Things for AP Lab Set Ups

Chromatography – 0.1 KCl works best

Unit 0 – Honors Chem Review

Gravimetric Analysis of a Mixture

Gravimetric Analysis of a Mixture

Chemicals

- Mixture of NaCl and Na_2CO_3 in a vial (~2 g of mixture)
- 0.40 M $CaCl_2$ solution, 80mL

$CaCl_2$ solution in beaker(s) up front with pipettes. They will get 80mL up front and bring back to table.

Equipment in Yellow Bins

- Beaker, 250 mL
- Filter flask with Buchner Funnel
- Graduated cylinder, 100 mL
- Glass stir rod
- Rubber policeman
- Filter paper, qualitative
- Weigh boat
- Digital scale
- Drying oven
- Wash Bottle with DI H2O
- Large beaker up front on demo table
- Larger white tray up front on demo table

1 trial					
Sample	**%**	**Amount in each vial**	**# benches**	**x _____ periods**	**= total needed**
4 grams	x 0.35 Na_2CO_3	**1.40 g Na_2CO_3**	x 8	x 4.25	**= 47.6 g**
	x 0.65 NaCl	**2.60 g NaCl**	x 8	x 4.25	**= 88.4 g**

0.40 M $CaCl_2$ Needed	**# benches**	**Per period**	**x ____ periods**	**= total needed**	**Rounded up for extra**
80 mL	x 8	= 640 mL	x 4	= 2560 mL	**Make ___3____ Liters**

8 vials per period	
x ___ periods	4
Total # vials	32
+ a few extra	**= 35**

			To make 1 L $CaCl_2$
1 L	0.40 mol	110.98 g	**= 44.392 g $CaCl_2$**
	1 L	1 mol $CaCl_2$	

Teacher's Notes: Fill a 5mL screw top vial ~4mL full. Err on the side of a little more. Trying to get roughly 4g in each tube. All benches get their own vial per period. Making CaCl2 exothermic. Gets decently hot. Mix slowly in beaker then transfer to vol. flask and dilute to mark.

Teacher's Notes: **a 35% Na_2CO_3 to 65% NaCl** mixture works well for this procedure. If you up the percentage of Na_2CO_3, then increase the $CaCl_2$ solution to ensure that all the CO_3^{2-} is precipitated out.

Gravimetric Analysis of a Mixture

DON'T FORGET

- LABEL WEIGH BOAT WITH LAB BENCH AND PERIOD!
- Dry weight of weigh boat + filter paper
- Wet filter paper down!
- Filter carefully → keep that ppt on top of the filter paper!

Cleanup

- Goggles in UV Cabinet **nicely!**
- **Reset trays for next period!**
- Filtrates can go down the drain → FLUSH DRAIN WITH WATER!
- Precipitate + filter paper in weigh boat → **UP FRONT IN BIN!**
- **Plastic vial with orange lid → UP FRONT IN BIG BEAKER!**

Gravimetric Analysis of a Mixture

Last period of the day

DON'T FORGET

- LABEL WEIGH BOAT WITH LAB BENCH AND PERIOD!
- Dry weight of weigh boat + filter paper
- Wet filter paper down!
- Filter carefully → keep that ppt on top of the filter paper!

Clean up instructions will be on next slide towards the end of the class period!

Cleanup

Goggles in UV Cabinet nicely!

- Filtrates and extra $CaCl_2$ can go down the drain → FLUSH DRAIN WITH WATER!
- Precipitate + filter paper in weigh boat → **UP FRONT IN BIN!**
- **Plastic vial with orange lid → UP FRONT IN BIG BEAKER!**
- **Hand pump up front in pink bin!**

Stay on table:

- **Nothing!**

Put away in cabinets/drawers:

- **Any clean/dry beakers** – in top cabinets, shelves have labels for sizes you can leave tape on them
- **Grad Cylinders** – top cabinet by table 3
- **DI water bottles** – top cabinet by table 3
- **Filter Flasks** – top cabinet by table 4-5
- **Stir rod** – drawer table 2
- **Buchner Funnels** – bin up front
- **Trays** - stacked nicely by table 5

Throw away:

- **Pipettes**
- **Paper towels**

Gravimetric Analysis of a Mixture – DAY 2

DON'T FORGET

- USE THE SAME SCALE YOU USED YESTERDAY!

Cleanup

- Dry precipitate and filter paper → in trash **after** Day 2

- **Report data on shared spreadsheet →**
  https://tinyurl.com/2p894e48

% Comp Ag-Cu Alloy Bead

% Comp Ag-Cu Alloy Bead

DAY 1

- 100 mL beaker labeled
- Watch Glass
- Weigh Boat labeled
- 6 M Nitric Acid – in hood
- Graduated Cylinder – in hood

DAY 2

- 100 mL beaker
- DI water
- Weigh Boat Labeled
- Scoop
- Stir rod
- Buchner funnel w/ collar
- Filter flask
- Hose/aspirator/beaker in sink
- Filter paper + mesh disk
- Hot plate
- 25mL graduated cylinder
- NaCl – up front
- Scale – up front
- 70% alcohol – up front
- Plastic grad cylinder up front

Day 3

- Scale

DAY 1

- Put weigh boat on scale
- Tare the scale
- Weigh the bead
- Put bead in beaker
- Bring to hood
- Add 10mL nitric acid
- Watch Glass
- Sit in hood over night
- Calculate NaCl needed to ppt 100% Ag bead

DAY 2

- Weigh weighboat + dry filter paper
- Set up Buchner funnel
- Weigh 2x NaCl calculated on Day 1 into beaker – up front
- Add 25 mL H2O to make salt solution
- Add NaCl sol’n to dissolved bead
- Filter
- Rinse with nitric acid wash – share the bottle
- Rinse with 10mL alcohol – up front
- Collect on weigh boat
- Dry overnight

