

DATA SHEET

EXPERIMENT 1: CHEMICAL REACTIONS

Group: _____ Section: _____1_____ Date: _____

Group members: _____

Instructor's/TA's signature and comments:

Expt. 1	Expt. 6
Expt. 2	Expt. 7
Expt. 3	Expt. 8
Expt. 4	Expt. 9
Expt. 5	Approval

1. Reactions of Cu^{2+}

Reaction	Observation
0.5M CuSO_4 + 2M NaOH	
0.5M CuSO_4 + 2M NH_4OH	

2. Reactions of silver halides

Reaction	Observation
0.5M KCl + 0.1M AgNO_3	
0.5M KCl + 0.1M AgNO_3 + 2M NH_4OH	
0.5M KBr + 0.1M AgNO_3	
0.5M KBr + 0.1M AgNO_3 + 2M NH_4OH	
0.5M KI + 0.1M AgNO_3	
0.5M KI + 0.1M AgNO_3 + 2M NH_4OH	

3. Reactions of H₂O₂

Reaction	Observation
0.1M KMnO ₄ + 2M H ₂ SO ₄ + H ₂ O ₂	
0.1M KI + 2M H ₂ SO ₄ + H ₂ O ₂	
H ₂ O ₂ + MnO ₂	

4. Reactions of Nitrate

Reaction	Observation
1M NaNO ₃ + FeSO ₄ + concentrated H ₂ SO ₄	
1M NaNO ₂ + FeSO ₄ + concentrated H ₂ SO ₄	
1M NaNO ₃ + FeSO ₄ + concentrated CH ₃ COOH	

5. Reactions of KMnO_4

Reaction	Observation
0.5M Na_2SO_3 + 2M H_2SO_4 + 0.1M KMnO_4	
0.5M Na_2SO_3 + 6N NaOH + 0.1M KMnO_4	
0.5M Na_2SO_3 + H_2O + 0.1M KMnO_4	

6. Reaction of Potassium Dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$)

Reaction	Observation
2M $\text{K}_2\text{Cr}_2\text{O}_7$ + 6M H_2SO_4 + $\text{C}_2\text{H}_5\text{OH}$	

7. A. Reactions of Fe^{3+}

Reaction	Observation
0.5M FeCl_3 + 2M KOH	
0.5M FeCl_3 + 2M NH_4OH	

7. B. Reactions of Fe^{2+}

Reaction	Observation
0.5M FeSO_4 + 2M KOH	
0.5M FeSO_4 + 2M NH_4OH	

8. Reactions of Al^{3+}

Reaction	Observation
0.5M $\text{Al}_2(\text{SO}_4)_3$ + 2M NaOH	
0.5M $\text{Al}_2(\text{SO}_4)_3$ + 2N NaOH + 2M HCl	
0.5M $\text{Al}_2(\text{SO}_4)_3$ + 2M NaOH + 2M NaOH	

9. Flame test

Solution	Dominant flame color
LiCl	
NaCl	
KCl	
CaCl_2	
BaCl_2	

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EXPERIMENT 2: pH AND BUFFERS

Group: _____ Section: _____ 2 _____ Date: _____

Group members: _____

Instructor's/TA's signature and comments:

Expt. 1	Expt. 4
Expt. 2	Expt. 5
Expt. 3	Approval

1. pH OF DEIONIZED WATER

Time (second)	Observed pH	
	1 st (your group) (Group____)	2 nd (other group in the class) (Group____)
0		
20		
40		
60		
80		
100		
120		
140		
160		

2. pH OF STRONG ACID

Solution	Theoretical pH	Measured pH	
		1 st (Group____)	2 nd (Group____)
10 mL of 0.1M HCl			
Add 90 mL of distilled water			
Add 10 mL of 0.1M NaOH			
Add 90 mL of 0.01M NaOH			

3. pH OF WEAK ACID

Solution	Measured pH		Averaged K _a
	1 st (Group____)	2 nd (Group____)	
0.1M acetic acid			
0.01M acetic acid			
0.001M acetic acid			

4. pH OF SALTS

Solution	Predicted pH	Measured pH	
		1 st (Group____)	2 nd (Group____)
0.1M NaCl			
0.1M CH ₃ COONa			
0.1M NH ₄ Cl			

5. pH OF BUFFERS

Buffer	Volume (mL) 0.1M CH ₃ COOH	Volume (mL) 0.1M CH ₃ COONa	[Acid]	[Base]	Calculated pH	Measured pH	
						1 st (Group__)	2 nd (Group__)
A	10.0	40.0					
B	40.0	10.0					
C	25.0	25.0					

❖ Part I: Addition of 10 drops 0.1 M HCl

Buffer	pH from the start, pH _o	pH after adding 10 drops HCl	Total volume HCl (drops) to change pH by one unit (pH _o -1)
A			
B			
C			

❖ Part II: Addition of 10 drops 0.1 M NaOH

Buffer	pH from the start, pH _o	pH after adding 10 drops NaOH	Total volume NaOH (drops) to change pH by one unit (pH _o +1)
A			
B			
C			

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EXPERIMENT 3: REDOX TITRATION

Group: _____ Section: _____ 3 _____ Date: _____

Group members: _____

Instructor's/TA's signature and comments:

Expt. 1	Expt. 3
Expt. 2	Expt. 4
Approval	

1. TITRATION OF KMnO_4 SOLUTION WITH STANDARD $\text{H}_2\text{C}_2\text{O}_4$ SOLUTION

Trial #	Burette reading (mL)	Volume of KMnO_4 (mL)	Normality of KMnO_4 (N)
1	-		
2	-		

Average Normality of KMnO_4 = _____ (N)

2. TITRATION OF UNKNOWN CONCENTRATION $\text{H}_2\text{C}_2\text{O}_4$ SOLUTION WITH STANDARD KMnO_4 SOLUTION

Trial #	Burette reading (mL)	Volume of KMnO_4 (mL)	Normality of $\text{H}_2\text{C}_2\text{O}_4$ (N)
1	-		
2	-		

Average Normality of $\text{H}_2\text{C}_2\text{O}_4$ = _____ (N)

3. TITRATION OF UNKNOWN CONCENTRATION FeSO_4 SOLUTION WITH STANDARD KMnO_4 SOLUTION

Trial #	Burette reading(mL)	Volume of KMnO_4 (mL)	Normality of FeSO_4 (N)
1	-		
2	-		

Average Normality of FeSO_4 = _____ (N)

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EXPERIMENT 4: CHEMICAL EQUILIBRIUM

Group: _____ Section: _____4_____ Date: _____

Group members: _____

Instructor's/TA's signature and comments:

Expt. 1	Expt. 4
Expt. 2	Expt. 5
Expt. 3	Approval

1. ACID/BASE EQUILIBRIA

Equilibrium System: $2\text{CrO}_4^{2-}(\text{aq}) + 2\text{H}^+(\text{aq}) \rightleftharpoons \text{Cr}_2\text{O}_7^{2-}(\text{aq}) + \text{H}_2\text{O}(\text{l})$		
Description of conditions	Predicted outcome	Observation
Initial solution		
+ Conc. HCl		
+ 6 N NaOH		

2. EQUILIBRIA OF ACID/BASE INDICATORS

Equilibrium System: $\text{H}(\text{MV})_{(\text{aq})} + \text{H}_2\text{O}_{(\text{l})} \rightleftharpoons \text{H}_3\text{O}^+_{(\text{aq})} + \text{MV}^-_{(\text{aq})}$		
Addition	Predicted outcome	Observation
None (control)		
6 M HCl		
6 M NaOH		
6 M HCl		

3. COMPLEX ION FORMATION

Equilibrium System: $\text{Fe}^{3+}_{(\text{aq})} + \text{SCN}^{-}_{(\text{aq})} \rightleftharpoons [\text{Fe}(\text{SCN})]^{2+}_{(\text{aq})}$		
Addition	Predicted outcome	Observation
None (control)		
0.01M FeCl_3		
0.01 M KSCN		
6M NaOH		
Cold		
Hot		
0.1M AgNO_3		

4. EQUILIBRIA OF PRECIPITATION REACTIONS

Equilibrium System: $\text{Ca}^{2+}_{(\text{aq})} + \text{C}_2\text{O}_4^{2-}_{(\text{aq})} \rightleftharpoons \text{CaC}_2\text{O}_4_{(\text{s})}$		
Addition	Predicted outcome	Observation
Test tube 1: 0.1 M $\text{Na}_2\text{C}_2\text{O}_4$		
Test tube 2: + 0.1 M $\text{H}_2\text{C}_2\text{O}_4$		
Test tube 2: + 6 M HCl		
Test tube 2: + 6 M NH_4OH		

5. TEMPERATURE EFFECTS ON EQUILIBRIA

Equilibrium System: $[\text{Co}(\text{H}_2\text{O})_6]^{2+}_{(\text{aq})} + 4\text{Cl}^{-}_{(\text{aq})} \rightleftharpoons [\text{CoCl}_4]^{2-}_{(\text{aq})} + 6\text{H}_2\text{O}_{(\text{l})}$		
Description of conditions	Predicted outcome	Observation
Nothing changed (control)		
Hot water bath		
Ice-water bath		

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EXPERIMENT 5: FACTORS AFFECTING REACTION RATE

Group: _____ Section: _____ 5 _____ Date: _____

Group members: _____

Instructor's/TA's signature and comments:

Expt. 1	Expt. 3
Expt. 2	Approval

1. EFFECT OF CONCENTRATION ON REACTION TIME

Reaction 1:

Reaction 2:

Calculate the initial concentrations of I^- and $\text{S}_2\text{O}_8^{2-}$ ions:

Mixture # 5:

$[\text{I}^-]$ =

$[\text{S}_2\text{O}_8^{2-}]$ =

Mixture	Iodide ion	Peroxydisulfate	Time in seconds
1			
2			
3			
4			
5			
6			
Mixture	Iodide ion	Peroxydisulfate	Time in seconds
7			
8			
9			
10			
11			

2. EFFECT OF TEMPERATURE ON THE REACTION RATE

Reaction System:			
Description of conditions	Predicted outcome	Observation	Reaction time
Room temperature			
50°C			
90°C			

3. EFFECT OF A CATALYST ON THE REACTION RATE (30 pts)

Reaction System:			
Trial	Description of conditions	Predicted outcome	Observation (Reaction rate)
1	+ MnCl ₂		
2	+ MnO ₂		
3	+ NaCl		
4	+ CaCl ₂		
5	+ Zn		
6	+ KNO ₃		
7	+ Fe(NO ₃) ₃		