Faculty Submitting: Allison Kelly

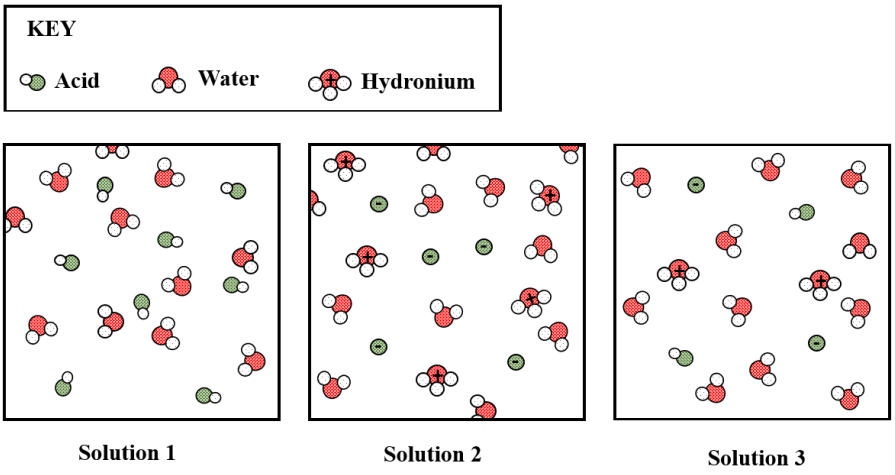
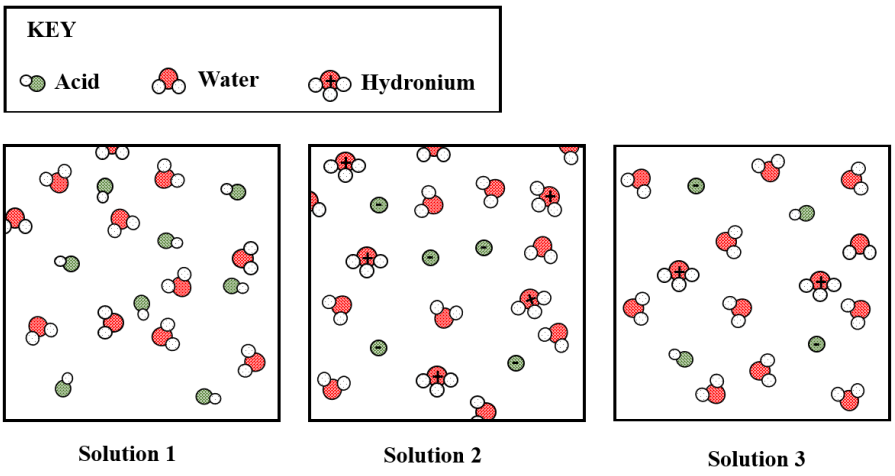
Specify here whether "Pre" or "End" of Unit and the Unit #: End Unit 4

Categorize and predict the products for metathesis, combination, decomposition, acid/base, oxidation and precipitation reactions ***AND*** *Define and distinguish between Arrhenius and Bronsted-Lowry acids and bases*	
Unit 4_ Question 1	**Canvas Question Type:** Multiple Choice QUESTION GROUP
1a	What solid precipitates when solutions of $Na_3PO_{4(aq)}$ and $CaCl_{2(aq)}$ are mixed?
	Correct Answer: $Ca_3(PO_4)_{2(s)}$ Wrong Answers: $NaCl_{(s)}$ $Na_3Ca_{(s)}$ $Cl_2PO_{4(s)}$
1b	What solid precipitates when solutions of $AgNO_{3(aq)}$ and $MgCl_{2(aq)}$ are mixed?
	Correct Answer: $AgCl_{(s)}$ Wrong Answers: $Mg(NO_3)_{2(s)}$ $AgMg_{(s)}$ $NO_3Cl_{2(s)}$
Read More	https://openstax.org/books/chemistry-2e/pages/4-2-classifying-chemical-reactions#fs-idp140132617697568
Unit 4_ Question 2	**Canvas Question Type:** Multiple Choice QUESTION GROUP
2a	What solid precipitates when solutions of $Ba(OH)_{2(aq)}$ and $FeCl_{3(aq)}$ are mixed?
	Correct Answer: $Fe(OH)_{3(s)}$ Wrong Answers: $BaCl_{2(s)}$ $BaFe_{(s)}$ $Cl_3(OH)_{2(s)}$