DAY 3

- Weigh weighboat + filter paper + product
- Do calculations

Bead = 92% Ag

Unit 1 – Thermochemistry

Determining the Enthalpy of a Reaction w/microscale calorimetry

Enthalpy of a Rxn – 2 trials

Chemicals

- **1.0 M HCl** x 500mL per period
- **MgO** x 2g per period
- **Mg ribbon** x 60cm per period

- **Shared Lab Data:**
  https://tinyurl.com/2p894e48

Equipment

- Vernier computer interface
- Temp probe
- Microcalorimeter
- Forceps
- Weigh boat
- 25mL grad cylinder
- Stir plate
- Scoopula
- Stir bar and pink labeled stir bar beaker
- DI H_2O bottle

TWO TRIALS				
Chemical	**per period**	**x _____ periods**	**= total needed**	**Rounded up for extra**
HCl, 1.0 M	480 mL	x 4	1920 mL	3 L
MgO	1.6 g	x 4	6.4 g	10 g
Mg ribbon	56 cm	x 4	224 cm	250 cm

Teacher's Notes:

Accepted Value =

MgO Heat of formation = -601.6 kJ/mol

$M_1V_1 = M_2V_2 \rightarrow V_1 = \frac{M_2V_2}{M_1}$			**To make 1 L HCl**
M_2	**V_2**	**M_1**	**V_1 = 0.333 L**
1	1 L	6 M	**= 167 mL**

$M_1V_1 = M_2V_2 \rightarrow V_1 = \frac{M_2V_2}{M_1}$			**To make 1 L HCl**
M_2	**V_2**	**M_1**	**V_1 = 0.333 L**
1	1 L	3 M	**= 333 mL**

Tips

- One graph with two trial lines
- After each trial → Experiment → Store latest run
- Write down which color line is which trial

Cleanup

- Goggles in UV Cabinet **nicely!**
- **Reset trays for next period!**
- ***Used*** chemicals can go down the drain → FLUSH DRAIN WITH WATER!
- **MgO Beakers UP FRONT**

- **Report data on shared spreadsheet →** https://tinyurl.com/2p894e48

Cleanup

Goggles in UV Cabinet nicely!

Stay on table:

- **Nothing!**

Table 8

- Stir plate and cord
- Stir bar inside pink beaker
- Stir bar retriever
- Vernier computer interface back in the box NICELY
- Temp probe dry and in plastic bag NICELY
- Calorimeter DRIED
- Weigh boats DRIED

Put away in cabinets/drawers:

- **Graduated cylinders**
  – top cabinet by table 3
- **DI water bottles**
  – top cabinet by table 3
- **Forceps**
  – in drawer on table 3
- **Scoopula**
  – in drawer under DI water jug near table 2
- **Trays**
  - stacked nicely by table 5

Trash

- **Paper towels**

WIPE DOWN BENCHES WITH WATER and TOWELS

Determining the Enthalpy of a Reaction

Enthalpy of a Rxn – 3 trials

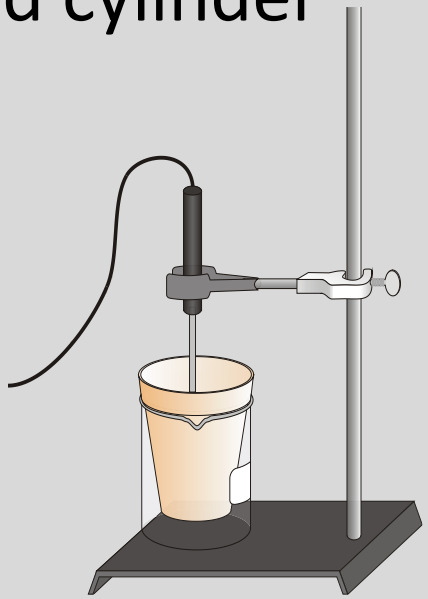
Chemicals

- **2.0 M HCl** x 750mL per period
- **2.0 M NaOH** x 750mL per period
- **2.0 M NH_4Cl** x 450mL per period
- **2.0 M NH_4OH** x 450mL per period

- Thermo data
- **Shared Lab Data:** https://tinyurl.com/2p894e48

Equipment

- Vernier computer interface
- Temp probe
- Styrofoam cup
- 600mL beaker
- 2 x 250mL beaker (to come get chemicals)
- 50mL graduated cylinder
- Stir bar
- Stir plate
- Ring stand
- Utility clamp
- DI H_2O bottle



Enthalpy of a Rxn – 2 trials

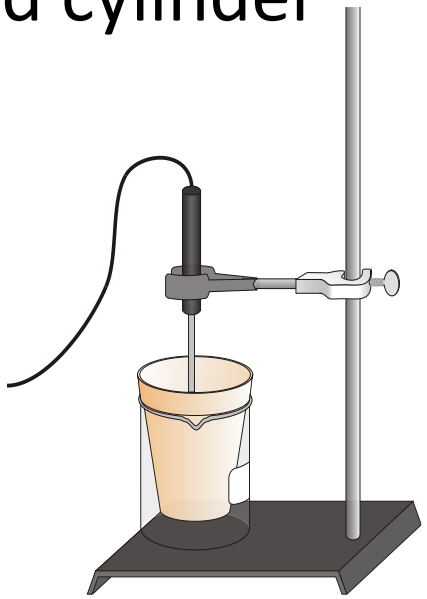
Chemicals

- **2.0 M HCl** x 500mL per period
- **2.0 M NaOH** x 500mL per period
- **2.0 M NH_4Cl** x 300mL per period
- **2.0 M NH_4OH** x 300mL per period

- Thermo data
- **Shared Lab Data:** https://tinyurl.com/2p894e48

Equipment

- Vernier computer interface
- Temp probe
- Styrofoam cup
- 600mL beaker
- 2 x 250mL beaker (to come get chemicals)
- 50mL graduated cylinder
- Stir bar
- Stir plate
- Ring stand
- Utility clamp
- DI H_2O bottle



THREE TRIALS				
Chemical	**mL per period**	**x _____ periods**	**= total needed**	**Rounded up for extra**
HCl, 2.0 M	750	x 4	3000 mL	4 L
NaOH, 2.0 M	750	x 4	3000 mL	4 L
NH_4Cl, 2.0 M	450	x 4	1800 mL	3 L
NH_4OH, 2.0 M	450	x 4	1800 mL	3 L

Teacher's Notes:
Make the NaOH in a beaker with 700mL water, let cool, transfer to volumetric and dilute. Stir again.

