ACIDS, BASES, AND TITRATION CURVES I SMART WORKSHEET

PART A: DETERMINATION OF THE CONCENTRATION OF THE NAOH TITRANT

DATA ANALYSIS

UNITS

Choose the correct units for the variables below:

Variable	Units
Mass KHP	g
Volume NaOH used ($\Delta V = V_f - V_i$)	mL
NaOH Concentration	mol/L

DATA

Use your data collected in the lab to complete the table below.

- Trials 1 and 2 are compulsory, trials 3-5 are optional.
- The molar mass of KHP is 204.22 $\mathrm{g/mol}$.
- K_a = 1.80 × 10^{-5}

	Trials				
Trial #	1	2	3 *(optional)*	4 *(optional)*	5 *(optional)*
Mass KHP	0.4665	0.4550			
Volume NaOH used	9.88	7.48			
1. NaOH Concentration *(Unrounded)*	0.231205	0.297860			
2. NaOH Concentration *(Rounded)*	0.231	0.298			

MOLARITY ANALYSIS

CHOICE OF 2 TRIALS

Indicate the 2 trials used to calculate average $[\mathrm{NaOH}]$:

	Choice 1	Choice 2
Trial number	1	2

AVERAGE MOLARITY CALCULATION

	Unrounded	Rounded
4, 5. Average Molarity of NaOH $(\mathrm{mol/L})$	0.264500	0.265

YOUR PROGRESS ON PART A

CORRECT	POINTS AWARDED	AUTOSOLVED	NOT FINISHED
9 / 9	36 / 36	0 / 9	0 / 15

PART B: TITRATION OF ACETIC ACID

DATA

Use your data collected in the lab to complete the table below.

	Trials		
Trial #	1	2	Units
Volume of acetic acid dispensed	8.50	8.50	mL
Volume NaOH added to reach equivalence point (from 2nd derivative analysis on LabQuest)	4.05	3.42	mL
pH halfway to the equivalence point (from analysis of titration curve on LabQuest)	4.62	4.76	unitless
$\mathrm{p}K_a$ of acetic acid	4.62	4.76	unitless

$\mathrm{p}K_a$ ANALYSIS

AVERAGE $\mathrm{p}K_a$

Calculate the average of measured $\mathrm{p}K_a$ values:

	Unrounded	Rounded
Average $\mathrm{p}K_a$	4.690	4.69

CALCULATING K_a

Calculate the K_a from the average $\mathrm{p}K_a$ (4.690):

	Unrounded	Rounded
K_a from average $\mathrm{p}K_a$	0.0000204174	0.000020

CALCULATING $\mathrm{p}K_a$ *FROM ACCEPTED* K_a

Calculate the $\mathrm{p}K_a$ of acetic acid from accepted K_a (1.80×10^{-5}) :

	Unrounded	Rounded
$\mathrm{p}K_a$ from accepted K_a	4.74473	4.74

CALCULATING % ERROR

Calculate % error of the average $\mathrm{p}K_a$:

	Unrounded	Rounded
% error	1.15349	1.2

CONCENTRATION ANALYSIS

MOLARITY CALCULATIONS OF 2 TRIALS

Calculate the molarity of acetic acid:

	Trials		
Trial #	1	2	Units
Molarity of acetic acid *(Unrounded)*	0.126111	0.106463	mol/L

Molarity of acetic acid *(Rounded)*	0.126	0.106	mol/L

AVERAGE MOLARITY OF ACETIC ACID

Calculate the average molarity of acetic acid:

	Unrounded	Rounded
Average molarity of acetic acid	0.116000	0.116

% DIFFERENCE BETWEEN THE 2 TRIALS

Calculate the % difference in acetic acid between the two trials:

	Unrounded	Rounded
% difference between two trials	17.2414	17

YOUR PROGRESS ON PART B

CORRECT	POINTS AWARDED	AUTOSOLVED	NOT FINISHED
23 / 23	98 / 98	0 / 23	0 / 29

YOUR OVERALL PROGRESS

Visual status toggles for statistics by question type

Units Calculation Rounding

CORRECT ANSWERS	POINTS AWARDED	AUTOSOLVED	NOT FINISHED
32 / 32	134 / 134	0 / 40	0 / 44

END OF ACTIVITY