2b	What solid precipitates when solutions of $CaI_{2(aq)}$ and $K_2SO_{4(aq)}$ are mixed?
	Correct Answer: $CaSO_{4(s)}$ Wrong Answers: $KI_{(s)}$ $CaK_{2(s)}$ $I_2SO_{4(s)}$
Read More	https://openstax.org/books/chemistry-2e/pages/4-2-classifying-chemical-reactions#fs-idp140132617697568
Unit 4_ Question 3	**Canvas Question Type:** Multiple Answer QUESTION GROUP
3a	Select all of the spectator ions in the following reaction: $Na_2S_{(aq)} + Fe(NO_3)_{2(aq)} \rightarrow FeS_{(s)} + 2NaNO_{3(aq)}$
	Correct Answers: Na^+ NO_3^- Wrong Answers: S^{2-} Fe^{2+}
3b	Select all of the spectator ions in the following reaction: $2LiF_{(aq)} + Pb(C_2H_3O_2)_{2(aq)} \rightarrow 2LiC_2H_3O_{2(aq)} + PbF_{2(s)}$
	Correct Answers: Li^+ $C_2H_3O_2^-$ Wrong Answers: F^- Pb^{2+}
Read More	https://openstax.org/books/chemistry-2e/pages/4-2-classifying-chemical-reactions#fs-idp140132617697568
Unit 4_ Question 4	**Canvas Question Type:** Multiple Answer QUESTION GROUP
4a	Select all the spectator ions when $CuF_{2(aq)}$ is mixed with $K_2CO_{3(aq)}$

	Correct Answers: K^+ F^- Wrong Answers: Cu^{2+} CO_3^{2-}
4b	Select all the spectator ions when $CuClO_{4(aq)}$ is mixed with $NaBr_{(aq)}$
	Correct Answers: Na^+ ClO_4^- Wrong Answers: Cu^+ Br^-
Read More	https://openstax.org/books/chemistry-2e/pages/4-2-classifying-chemical-reactions#fs-idp140132617697568
Unit 4_ Question 5	**Canvas Question Type:** Multiple Choice QUESTION GROUP
5a	Select the net ionic equation for the following reaction: $NH_4Cl_{(aq)} + AgNO_{3(aq)} \rightarrow$
	Correct Answer: $Ag^+_{(aq)} + Cl^-_{(aq)} \rightarrow AgCl_{(s)}$ Wrong Answers: $NH_4^+{}_{(aq)} + NO_3^-{}_{(aq)} \rightarrow NH_4NO_{3(s)}$ $NH_4Cl_{(aq)} + AgNO_{3(aq)} \rightarrow NH_4NO_{3(s)} + AgCl_{(aq)}$ $NH_4Cl_{(aq)} + AgNO_{3(aq)} \rightarrow NH_4NO_{3(aq)} + AgCl_{(s)}$ $NH_4^+{}_{(aq)} + Cl^-_{(aq)} + Ag^+_{(aq)} + NO_3^-{}_{(aq)} \rightarrow NH_4^+{}_{(aq)} + NO_3^-{}_{(aq)} + AgCl_{(s)}$ $NH_4^+{}_{(aq)} + Cl^-_{(aq)} + Ag^+_{(aq)} + NO_3^-{}_{(aq)} \rightarrow NH_4NO_{3(s)} + Ag^+_{(aq)} + Cl^-_{(aq)}$
5b	Select the net ionic equation for the following reaction: $KOH_{(aq)} + CuNO_{3(aq)} \rightarrow$
	Correct Answer: $OH^-_{(aq)} + Cu^+_{(aq)} \rightarrow CuOH_{(s)}$ Wrong Answers: $K^+_{(aq)} + NO_3^-{}_{(aq)} \rightarrow KNO_{3(s)}$ $KOH_{(aq)} + CuNO_{3(aq)} \rightarrow KNO_{3(aq)} + CuOH_{(s)}$ $KOH_{(aq)} + CuNO_{3(aq)} \rightarrow KNO_{3(s)} + CuOH_{(aq)}$