			To make 1 L NaOH
1 L	2.0 mol	40 g	**= 80 g NaOH**
	1 L	1 mol NaOH	

or

$M_1V_1 = M_2V_2 \rightarrow V_1 = \frac{M_2V_2}{M_1}$

To make 1 L NaOH			
M_2	**V_2**	**M_1**	**V_1 = 0.5 mL**
2	1 L	4 M	**= 500 mL**

			To make 1 L NH_4Cl
1 L	2.0 mol	53.49 g	**= 106.98 g NH_4Cl**
	1 L	1 mol NH_4Cl	

$M_1V_1 = M_2V_2 \rightarrow V_1 = \frac{M_2V_2}{M_1}$

To make 1 L NH_4OH			
M_2	**V_2**	**M_1**	**V_1 = 0.1351 mL**
2	1 L	14.8 M	**= 135.1 mL**

$M_1V_1 = M_2V_2 \rightarrow V_1 = \frac{M_2V_2}{M_1}$

To make 1 L HCl			
M_2	**V_2**	**M_1**	**V_1 = 0.1667 mL**
2	1 L	12 M	**= 166.7 mL**

TWO TRIALS				
Chemical	**mL per period**	**x _____ periods**	**= total needed**	**Rounded up for extra**
HCl, 2.0 M	500	x 4	2000 mL	3 L
NaOH, 2.0 M	500	x 4	2000 mL	3 L
NH_4Cl, 2.0 M	300	x 4	1200 mL	2 L
NH_4OH, 2.0 M	300	x 4	1200 mL	2 L

Teacher's Notes:
Make the NaOH in a beaker with 700mL water, let cool, transfer to volumetric and dilute. Stir again.

			To make 1 L NaOH
1 L	2.0 mol	40 g	**= 80 g NaOH**
	1 L	1 mol NaOH	

or

$M_1V_1 = M_2V_2 \rightarrow V_1 = \frac{M_2V_2}{M_1}$

To make 1 L NaOH			
M_2	**V_2**	**M_1**	**V_1 = 0.333 L**
2	1 L	6 M	**= 333 mL**

			To make 1 L NH_4Cl
1 L	2.0 mol	53.49 g	**= 106.98 g NH_4Cl**
	1 L	1 mol NH_4Cl	

$M_1V_1 = M_2V_2 \rightarrow V_1 = \frac{M_2V_2}{M_1}$

To make 1 L NH_4OH			
M_2	**V_2**	**M_1**	**V_1 = 0.3333 mL**
2	1 L	6 M	**= 333.3 mL**

$M_1V_1 = M_2V_2 \rightarrow V_1 = \frac{M_2V_2}{M_1}$

To make 1 L HCl			
M_2	**V_2**	**M_1**	**V_1 = 0.333 L**
2	1 L	6 M	**= 333 mL**

Part 1 – Lab bench #1 and #2 – Rxn 1 = Δ 13 deg

- 50mL HCl + 50mL NaOH

Part 2 – Lab bench #3, #4 and #5 – Rxn 2 – Δ 1 deg

- 50mL NH_4Cl + 50mL NaOH

Part 3 – Lab bench #6, #7 and #8 – Rxn 3 – Δ 11 deg

- 50mL HCl + 50mL NH_4OH

Part 4 - Everyone

- Data analysis
- Find max/min temps
- Report data on shared spreadsheet

Rxn 1 – Lab bench #1 and #2

- 50mL **HCl** + 50mL **NaOH**

Rxn 2 – Lab bench #3, #4 and #5

- 50mL **NH_4Cl** + 50mL **NaOH**

Rxn 3 – Lab bench #6, #7 and #8

- 50mL **HCl** + 50mL **NH_4OH**

Part 4 - Everyone

- Data analysis
- Find max/min temps
- **Report data on shared spreadsheet** →

https://tinyurl.com/2p894e48

Tips

- One graph with two trial lines
- After each trial → Experiment → Store latest run
- Write down which color line is which trial

Cleanup

- Goggles in UV Cabinet **nicely!**
- **Reset trays for next period!**
- ***Used*** chemicals can go down the drain → FLUSH DRAIN WITH WATER!
- **Extra chemicals STAY ON THE TABLE!**

Cleanup

Goggles in UV Cabinet nicely!

Stay on table:

- **Ring stand w/clamp**
- **Stir Plate with cord unplugged, nicely next to the stir plate**

Up Front

- Stir bar
- Stir bar retriever
- Vernier computer interface back in the box
- Temp probe
- Styrofoam cup

Put away in cabinets/drawers:

- **Graduated cylinders**
  – top cabinet by table 3
- **DI water bottles**
  – top cabinet by table 3
- **Any clean/dry beakers**
  – in top cabinets, shelves have labels for sizes you can leave tape on them
- **Trays**
  - stacked nicely by table 5

Trash

- **Pipettes**
- **Paper towels**

WIPE DOWN BENCHES WITH WATER and TOWELS

Unit 2 – Thermodynamics

Determining the Entropy of a Reaction

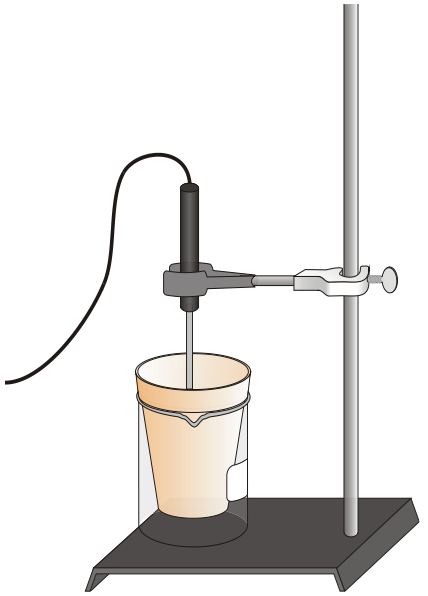
Entropy of a Rxn

Chemicals

- $NaNO_3$ x 8.5 g per table x 2 benches
- NH_4Cl x 5.5 g per table x 3 benches
- NH_4NO_3 x 8 g per table x 3 benches

Equipment

- **Vernier computer interface**
- **Temp probe**
- **Styrofoam cup small w/a lid**
- **600mL beaker**
- **100mL beaker w/color tape**
- **50mL graduated cylinder**
- **Stir bar and wand**
- **Scoop**
- **Weigh boat**
- **Stir plate**
- **Ring stand**
- **Utility clamp**
- **DI H_2O bottle**
- **4 goggles in each tray**



TWO TRIALS					
Chemical	**g per trial**	**x 2 trials**	**x _____ tables**	**x _____ periods**	**= total needed**
$NaNO_3$	4.25	8.5	x 2	x 4	**68 g**
NH_4Cl	2.675	5.349	x 3	x 4	**64.2 g**
NH_4NO_3	4	8	x 3	x 4	**96 g**

Teacher's Notes:

CHECK MASSES in the chemical bottles

Accepted dS NH4NO3 = 108 J/mol.K

NH_4NO_3
$\Delta T = -5$

			To make 50mL 1 M $NaNO_3$ (student's make at their bench)
0.05 L	1.0 mol	85.00 g	**= 4.25 g $NaNO_3$**
	1 L	1 mol $NaNO_3$	

			To make 50mL 1 M NH_4Cl $NaNO_3$ (student's make at their bench)
0.05 L	1.0 mol	53.49 g	**= 2.675 g NH_4Cl**
	1 L	1 mol NH_4Cl	

			To make 50mL 1 M NH_4NO_3 $NaNO_3$ (student's make at their bench)
0.05 L	1.0 mol	80 g	**= 4 g NH_4NO_3**
	1 L	1 mol NH_4NO_3	

Calorimeter constant

EXO | ENDO | ENDO

$-Q_{HOT} = Q_{COLD} + Q_{CAL}$

$-m_{HOT} C_{H2O} \Delta T_{HOT} = m_{COLD} C_{H2O} \Delta T_{COLD} + C_{CAL} \Delta T_{COLD}$

Chemical Reaction

Trial #1 #2

$Q_{RXN} = -(mC\Delta T + C_{CAL}\Delta T)$

System endo

Surroundings exo

Chemicals

- $NaNO_3$ = benches 1, 2
- NH_4Cl = benches 3, 4, 5
- NH_4NO_3 = benches 6, 7, 8

Tips

- One graph with three trial lines
- After each trial → Experiment → Store latest run
- Write down which color line is which trial

Cleanup

- Goggles in UV Cabinet **nicely!**
- **Reset trays for next period!**
- **Stir bar to me!**
- Used chemicals can go down the drain → FLUSH DRAIN WITH WATER!

Chemicals

- NH_4NO_3 = ALL benches this year!

Tips

- One graph with two trial lines
- After each trial → Experiment → Store latest run
- Write down which color line is which trial

Cleanup

- Goggles in UV Cabinet **nicely!**
- **Reset trays for next period!**
- Unused chemicals → stay on table
- Used chemicals can go down the drain → FLUSH DRAIN WITH WATER!

Cleanup

Goggles in UV
Cabinet nicely!

Stay on table:

- **Ring stand w/clamp**
- **Hot plate – Cords UP FRONT!**
- **Any beakers with extra chemicals**

Up Front

- Vernier computer interface back in the box
- Temp probe clean and dry!
- Styrofoam cup clean and dry!
- Stir bars
- Hot plate cords
- Stir plate cords

Put away in cabinets/drawers:

- **Graduated cylinders**
  – top cabinet by table 3
- **DI water bottles**
  – top cabinet by table 3
- **Scoop**
  – drawer table 2
- **Any clean/dry beakers**
  – in top cabinets
- **Stir Plate**
  – cords in the blue bin up front
  – stir plate in top cabinets by table 5
- **Weigh boats**
  – washed, dried, in top cabinet by back door
- **Trays**
  - stacked nicely by table 5

Unit 3 – Kinetics

Beers Law Activity

Beer's Law Activity

Chemicals

- 0.40 M copper (II) sulfate solution
  - 250 mL per period
- Unknown concentration ~0.20 M

- Sometimes $CuCl_2$

Equipment

- Venier computer interface
- Spectrometer
- Cuvette
- 20x150 mm test tubes x5
- 50mL graduated cylinder
- 100mL beakers x2
- Reusable Pipettes x 2
- Pipette pumps
- Test tube rack
- Stir rod
- Kimwipes
- Distilled H2O bottle

1 Trial					
Chemical	**mL per table**	**x _____ tables**	**x _____ periods**	**= total needed**	**Rounded up for extra**
0.40M $CuSO_4$	30	x 8	x 4	960 mL	2 L
0.20 $CuSO_4$	5	x 8	x 4	160 mL	1 L

			To make 1L 0.40M $CuSO_4 \bullet H_2O$
1 L	0.40 mol	249.68 g	**= 99.87 g $CuSO_4$**
	1 L	1 mol $CuSO_4 \bullet \mathbf{H_2O}$	

			To make 1L 0.20M $CuSO_4 \bullet H_2O$
1 L	0.2 mol	249.68 g	**= 49.94 g $CuSO_4$**
	1 L	1 mol $CuSO_4 \bullet \mathbf{H_2O}$	

Teacher's Notes:

Accepted value = ~0.20 M

0.2 M done, need more copper sulfate to make 0.4 M

Slow to dissolve but will.
Mix in a big beaker first until dissolved then pour in vol. flask and dilute to mark.

Optimal wavelength = 635nm, absorbance no greater than ~0.90

Reminders

- **Fill cuvettes THEN put them in spectrometers**
- **DON'T get the spectrometers wet!**
- **Have someone hold the beaker while you pipette so it doesn't get knocked off table.**
- **Remember – read from eye level, not above! Grad cylinders AND the graduated pipettes.**
- **Make sure you press the "KEEP" button between known trials! (maybe? Is this true for the chromebooks?)**
- **When doing your unknown – DO NOT press ANYTHING! Just record your value that it reads you**

Cleanup

- Goggles in UV Cabinet **nicely**!
- **Reset trays for next period!**
- **Waste up front for the contest!**

$CuSO_4$ must go in WASTE JUG up front!!!!

USE THE SAME CUVETTE EACH TIME!

$CuSO_4$ = blue labeled pipette

Waste Jug

Unknown $CuSO_4$

Optimal Wavelength is 635 nm

Cleanup

****$CuSO_4$ must go in WASTE JUG up front!!!!****

Goggles in UV Cabinet nicely!

Stay on table:

- **Nothing!**

Up Front

- **Vernier Spectrometers**
- **Wet cuvettes and lids in beaker - dry them as much as you can**
- **Test tubes IN THE RACKS UPSIDE DOWN TO HELP DRY**
- **Kimwipes**
- **Pipettes**
- **Pipette pumps**

Put away in cabinets/drawers:

- **Stir rods**
  – in drawer on table
- **Graduated cylinders**
  – top cabinet by table
- **DI water bottles**
  – top cabinet by table
- **Any clean/dry beakers**
  – in top cabinets, shelves have labels for sizes you can leave tape on them
- **Trays**
  - stacked nicely by table 5

Rate and Order of a Chemical Reaction (Pheno version)

Rate and Order

Chemicals

- Dilute Phenolphthalein dropper bottle
- Sodium hydroxide, NaOH, 2.0 M
- Distilled H2O

Equipment

- Spectrometer
- Cuvette with lid
- 50mL beaker
- Disposable pipette for filling cuvette
- Kimwipes
- Distilled H_2O
- Thermometer

Reminders

- 2.0 M NaOH
- One cuvette for whole experiment!
- Fill cuvettes THEN put them in spectrometers
- DON’T get the spectrometers wet!
- Once you combine your chemicals the reaction starts! Combine then get into the cuvette and the spec FAST!!!!

Cleanup

****Solution must go in WASTE JUG up front!!!!****

Goggles in UV Cabinet nicely!

Stay on table:

- **Nothing!**

In trashcan in the back:

- **Disposable pipettes**

On cart:

- **Vernier interface in box**
- **Spectrometers w/ cuvettes DRIED in the 400mL beaker!**
- **Kimwipes**

Put away in cabinets/drawers:

- **DI water bottles**
  – top cabinet by table 3
- **Any clean/dry beakers**
  – in top cabinets, shelves have labels for sizes you can leave tape on them

1 Trial					
Chemical	**mL per table**	**x _____ tables**	**x _____ periods**	**= total needed**	**Rounded up for extra**
2.0 M NaOH		x 8	x 4		
		x 8	x 4		

			To make 1L 2.0 M NaOH
1 L	0.20 mol	40 g	**= 80 g NaOH + 1.6g b/c always too low (additional 20% moles)**
	1 L	1 mol NaOH	

			To make 1L
1 L	0.02 mol	270.32 g	**=**
	1 L	1 mol $FeCl_3$	

M1	V1	M2	V2	**To make 1L 0.2M NaOH**
6 M	X L	0.2 M	1 L	**X = 0.333 x 1000 = 33.3 mL**

Teacher's Notes:

Accepted value = 1st order

NaOH should be standardized

Optimal wavelength = ?? nm

Rate and Order of a Chemical Reaction (Fe version)

Rate and Order

Chemicals

- 0.02 M KI
- DI Water
- 0.02 M $FeCl_3$ made in 0.10 M HCl MUST BE MADE NO EARLIER THAN THE DAY BEFORE
- Each Group needs 75mL each chemical
- 600mL per period

Equipment

- Spectrometer
- Cuvette
- Volumetric pipettes x3 orange, green, blue tape
- Pipette pumps

  Dark Green - orange & blue tape

  Light green no tape
- 250mL beakers x3 labeled w/ orange, green, blue tape
- 100mL beakers x3 labeled w/ orange, green, blue tape
- 600mL beaker x1 for waste labeled with red tape
- Disposable pipette for filling cuvette
- Kimwipes
- Distilled H_2O

Reminders

- 0.02 M KI
- DI Water
- 0.02 M $FeCl_3$
- One cuvette for whole experiment!
- Make as little waste as possible!
- Fill cuvettes THEN put them in spectrometers
- DON'T get the spectrometers wet!
- Once you combine your chemicals the reaction starts! Combine then get into the cuvette and the spec FAST!!!!

Cleanup

****Solution must go in WASTE JUG up front!!!!****

Goggles in UV Cabinet nicely!

Stay on table:

- **Nothing!**

In trashcan in the back:

- **Disposable pipettes**

On cart:

- **Vernier interface in box**
- **Spectrometers w/ cuvettes DRIED in the 400mL beaker!**
- **Kimwipes**

Put away in cabinets/drawers:

- **DI water bottles**
  – top cabinet by table 3
- **Any clean/dry beakers**
  – in top cabinets, shelves have labels for sizes you can leave tape on them

1 Trial					
Chemical	**mL per table**	**x _____ tables**	**x _____ periods**	**= total needed**	**Rounded up for extra**
0.02 M KI	75	x 8	x 4	2400 mL	3 L
0.02 $FeCl_3$	75	x 8	x 4	2400 mL	3 L

			To make 1L 0.02M KI
1 L	0.02 mol	166.0 g	**= 3.320 g KI**
	1 L	1 mol KI	

			To make 1L 0.02M $FeCl_3$ IN 0.10 M HCl
1 L	0.02 mol	270.32 g	**= 5.406 g $FeCl_3$**
	1 L	1 mol $FeCl_3$	

M1	V1	M2	V2	**To make 1L 0.01M HCl**
1 M	X L	0.10 M	1 L	**X = 0.10 x 1000 = 100 mL**

Teacher's Notes:

CANNOT MAKE AHEAD OF TIME! AT THE MOST MAKE IT THE DAY BEFORE.

Optimal wavelength = 430 nm

Unit 4 – Equilibrium

Determination of an Equilibrium Constant

Determination of an Eq. Constant

Chemicals

- Virtual Lab
  Data in shared data folder and also in Equilibrium chapter folder with lab handouts

Equipment

-

Unit 7 – Gas Laws

Molar Mass of a Gas Lab

Molar Mass of a Gas

Chemicals

- **Copper wire, 18 gauge, 10cm long**
- **2M HCl, 10mL**
- **Mg ribbon, 1cm, x2 pieces**
- **DI water**

Equipment

- **400 mL beaker**
- **Graduated cylinder, 10mL**
- **Eudiometer tube, 50mL**
- **One hole rubber stopper**
- **Scale**
- **Thermometer**
- **Barometer**
- **Metric ruler**
- **Scissors or wire cutters**

Molar Mass of a Gas

- Don’t drip acid all over! Cover the hole in the rubber stopper with a gloved finger when moving/transferring the tube around!
- Don’t forget to take the temperature of the water!
- **~ 1cm, make sure mass of Mg is between 0.02 – 0.03 grams**

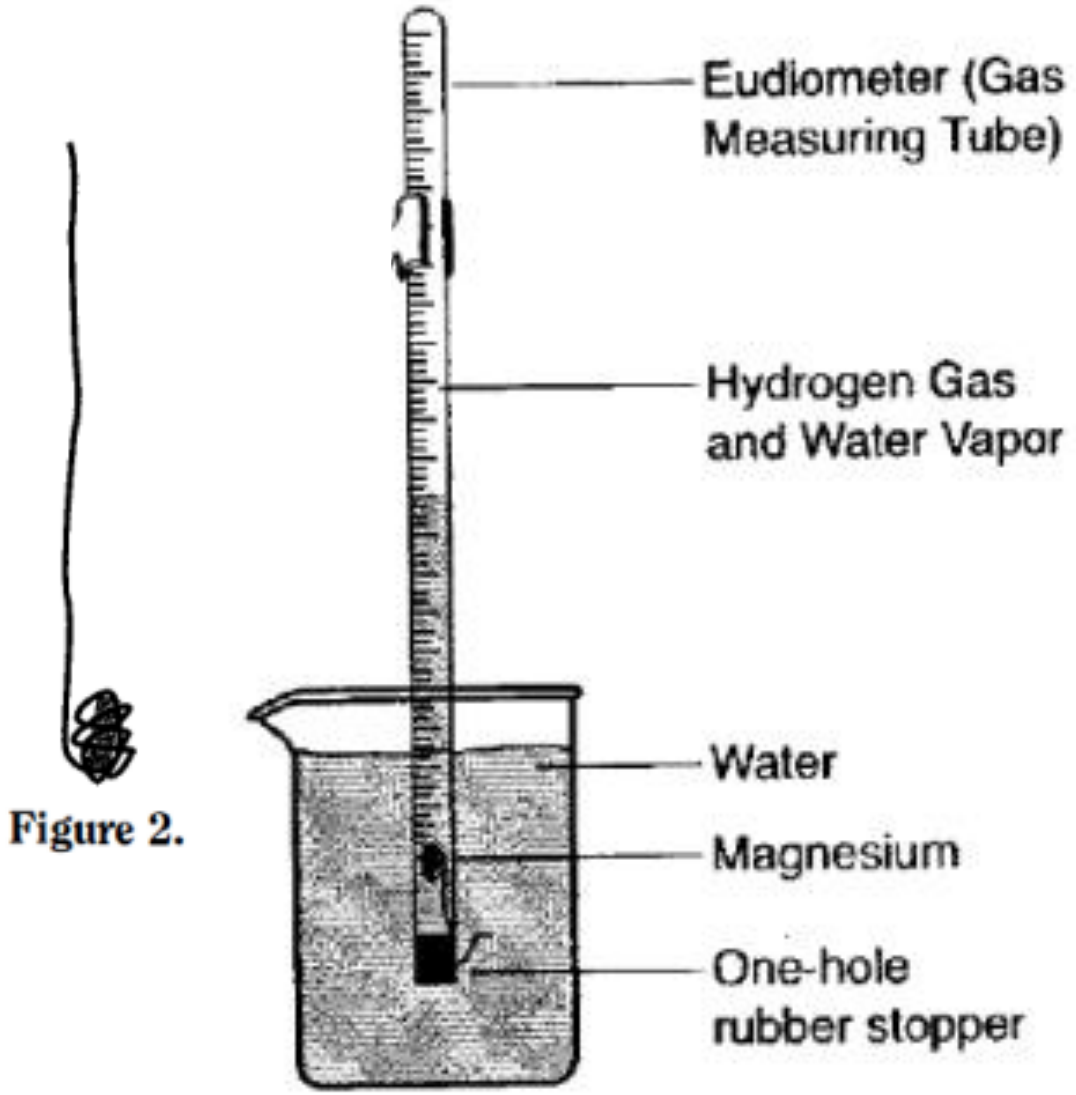


Figure 2.

1 Trial					
Chemical	**mL per table**	**x _____ tables**	**x _____ periods**	**= total needed**	**Rounded up for extra**
2 M HCl	15	x 8	x 4	480 mL	1 L

<u>Teacher's Notes:</u>
Magnesium is in the orange bin in the "random" cabinet in the back corner

Accepted Value = 22.4 L, density H2 = 0.0899 g/L

Unit 8 – IMFs

Rate of Evaporation

ADD YOUR DATA TO SHARED GOOGLE SHEET!

Table 1	**Hexane** WEAR GLOVES	**Ethanol**
Table 2		
Table 3		
Table 4		
Table 5	**Acetone** TAKES OFF NAILPOLISH!	**Water**
Table 6		
Table 7		
Table 8		

DATA TABLE

Substance	t_1 (°C)	t_2 (°C)	Δt ($t_1 - t_2$) (°C)
ethanol	23.5	15.2	8.3
1-propanol	23.0	18.1	4.9
1-butanol	23.2	21.5	1.7
n-pentane	23.0	6.9	16.1
methanol	22.9	9.8	13.1
n-hexane	23.2	11.2	12.0

MOST to LEAST IMFs (and their typical delta T values)

1. **Water** 8 → 9 H-bonding x2
2. **Ethanol** 10 → 12 H-bonding x1
3. **Hexane** 14 → 20 LDF (lots of them!)
4. **Acetone** 17 → 22 DP-DP

Substance	Predicted Δt (°C)	Explanation
1-butanol	varies (< 4.9°C)	It has a higher molecular wt. than 1-propanol (both have H-bonds).
n-pentane	varies (> 8.3°C)	It has a higher molecular wt. than either, but no H-bonding.
methanol	varies (> 8.3°C)	It has a lower molecular wt. than ethanol (both have H-bonds).
n-hexane	varies (< 16.1°C)	It has a higher molecular wt. than n-pentane; also no H-bonding.

Unit 9 – Solutions

Ksp of Ca(OH)2

Accepted value = 6.5×10^{-6}

Normal to have very high % errors for some reason – ask on ap group at some point

Unit 10 – Acid Base

Buffers

Titration

Chemicals

- 0.1 M NaOH
- 0.1 M HCl
- 0.1 M HAc
- DI water

Equipment

- Ring stand
- Burette clamp + Burette
- Clamp for pH probe + pH probe
- 50mL grad cylinder
- 15 mL grad cylinder
- DI water bottle
- 250 mL beaker
- Stir plate + cord + Stir bar + retriever
- Labquest interface
- Front table – two beakers for acids and pipette in each beaker.
- Parafilm for covering between days
- Extra rubber bands
- Buffers made for calibration + extra beaker for wash
- Two beakers for me to fill and rinse burettes + funnel

1 Trial					
Chemical	**mL per table**	**x _____ tables**	**x _____ periods**	**= total needed**	**Rounded up for extra**
0.1 M NaOH	25	x 8	x 4	800 mL	1 L
0.1 M HCl	25	x 8	x 4	800 mL	1 L
0.1 M Hac	25	x 8	x 4	800 mL	1 L

			To make 1L 0.1M NaOH
1 L	0.1 mol	40.00 g	**= 4.00 NaOH**
	1 L	1 mol NaOH	

M1	V1	M2	V2	**To make 1L 0.1M HCl**
3 M	X L	0.10 M	1 L	**X = 0.0333 x 1000 = 33.33 mL**

M1	V1	M2	V2	**To make 1L 0.1M HCl**
1 M	X L	0.10 M	1 L	**X = 0.1 x 1000 = 100 mL**

Teacher's Notes:

Accepted should be 0.1 M but may change year to year.

Shock pH probes in 0.1 M – 0.5 M HCl for 4-8 hours. Rinse with DI water. Soak in storage solution for 30-60 min. Rinse with DI water. Check pH in buffer solutions (made with capsule kit). Storage solution and buffer capsules in same cupboard as pH probes.

https://www.vernier.com/files/manuals/ph-bta/ph-bta.pdf

Titration

Titration

Chemicals

- 0.1 M NaOH
- 0.1 M HCl
- 0.1 M HAc
- DI water

Equipment

- Ring stand
- Burette clamp + Burette
- Clamp for pH probe + pH probe
- 50mL grad cylinder
- 15 mL grad cylinder
- DI water bottle
- 250 mL beaker
- Stir plate + cord + Stir bar + retriever
- Labquest interface
- Front table – two beakers for acids and pipette in each beaker.
- Parafilm for covering between days
- Extra rubber bands
- Buffers made for calibration + extra beaker for wash
- Two beakers for me to fill and rinse burettes + funnel

1 Trial					
Chemical	**mL per table**	**x _____ tables**	**x _____ periods**	**= total needed**	**Rounded up for extra**
0.1 M NaOH	25	x 8	x 4	800 mL	1 L
0.1 M HCl	25	x 8	x 4	800 mL	1 L
0.1 M Hac	25	x 8	x 4	800 mL	1 L

			To make 1L 0.1M NaOH
1 L	0.1 mol	40.00 g	**= 4.00 NaOH**
	1 L	1 mol NaOH	

M1	V1	M2	V2	**To make 1L 0.1M HCl**
3 M	X L	0.10 M	1 L	**X = 0.0333 x 1000 = 33.33 mL**

M1	V1	M2	V2	**To make 1L 0.1M HCl**
1 M	X L	0.10 M	1 L	**X = 0.1 x 1000 = 100 mL**

Teacher's Notes:

Accepted should be 0.1 M but may change year to year.

