min. later _____ sec
(11) 100 min. later _____ sec

pH dependence of the viscosity of DNA solutions

(12) pH of neutral buffer _____
(13) Efflux time of neutral buffer _____ sec
(14) pH of DNA solution in neutral buffer _____
(15) Efflux time of DNA in neutral buffer _____ sec

After addition of 1 drop of 0.1 M HCl

(16) pH of buffer _____
(17) Efflux time of buffer _____ sec
(18) pH of DNA solution _____
(19) Efflux time of DNA solution _____ sec

After addition of 1 drop of 0.1 M NaOH

(20) pH of buffer _____
(21) Efflux time of buffer _____ sec
(22) pH of DNA solution _____
(23) Efflux time of DNA solution _____ sec

After addition of 2 drops of 1 M NaOH

(24) pH of buffer _____
(25) Efflux time of buffer _____ sec
(26) pH of DNA solution _____
(27) Efflux time of DNA solution _____ sec

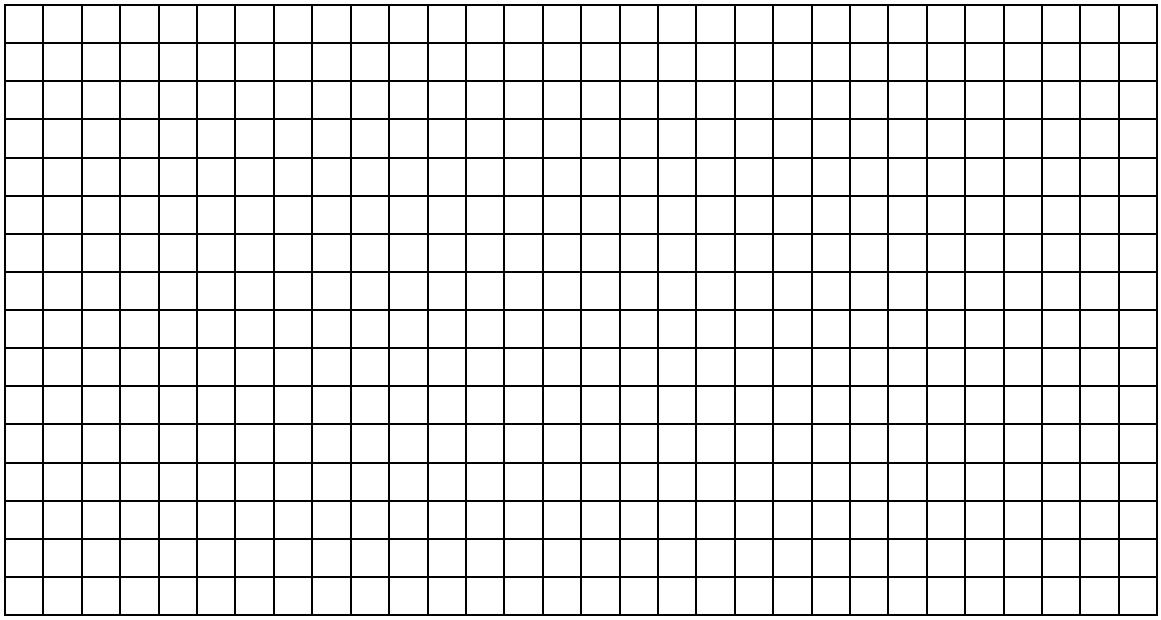
Tabulate your data on the pH dependence of relative viscosity

pH	η_{rel}
(3) _____	(5) / (2) _____
(14) _____	(15) / (13) _____
(18) _____	(19) / (17) _____
(22) _____	(23) / (21) _____
(26) _____	(27) / (25) _____

Name: _____ Section: _____

Questions

1. Plot your tabulated data: relative viscosity on the y–axis, and pH on the x–axis.



2. At what pH values did you observe helix-to-coil transitions?

3. Now plot your data on the refolding of DNA double helix (5) – (11) using Microsoft Office Excel®. Plot time on the x–axis (i.e., time after neutralization in min.) and the efflux times on the y–axis (in sec.). Make sure to include this graph with your report. See Experiment #18 for directions on using Excel®. Include the best-fitting line for the data points; *please note that this graph is NOT linear.*

4. Was there any indication that, upon neutralization of the denaturing acid, the DNA did refold into a double helix? Explain.