	$K^+_{(aq)} + OH^-_{(aq)} + Cu^+_{(aq)} + NO_3^-{}_{(aq)} \rightarrow K^+_{(aq)} + NO_3^-{}_{(aq)} + CuOH_{(s)}$ $K^+_{(aq)} + OH^-_{(aq)} + Cu^+_{(aq)} + NO_3^-{}_{(aq)} \rightarrow KNO_{3(s)} + Cu^+_{(aq)} + OH^-_{(aq)}$
Read More	https://openstax.org/books/chemistry-2e/pages/4-2-classifying-chemical-reactions#fs-idp140132617697568 https://openstax.org/books/chemistry-2e/pages/4-1-writing-and-balancing-chemical-equations
Unit 4_ Question 6	**Canvas Question Type:** Multiple Drop Down QUESTION GROUP
6a	$H_2SO_{3(aq)} + 2NaOH_{(aq)} \rightarrow 2H_2O_{(l)} + Na_2SO_{3(aq)}$ In the above reaction, which compound is acting as the acid? [dropone] In the above reaction, which compound is acting as the base? [droptwo]
	Dropone: H_2SO_3 NaOH H2O Na2SO3 DropTwo: NaOH H2O Na2SO3 H2SO3
6b	$HClO_{3(aq)} + KOH_{(aq)} \rightarrow H_2O_{(l)} + KClO_{3(aq)}$ In the above reaction, which compound is acting as the acid? [dropone] In the above reaction, which compound is acting as the base? [droptwo]
	Dropone: HClO3 KOH H2O KClO3 Droptwo: KOH H2O KClO3 HClO3
Read More	https://openstax.org/books/chemistry-2e/pages/4-2-classifying-chemical-reactions

Unit 4_ Question 7	**Canvas Question Type:** Multiple Choice QUESTION GROUP
7a	Which of the following accurately depicts a <u>weak acid</u> solution  ALT TEXT: The figure depicts three boxes which show molecular solution. In the box labeled Solution 1, there are acid molecules and water molecules. In the box labeled Solution 2, there are water molecules, hydronium ions, and dissociated anions. In the box labeled Solution3, there are water molecules, acid molecules, hydronium ions, and dissociated anions.
	Correct Answer: Solution 3 Wrong Answers Solution 2 Solution 1 All three solutions
7b	Which of the following accurately depicts a <u>strong acid</u> solution  ALT TEXT: The figure depicts three boxes which show molecular solution. In the box labeled Solution 1, there are acid molecules and water molecules. In the box labeled Solution 2, there

	are water molecules, hydronium ions, and dissociated anions. In the box labeled Solution3, there are water molecules, acid molecules, hydronium ions, and dissociated anions.
	Correct Answer: Solution 2 Wrong Answers Solution 3 Solution 1 All three solutions
Read More	https://openstax.org/books/chemistry-2e/pages/4-2-classifying-chemical-reactions#CNX_Chem_04_02_HClsoln
Unit 4_ Question 8	**Canvas Question Type:** Formula QUESTION GROUP
8a	What is the oxidation number of X, in $XO_3^{-[b]}$
**	6-b b 1 to 3, no decimal
8b	What is the oxidation number of X in $XO_4^{-[b]}$
	8-b b: 1 to 3, no decimal
Read More	https://openstax.org/books/chemistry-2e/pages/4-2-classifying-chemical-reactions
Video	Youtube: https://youtu.be/z-7Qk1-SqxY Gdrive: https://drive.google.com/file/d/19VNksnlrAlS6hQkCaVVoUlR4-uTDU6li/view?usp=sharing
Unit 4_ Question 9	**Canvas Question Type:** Fill in multiple blanks QUESTION GROUP
9a	Give the oxidation number for each element in the following compound. Be sure to include the sign on the number, for example: +2 or -2 etc. $PbSO_4$ Pb [P] S [S] O [O]

	+2,+6,-2
9b	Give the oxidation number for each element in the following compound. Be sure to include the sign on the number, for example: +2 or -2 etc. $FeCO_3$ Fe [F] C [C]s O [O] +2, +4, -2
Read More	https://openstax.org/books/chemistry-2e/pages/4-2-classifying-chemical-reactions
Unit 4_ Question 10	**Canvas Question Type:** Fill in multiple blanks QUESTION GROUP
10a	Give the oxidation number for each element in the following compound. Be sure to include the sign on the number, for example: +2 or -2 etc. MnO_2 Mn [Mn] O [O] +4,-2
10b	Give the oxidation number for each element in the following compound. Be sure to include the sign on the number, for example: +2 or -2 etc. H_2O H [H] O [O] +1,-2
Read More	https://openstax.org/books/chemistry-2e/pages/4-2-classifying-chemical-reactions
Unit 4_ Question 11	**Canvas Question Type:** Multiple Drop Downs

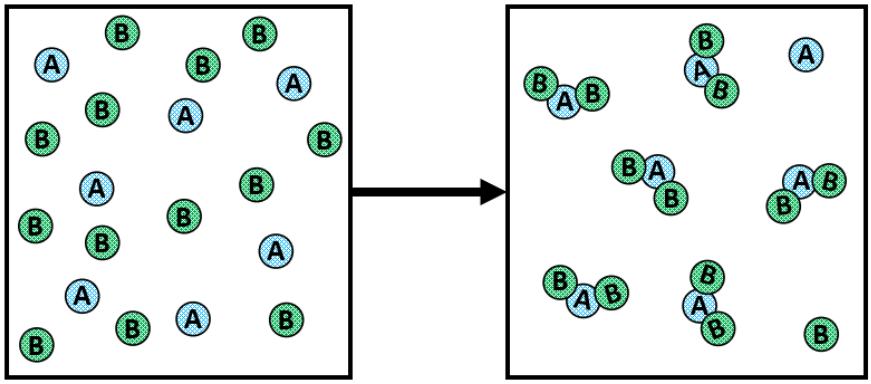
**	In the following reaction, identify the role of each species: $H_{2(g)} + 2OH^-_{(aq)} + Ni^{2+}_{(aq)} \rightarrow Ni_{(s)} + 2H_2O_{(l)}$ Oxidized: [dropone] Reduced: [droptwo] Oxidizing Agent/Oxidant: [dropthree] Reducing Agent/Reductant: [dropfour]
	DropOne: H2 OH- Ni2+ Ni(s) H2O DropTwo: Ni2+ H2 Ni(s) H2O OH- DropThree: Ni2+ H2 Ni(s) H2O OH- DropFour: H2 OH- Ni2+ Ni(s) H2O
Read More	https://openstax.org/books/chemistry-2e/pages/4-2-classifying-chemical-reactions
Video	Youtube: https://youtu.be/t8sO1yogCXw Gdrive: https://drive.google.com/file/d/1X5zvZv7i2gWT7VG3GqwhzN6x7frOVZHl/view?usp=sharing
Unit 4_ Question 12	**Canvas Question Type:** Multiple Drop Downs

	In the following reaction, identify the role of each species: $NO_3^-{}_{(aq)} + 4H^+_{(aq)} + Cr_{(s)} \rightarrow Cr^{3+}_{(aq)} + NO_{(g)} + 2H_2O_{(l)}$ Oxidized: [dropone] Reduced: [droptwo] Oxidizing Agent/Oxidant: [dropthree] Reducing Agent/Reductant: [dropfour]
	Dropone: Cr(s) Cr3+ NO3- H+ NO H2O DropTwo: NO3- Cr(s) Cr3+ H2O H+ NO DropThree: NO3- Cr(s) Cr3+ H2O H+ NO Dropfour: Cr(s) Cr3+ NO3- H+ NO H2O
Read More	https://openstax.org/books/chemistry-2e/pages/4-2-classifying-chemical-reactions
Balance chemical reactions	

Unit 4_ Question 13	**Canvas Question Type:** Fill in Multiple Blanks
	Balance the following chemical reaction, be sure to include "1" in the blank for any compounds with a stoichiometric coefficient of 1. [one] $Fe_2O_{3(s)}$ + [three] $CO_{(g)}$ → [two] $Fe_{(l)}$ + [threeb] $CO_{2(g)}$
Read More	https://openstax.org/books/chemistry-2e/pages/4-1-writing-and-balancing-chemical-equations
Unit 4_ Question 14	**Canvas Question Type:** Fill in Multiple Blanks
	Balance the following chemical reaction, be sure to include "1" in the blank for any compounds with a stoichiometric coefficient of 1. [one] $C_9H_{20(l)}$ + [fourteen] $O_{2(g)}$ → [ten] $H_2O_{(l)}$ + [nine] $CO_{2(g)}$
Read More	https://openstax.org/books/chemistry-2e/pages/4-1-writing-and-balancing-chemical-equations
Unit 4_ Question 15	**Canvas Question Type:** Fill in Multiple Blanks
	Balance the following chemical reaction, be sure to include "1" in the blank for any compounds with a stoichiometric coefficient of 1. [two] $Li_{(s)}$ + [twob] $H_2O_{(l)}$ → [twoc] $LiOH_{(aq)}$ + [one] $H_{2(g)}$
Read More	https://openstax.org/books/chemistry-2e/pages/4-1-writing-and-balancing-chemical-equations
Unit 4_ Question 16	**Canvas Question Type:** Fill in Multiple Blanks
	Balance the following chemical reaction, be sure to include "1" in the blank for any compounds with a stoichiometric coefficient of 1. [three] $CaCl_{2(aq)}$ + [two] $Li_3PO_{4(aq)}$ → [six] $LiCl_{(aq)}$ + [one] $Ca_3(PO_4)_{2(s)}$
Read More	https://openstax.org/books/chemistry-2e/pages/4-1-writing-and-balancing-chemical-equations

Perform calculations relating quantities in chemical reactions, including limiting reactant, theoretical yield, and percent yield calculations	
Unit 4_ Question 17	**Canvas Question Type:** Formula
	How many mols of HCl are required to complete react [mol] mols of aluminum according to the following, balanced chemical reaction: $2Al(s) + 6\ HCl_{(aq)} \rightarrow 2AlCl_{3(aq)} + 3H_{2(g)}$
	mol*3 mol 0.1 to 1.9, to three decimal places
Read More	https://openstax.org/books/chemistry-2e/pages/4-3-reaction-stoichiometry
Unit 4_ Question 18	**Canvas Question Type:** Formula
	If [mol] mols of aluminum are reacted with excess HCl, how many mols of hydrogen gas will be produced? $2Al(s) + 6\ HCl_{(aq)} \rightarrow 2AlCl_{3(aq)} + 3H_{2(g)}$
	mol*3/2 mol: 0.1 to 1.9 to three decimal places
Read More	https://openstax.org/books/chemistry-2e/pages/4-3-reaction-stoichiometry
Unit 4_ Question 19	**Canvas Question Type:** Formula
**	Urea ($CO(NH_2)_2$) can be synthesized via the following chemical reaction. If [mass] g of ammonia is reacted with excess carbon monoxide, how many grams of urea are formed? $2NH_{3(g)} + CO_{(g)} \rightarrow CO(NH_2)_{2(s)} + H_2O_{(l)}$
	mass/17.031/2*60.06 mass: 1.5-5.5, two decima places

Read More	https://openstax.org/books/chemistry-2e/pages/4-3-reaction-stoichiometry
Video	Youtube: https://youtu.be/BnNgbVBhyEg Gdrive: https://drive.google.com/file/d/14gb3KWuCnyIKBZBgrOyTOqWrDQH1DBJw/view?usp=sharing
Unit 4_ Question 20	**Canvas Question Type:** Formula
**	Formaldehyde, a naturally occur organic molecule that historically was used to preserve animal species, is carcinogenic, and has been observed in interstellar medium can be synthesized from methanol using the following reaction: $CH_3OH_{(g)} \rightarrow CH_2O_{(g)} + H_{2(g)}$ If [mass] g of methanol (CH_3OH) is reacted, how many grams of formaldehyde (CH_2O) are produced?
	mass/32.04*30.026 mass: 10.5 to 15.5, two decimal places Be sure to limit precision!
Read More	https://openstax.org/books/chemistry-2e/pages/4-3-reaction-stoichiometry
Video	Youtube: https://youtu.be/BnNgbVBhyEg Gdrive: https://drive.google.com/file/d/14gb3KWuCnyIKBZBgrOyTOqWrDQH1DBJw/view?usp=sharing
Unit 4_ Question 21	**Canvas Question Type:** Formula
	Incomplete combustion leads to the formation of toxic compounds like carbon monoxide. How many grams of oxygen would be necessary to completely combust [mass] g of octane? $2C_8H_{18(l)} + 25O_{2(g)} \rightarrow 16CO_{2(g)} + 18H_2O_{(g)}$
	mass/114.23*25/2*31.999 mass: 12.5-25.0 two decimal places
Read More	https://openstax.org/books/chemistry-2e/pages/4-3-reaction-stoichiometry

Unit 4_ Question 22	**Canvas Question Type:** Formula
	Hydrochloric acid is reacted with iron (II) sulfide to form hydrogen sulfide according to the balanced chemical equation. If [mola] mols of hydrochloric acid are reacted with [molb] mols of iron (II) sulfide, how many mols of hydrogen sulfide are formed? $2HCl_{(aq)} + FeS_{(s)} \rightarrow H_2S_{(aq)} + FeCl_{2(aq)}$
	mola/2 mola: 1.5-2, two decimal places molb: 1.2-1.4, two decimal places
Read More	https://openstax.org/books/chemistry-2e/pages/4-4-reaction-yields
Unit 4_ Question 23	**Canvas Question Type:** Multiple Choice
	In the following reaction, which reactant is the limiting reactant?  ALT TEXT: The diagram shows two boxes with molecular depictions of reactants and products. The box labeled reactants contains 7 A atoms and 13 B atoms. The box labeled products contains six molecules each with one A atom and 2 B atoms, and it contains one single A atom and one single B atom.
	Correct: B Wrong: A

Read More	https://openstax.org/books/chemistry-2e/pages/4-4-reaction-yields
Unit 4_ Question 24	**Canvas Question Type:** Formula
***	How many grams of precipitant are formed when [vola] mL of a [Ma] M aqueous solution of magnesium bromide is combined with [volb] mL of a [Mb] M aqueous solution of silver nitrate?
	volb/1000*Mb*187.77 vola; 20-25, two decimals volb: 20-25, two decimals Ma: 0.6 to 0.9, two decimals Mb: 0.1 to 0.4, two decimals
Read More	https://openstax.org/books/chemistry-2e/pages/4-4-reaction-yields
Video	Youtube: https://youtu.be/wQYj-sFUynA Gdrive: https://drive.google.com/file/d/1PBPQaSwFFjAkV12HfYjeh2psImic5DGt/view?usp=sharing
Unit 4_ Question 25	**Canvas Question Type:** Formula
**	Hydrazine can be synthesized via the following reaction: $2NH_{3(aq)} + Cl_{2(g)} + 2NaOH_{(aq)} \rightarrow N_2H_{4(aq)} + 2NaCl_{(aq)} + 2H_2O_{(l)}$ What is the theoretical yield of hydrazine when [massN] g NH_3 is reacted with [massC] g of Cl_2 and excess sodium hydroxide?
	massN/17.031/2*32.0452 massN: 1 to 2.5 grams, two decimal places massC: 6 to 7.5 grams, two decimal places
Read More	https://openstax.org/books/chemistry-2e/pages/4-4-reaction-yields
Video	Youtube: https://youtu.be/6ePLxf4uBUg Gdrive: https://drive.google.com/file/d/16qdhKfKOhFcGXalDjOaQ3qj1US0k40U9/view?usp=sharing

Unit 4_ Question 26	**Canvas Question Type:** Formula
**	Based on the balanced chemical reaction, how many mols of excess reactant is left when [massM] g of magnesium is reacted with [vol] mL of [mol] M of hydrochloric acid? $Mg_{(s)} + 2HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_{2(g)}$
	(vol*mol)-(massM/24.305*2)
	Vol: 40-55 mL, two decimal mol: 1.0-1.3 M, two decimal massM: 0.1 to 0.42, two decimal
Read More	https://openstax.org/books/chemistry-2e/pages/4-4-reaction-yields
Video	Youtube: https://youtu.be/X_ZfPT41JA0 Gdrive: https://drive.google.com/file/d/1I9RrI0i7H_0PGpPc-XWpwVXHbwpxa6pV/view?usp=sharing
Unit 4_ Question 27	**Canvas Question Type:** Formula
	If [mass] g of copper(II) oxide is reacted with excess hydrogen gas and [yield] g of copper is collected, what is the percent yield? $CuO_{(s)} + H_{2(g)} \rightarrow Cu_{(s)} + H_2O_{(l)}$
	100*yield/(mass/79.5454*63.546)
	mass: 5 to 7 g, two decimals yield: 2.5 to 3.5, two decimals
Read More	https://openstax.org/books/chemistry-2e/pages/4-4-reaction-yields
Titrations	
Unit 4_ Question 28	**Canvas Question Type:** Formula
	It requires [vol] mL of [M] M NaOH to fully titrate [vola] mL of HCl, what is the molarity of the acid?

	vol*M/vola
	vol: 20-50 mL, two decimal M: 0.5 to 0.9, two decimal vola: 20-50 mL, two decimal
Read More	https://openstax.org/books/chemistry-2e/pages/4-5-quantitative-chemical-analysis
Unit 4_ Question 29	**Canvas Question Type:** Formula
**	Potassium hydrogen phthalate (KHP) is a monoprotic weak acid that is often used to standardize solutions for titrations. If it requires [vol] mL of a sodium hydroxide solution to completely react [mass] g of KHP (Molar Mass: 204.222 g/mol), what is the molarity of the sodium hydroxide?
	mass/204.222/(vol/1000) mass: 1.5 to 2.5, two decimals vol: 50-70 mL, two decimals
Read More	https://openstax.org/books/chemistry-2e/pages/4-5-quantitative-chemical-analysis
Unit 4_ Question 30	**Canvas Question Type:** Formula
**	How many mL of [mola] M HCl would be required to completely react [mass] g of $CaSO_3$ $CaSO_{3(s)} + 2HCl_{(aq)} \rightarrow SO_{2(g)} + H_2O_{(l)} + CaCl_{2(aq)}$
	(mass/120.17*2)/mola*1000 mass: 2-4 , two decimals mola: 0.9 to 1.2 two decimals
Read More	https://openstax.org/books/chemistry-2e/pages/4-5-quantitative-chemical-analysis
Video	Youtube: https://youtu.be/2Jy1Z42ksQw Gdrive: https://drive.google.com/file/d/1xQEA7sosHZMFhBv4-nrxLxWHtawoKoLW/view?usp=sharing