Shock pH probes in 0.1 M – 0.5 M HCl for 4-8 hours. Rinse with DI water. Soak in storage solution for 30-60 min. Rinse with DI water. Check pH in buffer solutions (made with capsule kit). Storage solution and buffer capsules in same cupboard as pH probes.

https://www.vernier.com/files/manuals/ph-bta/ph-bta.pdf

Unit 11 – Electrochem

Electroplating

Titration

Chemicals

- 0.1 M NaOH
- 0.1 M HCl
- 0.1 M HAc
- DI water

Equipment

- Ring stand
- Burette clamp + Burette
- Clamp for pH probe + pH probe
- 50mL grad cylinder
- 15 mL grad cylinder
- DI water bottle
- 250 mL beaker
- Stir plate + cord + Stir bar + retriever
- Labquest interface
- Front table – two beakers for acids and pipette in each beaker.
- Parafilm for covering between days
- Extra rubber bands
- Buffers made for calibration + extra beaker for wash
- Two beakers for me to fill and rinse burettes + funnel

1 Trial					
Chemical	**mL per table**	**x _____ tables**	**x _____ periods**	**= total needed**	**Rounded up for extra**
0.1 M NaOH	25	x 8	x 4	800 mL	1 L
0.1 M HCl	25	x 8	x 4	800 mL	1 L
0.1 M Hac	25	x 8	x 4	800 mL	1 L

			To make 1L 0.1M NaOH
1 L	0.1 mol	40.00 g	**= 4.00 NaOH**
	1 L	1 mol NaOH	

M1	V1	M2	V2	**To make 1L 0.1M HCl**
3 M	X L	0.10 M	1 L	**X = 0.0333 x 1000 = 33.33 mL**

M1	V1	M2	V2	**To make 1L 0.1M HCl**
1 M	X L	0.10 M	1 L	**X = 0.1 x 1000 = 100 mL**

Teacher's Notes:

Accepted should be 0.1 M but may change year to year.

Shock pH probes in 0.1 M – 0.5 M HCl for 4-8 hours. Rinse with DI water. Soak in storage solution for 30-60 min. Rinse with DI water. Check pH in buffer solutions (made with capsule kit). Storage solution and buffer capsules in same cupboard as pH probes.

https://www.vernier.com/files/manuals/ph-bta/ph-bta.pdf

Unit 12 – After AP Exam

Lemonade Lab

Titration

Chemicals

- 0.1 M NaOH
- 0.1 M HCl
- 0.1 M HAc
- DI water

Equipment

- Ring stand
- Burette clamp + Burette
- Clamp for pH probe + pH probe
- 50mL grad cylinder
- 15 mL grad cylinder
- DI water bottle
- 250 mL beaker
- Stir plate + cord + Stir bar + retriever
- Labquest interface
- Front table – two beakers for acids and pipette in each beaker.
- Parafilm for covering between days
- Extra rubber bands
- Buffers made for calibration + extra beaker for wash
- Two beakers for me to fill and rinse burettes + funnel

1 Trial					
Chemical	**mL per table**	**x _____ tables**	**x _____ periods**	**= total needed**	**Rounded up for extra**
0.1 M NaOH	25	x 8	x 4	800 mL	1 L
0.1 M HCl	25	x 8	x 4	800 mL	1 L
0.1 M Hac	25	x 8	x 4	800 mL	1 L

			To make 1L 0.1M NaOH
1 L	0.1 mol	40.00 g	**= 4.00 NaOH**
	1 L	1 mol NaOH	

M1	V1	M2	V2	**To make 1L 0.1M HCl**
3 M	X L	0.10 M	1 L	**X = 0.0333 x 1000 = 33.33 mL**

M1	V1	M2	V2	**To make 1L 0.1M HCl**
1 M	X L	0.10 M	1 L	**X = 0.1 x 1000 = 100 mL**

Teacher's Notes:

Accepted should be 0.1 M but may change year to year.

Shock pH probes in 0.1 M – 0.5 M HCl for 4-8 hours. Rinse with DI water. Soak in storage solution for 30-60 min. Rinse with DI water. Check pH in buffer solutions (made with capsule kit). Storage solution and buffer capsules in same cupboard as pH probes.

https://www.vernier.com/files/manuals/ph-bta/ph-bta.pdf

Standardizing NaOH lab

Titration

Chemicals

- 0.1 M NaOH
- 0.1 M HCl
- 0.1 M HAc
- DI water

Equipment

- Ring stand
- Burette clamp + Burette
- Clamp for pH probe + pH probe
- 50mL grad cylinder
- 15 mL grad cylinder
- DI water bottle
- 250 mL beaker
- Stir plate + cord + Stir bar + retriever
- Labquest interface
- Front table – two beakers for acids and pipette in each beaker.
- Parafilm for covering between days
- Extra rubber bands
- Buffers made for calibration + extra beaker for wash
- Two beakers for me to fill and rinse burettes + funnel

1 Trial					
Chemical	**mL per table**	**x _____ tables**	**x _____ periods**	**= total needed**	**Rounded up for extra**
0.1 M NaOH	25	x 8	x 4	800 mL	1 L
0.1 M HCl	25	x 8	x 4	800 mL	1 L
0.1 M Hac	25	x 8	x 4	800 mL	1 L

			To make 1L 0.1M NaOH
1 L	0.1 mol	40.00 g	**= 4.00 NaOH**
	1 L	1 mol NaOH	

M1	V1	M2	V2	**To make 1L 0.1M HCl**
3 M	X L	0.10 M	1 L	**X = 0.0333 x 1000 = 33.33 mL**

M1	V1	M2	V2	**To make 1L 0.1M HCl**
1 M	X L	0.10 M	1 L	**X = 0.1 x 1000 = 100 mL**

Teacher's Notes:

Accepted should be 0.1 M but may change year to year.

Shock pH probes in 0.1 M – 0.5 M HCl for 4-8 hours. Rinse with DI water. Soak in storage solution for 30-60 min. Rinse with DI water. Check pH in buffer solutions (made with capsule kit). Storage solution and buffer capsules in same cupboard as pH probes.

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