Appendix C: Practical Scoring Rubric

Part I: Investigation Design	
Question 1: Description of Procedure	
□ Balanced Equation or state 1:1 ratio (anywhere in Part 1).	
□ Properly prepare a buret (wash and rinse with base).	
□ Measure 10 mL of acid with pipette.	
□ Add a few drops of phenolphthalein.	
□ Titrate to end point or describe as light pink.	
Repeated trials.	/6
Ouestion 2: Data Table	
□ NaOH volumes (initial, final and/or change).	
$\Box$ Volumes ±.01	
□ Moles Acid and/or moles Base	
$\square$ Molarity Acid	
$\square$ Repeated Trials (3 or more)	
□ Clearly organized	/6
Question 3: Calculations	
$\square$ Set-up with dimensional analysis or using $M_1V_1 = M_2V_2$ .	
□ Molarity	
□ Correct significant figures. (4)	/3
Question 4: Statistical Analysis and Reported Answer	
□ 4D test used or lack of use justified.	
□ Average value.	
□ Standard deviation	
$\square$ M ±SD	
□ Accurate within 0.001 M.	/5
Part II: Equilibrium	
Question 1: Observations	
□ Observations are correct, blue in hot and pink in cold.	/1
Question 2: Argument	I
$\Box$ Identifies reaction as exothermic	
$\square$ Correctly uses Le Chatelier's principle to predict heat of reaction	
$\square$ Reasoning is correct	
Findence is highlighted correctly (If overly highlighted no points)	14
Lyndence is ingringined correctly. (If overry ingringined no politis.)	/4

## Part III: Acids, Bases and Buffers

## Accuracy of Claim Each item is worth 1 to 4 pts. Correct claim only: 1 pt Option: a. 0 pt; b. 1 pts; c. 2 pts; d. or e 3 pts.)

a. No supporting evidence, just matches chemical with letter.

b. Data or concept is defined but not linked to claim. Reads like a list of defined terms.

c. Claim is linked to the evidence, but the use of the evidence is not justified.

d. The claim is generated largely by logical deduction based on legitimate reasoning from the data table.

e. The evidence is appropriate and is *explicitly* linked the claim.

$\square$ A = Buffer	a. 0	b. 1	c. 2	d. 3	e. 3		
$\square$ B = NH <sub>4</sub> OH	a. 0	b. 1	c. 2	d. 3	e. 3		
$\Box$ C = HCl	a. 0	b. 1	c. 2	d. 3	e. 3		
$\square$ D = NaOH	a. 0	b. 1	c. 2	d. 3	e. 3		
$\Box E = HC_2H_3O_2$	a. 0	b. 1	c. 2	d. 3	e. 3		/20
Evidence	1 ·						
U Used Appropriate A	nalysis	of Data	a 				
Classification strong/weak acid or base							
Values from table or relative values (high/low)							
Change in values with added acid or base							
□ Appropriate interpretation of analysis							
□ Used multiple types	of evic	lence					
r · Jr ·							/3