5. Compare the efflux time of the neutral DNA (15) to that of the denatured DNA 100 min. after neutralization (11). What does the difference between these two efflux times tell you regarding the refolding process?

Name: _____ Section: _____

6. Calculate the intrinsic viscosity of your DNA at:

   a. Neutral pH = 2.3 × {log [(15) / (13)]} / (4) =

   b. Acidic pH = 2.3 × {log [(5) / (2)]} / (4) =

   c. Basic pH = 2.3 × {log [(27) / (25)]} / (4) =

   d. Neutral pH 100 min. after neutralization = 2.3 × {log [(11) / (13)]} / (4) =

7. A high intrinsic viscosity implies a double helix; a low intrinsic viscosity means a random coil. What do you think is the shape of the DNA after acid denaturation and subsequent neutralization? (See 6d above.) Explain your answer.

Name: _____ Section: _____

Data and Calculations for Experiment 18

Test Tube	Initial glucose concentration (from bottle)	Absorbance at 730 nm
1		
2		
3		
4		
5		
Unknown Code _____	**To be determined in Question #1 below**	

Based on your Excel® graph, what is the equation of the line? _____

Questions

1. Using your unknown absorbance value and calibration line, what is the concentration of your unknown solution? Show your work below.

2. The following absorbance values for four solutions with known MnO_4^- concentrations were measured using a spectrophotometer:

Solution	$[MnO_4^-]$	Absorbance
1	7.00×10^{-5} M	0.175
2	1.00×10^{-4} M	0.250
3	2.00×10^{-4} M	0.500
4	3.50×10^{-4} M	0.875

Plot a graph of Absorbance vs. Concentration of MnO_4^- using Microsoft Excel® (be sure to include your graph with this report). Determine the concentration of an unknown MnO_4^- sample whose absorbance is found to be 0.780.

3. In your own words, write a logical, coherent conclusion which demonstrates a thorough working knowledge and understanding of important concepts and underlying chemical principles pertinent to this experiment, forms appropriate conclusions based on interpretations of results, includes applications of and improvements in the experiment, and demonstrates accountability by providing justification for any errors. If additional space is needed, please use the back of this page. (For additional guidelines on writing this conclusion, please refer to the **Moorpark College Chemistry Department Laboratory Report Rubric** found in the lab manual and department website.)

Name: _____ Section: _____

Data and Calculations for Experiment 19

A. pH

Solution	pH
1. Prepared Soap	_____
2. Commercial Soap	_____
3. Commercial Detergent	_____
4. D.I. Water	_____

B. Emulsifying Properties

Solution	Initial Observations	Observations After 1 Minute
1. Prepared Soap		
2. Commercial Soap		
3. Commercial Detergent		
4. D.I. Water		

Name: _____ Section: _____

C. Effect of Hard Water

Solution	Initial Observations	Observations After 5 Minutes
1. Prepared Soap		
2. Commercial Soap		
3. Commercial Detergent		

D. Describe the washing properties of your soap in terms of lathering ability and feel.

Questions

1. Which solution was most basic according to pH measurements?

2. Which solution(s) show(s) the best ability to emulsify oil?

3. Explain your observations for the addition of hard water. What is happening in each test tube and why?

Name: _____ Section: _____

Post-Lab Questions

1. Suggest several ways that the procedure might be changed to increase the amount of DNA extracted from the onion cells.

2. Suppose a student added ethyl alcohol directly to the onion cell filtrate without first centrifuging the sample. What do you think the student would observe? Would the student be successful in extracting the DNA? Explain.

3. Would you expect similar results if you were to use other cells, such as beef liver or yeast as sources of DNA? Explain your reasoning.

4. Consider a single-celled organism, such as a bacterium, whose DNA is not enclosed within a membrane bound nucleus.

   a) Would you predict that it would be easier or harder to extract the DNA from a bacterial cell compared to extracting DNA from onion cells? Briefly explain.

   b) Would you predict that a single-celled bacterial organism would have as much DNA as a cell from a more complex organism, such as an onion? Explain.

Name: _____ Section: _____

Data and Observations

Record your observations from…

Step 5:

Step 7:

Step 10:

Step 14:

Step 15:

Step 18: