

AP Chemistry Summer Assignment 2017

Due: The first day of class, August 10th (blue)/ August 11th (gold)

WELCOME TO AP CHEMISTRY!

This summer assignment is designed to help you prepare to take AP chemistry by helping you review important chemistry and math topics that are prerequisites for this course. Students who successfully complete AP chemistry will be significantly more prepared to take college-level chemistry, and can receive college credit in chemistry by passing the AP exam at the end of the year. Some colleges will offer up to 10 college credits in chemistry for a high score on this exam!! Check your individual college to see what credits you can earn by passing the AP chemistry exam.

This assignment has videos about various chemistry topics followed by practice questions. The practice questions will be graded. If you remember the topic from honors chemistry and can correctly answer the questions, there is no need to watch the videos. If you need a refresher from honors chemistry, these videos will be helpful in your reviewing process. There will be a test on this information the first week of school to ensure that you understand the essentials we will be using all year. This summer assignment will be approximately 10% of your first quarter grade.

It is extremely important that you complete this assignment **before school begins in August**. AP chemistry is a very rigorous course, and we need to jump right into the material as soon as possible. Rushing through the material the day before school starts is an ineffective method for reviewing this material. Your focus should be on learning any material you do not know, not getting a grade for the assignment. A turning in the assignment may temporarily help your grade, but if you do not know the information, you will be at a huge disadvantage all year.

In addition to completing your summer assignment, be sure to get all of your materials for class, and study your lab safety rules before the 1st day of school. We will do a lab the 2nd or 3rd day of class, and you **MUST** get 100% on the lab safety quiz before you can participate in chemistry lab work. You will also need a composition book (no spiral bound notebooks) to act as your lab notebook. This is a lab-intensive course, and we will be doing lab on a weekly basis. The College Board requires lab work to make up a minimum of 25% of class time.

If you have any questions about any of the topics covered in this assignment, please do not hesitate to email me at mitschh@pcsb.org. I will be happy to answer any questions, and I will be checking my email all summer long. I want to help you be as successful as possible in this course! I look forward to seeing all of you in the fall, and I am so excited to have you in AP chemistry.

Sincerely,
Ms. Mitsch

Part 1: Review syllabus, lab safety contract, and course website

- Go to the class website and look at the material that is there. There will be additional information added throughout the summer, so it will be helpful to bookmark the website and check it periodically. There is a lot of information for lab safety that will help you for the lab safety quiz. The website is below:
<http://msmitschchemistry.weebly.com>
- Review the AP chemistry course syllabus. The link is here:
http://msmitschchemistry.weebly.com/uploads/8/0/7/1/80718384/ap_chemistry_welcome_packet.pdf
- Answer the syllabus questions below to show understanding of the rules and procedures in AP chemistry.

Syllabus Questions:

1. What are the required materials for this course?
2. How frequently should you bring lab-appropriate shoes to AP chemistry?

3. What should you do if you are unable to purchase supplies?
4. Does Ms. Mitsch round or bump up grades?
5. Does Ms. Mitsch allow you to turn in homework assignments at the end of the day on the due date?
6. What is the AP Chemistry late work policy?
7. If you lose a copy of an assignment, what should you do to get another copy?
8. Your homework does not explicitly say to show all your work. Is it necessary to show work or can you just provide the answers?
9. How must all lab reports be turned in?
10. What is the consequence for failing to clean up your lab station after a lab?
11. It is the end of the quarter. What should you do with your AP chemistry notes and graded work?
12. How frequently will review quizzes be given?
13. Does Ms. Mitsch allow you to retake quizzes or tests?
14. I didn't study at all for my AP chemistry test, but I know it will be curved. Will the curve offset my lack of studying?
15. It is the last week of the quarter and I have a 79% in AP chemistry. Will Ms. Mitsch give me extra credit to bring up my grade to a B?
16. I have not studied all quarter and have not been keeping up with my work. I currently have a 52% in AP chemistry. Ms. Mitsch assigned the class extra credit. Will the extra credit bring my grade to a C?
17. Is late extra credit accepted?
18. When must you get all of your work from an absence?
19. How much extra time do you have to turn in your absent work?
20. What should you do when you come back from an absence?
21. When can you make up tests?
22. What is the lab makeup policy?
23. Can you copy data from your lab partner if you miss a lab?
24. What is the consequence for lab safety violations?
25. What is Ms. Mitsch's hall pass policy?
26. What is the consequence for interrupting another period with a question about your grade?
27. What is the cell phone policy?
28. What assignments are considered individual work?
29. What parts of the lab report are considered individual?
30. What must you include if you use an internet resource in your lab report?
31. What should you do if you need help in AP chemistry?

Part 2: Scientific Notation and Significant Figures

This section will help you review significant figures rules that will be used in all chemistry calculations and lab work.

- If needed, review scientific notation by watching this video: <https://www.youtube.com/watch?v=Dme-G4rc6NI>
- Review significant figures rules. If you don't remember the rules from honors chemistry, you may find it helpful to view the following videos.
 1. <https://www.youtube.com/watch?v=5UjwJ9PIUvE&list=PL3hPm0ZdYhyy0PQUQ1ka94hxVQPdYGS9m>
 2. https://www.youtube.com/watch?v=PNH7_nDE6SQ&index=2&list=PL3hPm0ZdYhyy0PQUQ1ka94hxVQPdYGS9m
 3. <https://www.youtube.com/watch?v=7b60RZqut0U&list=PL3hPm0ZdYhyy0PQUQ1ka94hxVQPdYGS9m&index=3>
 4. <https://www.youtube.com/watch?v=o5BmoMDJLRY&index=5&list=PL3hPm0ZdYhyy0PQUQ1ka94hxVQPdYGS9m>
 5. <https://www.youtube.com/watch?v=2eXC6s9X6Wc&list=PL3hPm0ZdYhyy0PQUQ1ka94hxVQPdYGS9m&index=6>

6. <https://www.youtube.com/watch?v=IIQPHC5gZT8&index=7&list=PL3hPm0ZdYhyy0PQUQ1ka94hxVQPdYGS9m>

- Look over notes for significant figures using this website: <http://imathesis.com/media/Significant.pdf>
- Answer the questions below regarding significant figures.

Significant Figures questions:

Identify the number of significant figures in each measurement below.

- 1) 1232 mL
- 2) 1001 L
- 3) 0.003 g
- 4) 0.04560 m
- 5) 9500 kL
- 6) 2.00×10^{22} mg

Write each measurement below to 3 significant figures.

- 7) 46234 mL
- 8) 0.00023450 kg
- 9) 6 L
- 10) 59 g
- 11) 7.8932×10^{23} μm

Perform the following operations giving the proper number of significant figures in the answer:

- 12) 23.4×14 _____
- 13) $0.005 - 0.0007$ _____
- 14) $7.895 + 3.4$ _____
- 15) $0.2 / 0.0005$ _____

Part 3: Dimensional Analysis

- Watch the following videos to review dimensional analysis (as needed):
 1. <https://www.youtube.com/watch?v=7N0IRJLwpPI>
 2. <https://www.youtube.com/watch?v=BKsPi-VXp5U>
- Complete the dimensional analysis problems below. Show all work for each question. Now work = no credit.

Dimensional analysis problems:

Answer each of the following dimensional analysis questions. Show all work. Round your answer to the correct significant figures.

- 1) 2.00 L to mL
- 2) 35.28 kL to cL
- 3) 750 ounces to grams
- 4) 14630000000 millimeters to miles
- 5) 16 kg to pounds

Part 4: Density

- Watch the following videos about calculating density (as needed):
<https://www.youtube.com/watch?v=PpMGjzdSCiE>
<https://www.youtube.com/watch?v=36d1VdcUEJI&t=319s>
- Answer the density questions below:

Density calculations questions:

Answer the following questions. Include units and work. No work = no credit.

1. A 2.75 kg sample of a substance occupies a volume of 250.0 cm³. Find its density in g/cm³.
2. Under certain conditions, oxygen gas (O₂) has a density of 0.00134 g/mL. Find the volume occupied by 250.0 g of O₂ under the same conditions.
3. Find the volume that 35.2 g of carbon tetrachloride (CCl₄) will occupy if it has a density of 1.60 g/mL.
4. The density of ethanol is 0.789 g/mL. Find the mass of a sample of ethanol that has a volume of 150.0 mL.

Part 5: Atomic structure and the groups of the periodic table

- Watch the following videos to review atomic structure (as needed):
 1. <https://www.youtube.com/watch?v=dRfrvpVdKGM>
 2. <https://www.youtube.com/watch?v=EboWeWmh5Pg>
 3. <https://www.youtube.com/watch?v=WWc3k2723IM>
 4. <https://www.youtube.com/watch?v=fLSfgNxoVGk>
 5. <https://www.youtube.com/watch?v=yADrWdNTWEc>
- Answer the questions below regarding chemical structure and the periodic table:

Atomic structure and the periodic table questions:

Answer each question as completely as possible.

1. Define ion
2. Define isotope.
3. Fill in the gaps in the following table, assuming each column represents a **neutral** atom:

Symbol	³⁹ ₁₉ K				
Protons		25			82
Neutrons		30	64		
Electrons			48	56	
Mass #				137	207

4. Write the correct symbol, with both superscripts and subscripts, for each of the following :
 - a. the isotope of sodium with mass 23
 - b. the atom of vanadium that contains 28 neutrons
 - c. the isotope of chlorine with mass 37

- d. an atom of magnesium that has an equal number of protons and neutrons
5. Give the name and the common charge for elements found in each of these groups of the Periodic Table:
 - a. Group 1
 - b. Group 2
 - c. Group 17
 - d. Group 18
 6. Describe where each type of element is found on the Periodic Table.
 - (1) Metals
 - (2) Non-metals
 - (3) Transition metals
 - (4) alkali metals
 - (5) halogens

Part 6: Light and Electron Configuration

- Watch the following videos to review light calculations (as needed)
 1. https://www.youtube.com/watch?v=rLNM8zI4Q_M
 2. <https://www.youtube.com/watch?v=OQwTcl9TeUM>
 3. <https://www.youtube.com/watch?v=GwZvtfZRNKk>
 4. <https://www.youtube.com/watch?v=AmAQLW2JT8&t=81s>
 5. https://www.youtube.com/watch?v=v2M_o8GjRoU
- Watch the following videos to review electron configuration (as needed):
 1. <https://www.khanacademy.org/science/ap-chemistry/electronic-structure-of-atoms-ap/electron-configurations-jay-sal-ap/v/orbitals>
 2. <https://www.khanacademy.org/science/ap-chemistry/electronic-structure-of-atoms-ap/electron-configurations-jay-sal-ap/v/more-on-orbitals-and-electron-configuration>
 3. <https://www.khanacademy.org/science/ap-chemistry/electronic-structure-of-atoms-ap/electron-configurations-jay-sal-ap/v/noble-gas-configuration-electronic-structure-of-atoms-chemistry-khan-academy>
 4. <https://www.khanacademy.org/science/ap-chemistry/electronic-structure-of-atoms-ap/electron-configurations-jay-sal-ap/v/electron-configurations-2>
 5. <https://www.khanacademy.org/science/ap-chemistry/electronic-structure-of-atoms-ap/electron-configurations-jay-sal-ap/v/electron-configuration-d-block>
- Answer the light and electron configuration question below:

Electron configuration and Light Questions:

Use $E=h\nu$ and $c=\lambda\nu$ ($h=6.626 \times 10^{-34}$ Js and $c=2.998 \times 10^8$ ms⁻¹) to solve the problems below.

1. A sodium vapor lamp emits light photons with a wavelength of 5.89×10^{-7} m. What is the energy of these photons?
2. One of the electron transitions in a hydrogen atom produces infrared light with a wavelength of 7.464×10^{-6} m. What amount of energy causes this transition?
3. Find the energy in kJ for an x-ray photon with a frequency of 2.4×10^{18} 1/s.

Write a ground state electron configuration for each neutral atom. Ground state means that all of the lowest possible energy levels (up to the proper number of electrons for the element) are filled.

4. Na
5. Pb

6. Sr

Write a ground state electron configuration for these ions. Remember that ions have a change in the total number of electrons (positive have lost electrons and negative have gained). Example: N^{3-} is $1s^2 2s^2 2p^6$. It has three extra electrons

7. O^{2-}

8. Fe^{2+}

Determine which neutral atom is represented by each electron configuration below.

9. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^4$

10. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$

11. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6$

Part 8: Periodic Trends

- Watch the following videos on periodic trends. Many of these trends were not covered in honors chemistry. Be sure to review these trends.
 1. <https://www.khanacademy.org/science/ap-chemistry/periodic-table-ap/periodic-table-trends-ap/v/atomic-and-ionic-radii>
 2. <https://www.khanacademy.org/science/ap-chemistry/periodic-table-ap/periodic-table-trends-ap/v/ionization-energy-trends>
 3. <https://www.khanacademy.org/science/ap-chemistry/periodic-table-ap/periodic-table-trends-ap/v/first-and-second-ionization-energy>
 4. <https://www.khanacademy.org/science/ap-chemistry/periodic-table-ap/periodic-table-trends-ap/v/electron-affinity>
 5. <https://www.khanacademy.org/science/ap-chemistry/periodic-table-ap/periodic-table-trends-ap/v/electronegativity-trends>
- Fill out the chart below:

Trend	Definition	Increases or decreases as you go across a period?	Reasoning:	Increases or decreases as you go down a group?	Reasoning:
Atomic radius					
Ionic radius					

Ionization energy					
Electron affinity					
Electronegativity					

Part 9: Bonding and Lewis Structures

- Watch the following videos to review bonding and Lewis structures (as needed)
 1. <https://www.khanacademy.org/science/ap-chemistry/chemical-bonds-ap/types-chemical-bonds-ap/v/ionic-covalent-and-metallic-bonds>
 2. <https://www.khanacademy.org/science/ap-chemistry/chemical-bonds-ap/types-chemical-bonds-ap/v/ionic-bonds-and-coulombs-law>
 3. <https://www.khanacademy.org/science/ap-chemistry/chemical-bonds-ap/types-chemical-bonds-ap/v/electronegativity-and-chemical-bonds>
 4. <https://www.khanacademy.org/science/ap-chemistry/chemical-bonds-ap/dot-structures-molecular-geometry-ap/v/drawing-dot-structures>
- Answer the following questions about bonding and Lewis structures:

Indicate what type of bond each compound has, then draw the Lewis Structures for each compound below. For each covalent compound, indicate if it is polar or nonpolar.

1. LiCl
2. SiO₂
3. CO₂
4. H₂O
5. CH₄
6. NH₃

Part 10: Nomenclature

- Study the element names and symbols. The periodic table on the AP exam WILL NOT have the names on it. You must know them. Here is a quizlet to help you study: <https://quizlet.com/146697677/elements-and-symbols-flash-cards/>
- Memorize the common polyatomic ions. There is a link to a polyatomic ion chart: <http://www.schaubscience.com/handouts/Polyatomics.pdf>

- Here is a quizlet to help you study the polyatomic ions: <https://quizlet.com/173978242/polyatomic-ions-polyatomic-ions-flash-cards/>
- Watch the following videos on nomenclature below (as needed). The last 2 videos are on naming acids. This may have not been covered in depth in your honors class. Be sure to review these 2 videos!
 1. <https://www.youtube.com/watch?v=URc75hoKGLY>
 2. <https://www.youtube.com/watch?v=p9iQ5Qn42DM>
 3. <https://www.youtube.com/watch?v=Rq0A-AHdB74>
 4. <https://www.youtube.com/watch?v=H4nfE8gRX7Q>
 5. <https://www.youtube.com/watch?v=PKA4CZwbZWU>
 6. <https://www.youtube.com/watch?v=DejkrR4pvRw>
 7. <https://www.youtube.com/watch?v=5Jb2u9ihfm4>
 8. <https://www.youtube.com/watch?v=VjynMk-Ta10>
- Answer the Nomenclature questions below.
- Need more practice? Not sure if you are doing it correctly? Try these web resources below:
 1. <https://www.quia.com/quiz/1240133.html>
 2. <http://www.sciencegeek.net/Chemistry/Quizzes/BinaryIonic/>
 3. <https://www.khanacademy.org/science/chemistry/atomic-structure-and-properties/names-and-formulas-of-ionic-compounds/e/naming-ionic-compounds>
 4. <http://www.sciencegeek.net/Chemistry/taters/Unit3BinaryNomenclature.htm>

Nomenclature Practice Questions

Write the chemical formula for each compound listed below.

- | | |
|-------------------------------|-------------------------|
| 1. Barium chloride | 9. Chlorous acid |
| 2. Titanium (IV) fluoride | 10. Dihydrogen monoxide |
| 3. Manganese (II) perchlorate | 11. Carbon dioxide |
| 4. Copper (III) sulfate | 12. Sulfuric acid |
| 5. Silicon dioxide | 13. Cesium nitride |
| 6. Osmium (IV) chromate | 14. Calcium sulfate |
| 7. Hydrochloric acid | 15. Ammonium phosphate |
| 8. Nitric acid | |

Write the chemical name for each compound below.

- | | |
|---|---|
| 16. SrBr ₂ | 26. AgNO ₃ |
| 17. CuI ₂ | 27. FeSO ₄ |
| 18. Ca(OH) ₂ | 28. H ₂ CO ₃ |
| 19. Fe ₃ (PO ₄) ₂ | 29. KC ₂ H ₃ O ₂ |
| 20. CO | 30. W(SO ₄) ₃ |
| 21. P ₃ O ₅ | |
| 22. CrSO ₄ | |
| 23. HBr | |
| 24. NH ₄ OH | |
| 25. H ₃ PO ₃ | |

Part 11: Reactions

- Memorize the solubility rules. Here is a link to the rules:
<http://www.schaubscience.com/handouts/SolubilityChart.pdf>
- Here is a quizlet to help you memorize the solubility rules: <https://quizlet.com/140259744/solubility-rules-flash-cards/>
- Watch the following videos on reaction types, balancing reactions, predicting products, and endothermic and exothermic reactions (as needed)
 1. <https://www.youtube.com/watch?v=yA3TZJ2em6g>
 2. <https://www.youtube.com/watch?v=aMU1RaRulSo>
 3. <https://www.youtube.com/watch?v=eNsVaUCzvLA>
 4. https://www.youtube.com/watch?v=eck_s_J6nKo
 5. <https://www.youtube.com/watch?v=QuwoLZYG91s>
 6. <https://www.youtube.com/watch?v=L-G7pLufXAO>
- Complete the reactions questions below:

Reactions questions:

Indicate the reaction type (synthesis, decomposition, etc.) for each reaction below and balance the equation.

- $\underline{\hspace{1cm}} \text{NaBr} + \underline{\hspace{1cm}} \text{Ca(OH)}_2 \rightarrow \underline{\hspace{1cm}} \text{CaBr}_2 + \underline{\hspace{1cm}} \text{NaOH}$ Reaction Type : _____
- $\underline{\hspace{1cm}} \text{NH}_3 + \underline{\hspace{1cm}} \text{H}_2\text{SO}_4 \rightarrow \underline{\hspace{1cm}} (\text{NH}_4)_2\text{SO}_4$ Reaction Type : _____
- $\underline{\hspace{1cm}} \text{C}_5\text{H}_9\text{O} + \underline{\hspace{1cm}} \text{O}_2 \rightarrow \underline{\hspace{1cm}} \text{CO}_2 + \underline{\hspace{1cm}} \text{H}_2\text{O}$ Reaction Type : _____
- $\underline{\hspace{1cm}} \text{Pb} + \underline{\hspace{1cm}} \text{H}_3\text{PO}_4 \rightarrow \underline{\hspace{1cm}} \text{H}_2 + \underline{\hspace{1cm}} \text{Pb}_3(\text{PO}_4)_2$ Reaction Type : _____
- $\underline{\hspace{1cm}} \text{Li}_3\text{N} + \underline{\hspace{1cm}} \text{NH}_4\text{NO}_3 \rightarrow \underline{\hspace{1cm}} \text{LiNO}_3 + \underline{\hspace{1cm}} (\text{NH}_4)_3\text{N}$ Reaction Type : _____
- $\underline{\hspace{1cm}} \text{HBr} + \underline{\hspace{1cm}} \text{Al(OH)}_3 \rightarrow \underline{\hspace{1cm}} \text{H}_2\text{O} + \underline{\hspace{1cm}} \text{AlBr}_3$ Reaction Type : _____

For each reaction, predict the products of the reaction, indicate which product is the precipitate that forms in the reaction (if applicable) and balance the equation.

1. $\underline{\hspace{1cm}} \text{NaOH (aq)} + \underline{\hspace{1cm}} \text{H}_2\text{SO}_4 \text{ (aq)} \rightarrow$
2. $\underline{\hspace{1cm}} \text{PbCl}_2 \text{ (aq)} + \underline{\hspace{1cm}} \text{AgNO}_3 \text{ (aq)} \rightarrow$
3. $\underline{\hspace{1cm}} \text{KMnO}_4 \text{ (aq)} + \underline{\hspace{1cm}} \text{ZnCl}_2 \text{ (aq)} \rightarrow$
4. $\underline{\hspace{1cm}} \text{NaOH (aq)} + \underline{\hspace{1cm}} \text{HClO}_4 \text{ (aq)} \rightarrow$
5. $\underline{\hspace{1cm}} \text{CaCl}_2 \text{ (aq)} + \underline{\hspace{1cm}} \text{K}_2\text{CO}_3 \text{ (aq)} \rightarrow$
6. $\underline{\hspace{1cm}} \text{BaCl}_2 \text{ (aq)} + \underline{\hspace{1cm}} \text{K}_3\text{PO}_4 \text{ (aq)} \rightarrow$
7. $\underline{\hspace{1cm}} \text{Pb(NO}_3)_2 \text{ (aq)} + \underline{\hspace{1cm}} \text{KOH (aq)} \rightarrow$

Part 12: Stoichiometry

- Watch the following videos on moles, mole conversions, stoichiometry and limiting reactants (as needed)
 1. <https://www.youtube.com/watch?v=wI56mHUDJgQ>
 2. <https://www.youtube.com/watch?v=hY7lzRBylSk&t=12s>
 3. <https://www.youtube.com/watch?v=HMAOrGpkTsQ&t=152s>
 4. <https://www.youtube.com/watch?v=CMnkSb2YsXI&t=13s>
 5. <https://www.youtube.com/watch?v=0RxB8xNmJNM>
 6. <https://www.youtube.com/watch?v=S6UQX7ZdkTg>
 7. <https://www.youtube.com/watch?v=S6UQX7ZdkTg>
 8. <https://www.youtube.com/watch?v=nZOVR8EMwRU>
 9. https://www.youtube.com/watch?v=Mlu_v8rE1TY
 10. <https://www.youtube.com/watch?v=N0dTXcoHI-I>
- Complete the stoichiometry questions below.

Stoichiometry practice questions:

Perform the following mole conversions:

1. How many atoms are in 0.750 moles of zinc?
2. How many molecules are in 0.400 moles of N_2O_5 ?
3. Find the grams in 1.26×10^{-4} mol of $HC_2H_3O_2$.
4. Find the mass in 2.6 mol of lithium bromide.
5. What is the volume of 0.05 mol of neon gas at STP?
6. What is the volume of 1.2 moles of water vapor at STP?

Use stoichiometry to solve the following problems.

- How many grams of CH_4 is needed to produce 50g of $CHCl_3$?
 $\underline{\hspace{1cm}} CH_4 + \underline{\hspace{1cm}} Cl_2 \rightarrow \underline{\hspace{1cm}} CHCl_3 + \underline{\hspace{1cm}} HCl$
- How many grams of $Ca(HCO_3)_2$ will be produced if you reacted 33.4g of $CaCO_3$ with excess H_2CO_3 ?
 $\underline{\hspace{1cm}} CaCO_3 + \underline{\hspace{1cm}} H_2CO_3 \rightarrow \underline{\hspace{1cm}} Ca(HCO_3)_2$
- How many moles of O_2 will be produced by letting 12.00 grams of $KClO_3$ react?
 $\underline{\hspace{1cm}} KClO_3 \rightarrow \underline{\hspace{1cm}} KCl + \underline{\hspace{1cm}} O_2$
- Lithium nitride reacts with dihydrogen monoxide to produce ammonia (NH_3) and lithium hydroxide. Complete and balance the equation.
 - a. How many grams of dihydrogen monoxide are needed to react with 98.7g of lithium nitride?
 - b. If the reaction produces 23.5L of dihydrogen monoxide, how many liters of carbon dioxide are produced?
 - c. How many grams of lithium nitride are needed to produce 45.0L of NH_3 ?

Answer the following questions using limiting reactants.

- 3.45 moles of nitrogen gas (N_2) react with 4.85 moles of hydrogen gas (H_2) to form ammonia (NH_3).
 $\underline{\hspace{1cm}} N_2 + \underline{\hspace{1cm}} H_2 \rightarrow \underline{\hspace{1cm}} NH_3$
 - a. Identify the limiting reactant.
 - b. How many moles of NH_3 are produced?
- A welder has 20.0 moles of acetylene gas (C_2H_2) and 10.0 moles of oxygen gas (O_2). They combine to form water and carbon dioxide.



1. Identify the limiting reactant.
 2. How many moles of CO₂ are produced?
- A student places 2.36 moles of acetic acid (CH₃CO₂H) and 3.89 grams of sodium hydroxide (NaOH) in a beaker of water. They react to form sodium acetate (NaCH₃CO₂) and water.



1. Identify the limiting reactant.
2. How many grams of water are produced

Part 13: Gas Laws

- Watch the following videos explaining the gas laws (as needed)
 1. <https://www.youtube.com/watch?v=ZoGtVVu3ymQ>
 2. <https://www.youtube.com/watch?v=oIfFoiwRCVE>
 3. <https://www.youtube.com/watch?v=w3kWaDWxChM>
 4. <https://www.youtube.com/watch?v=i-vA9uLSf7Y>
 5. <https://www.youtube.com/watch?v=bftkRnTcFj8>
 6. <https://www.youtube.com/watch?v=WhP6zJbSxec>
 7. <https://www.youtube.com/watch?v=TqLlfHBFY08>
- Complete the questions below:

Gas Laws questions - answer each question completely

1. A gas sample contained in a cylinder equipped with a moveable piston occupied 300.0 mL at a pressure of 2.00 atm. What would be the final pressure if the volume were increased to 500.0 mL at constant temperature?
2. Several balloons are inflated with helium to a volume of 0.75 L at 27°C. One of the balloons was found several hours later, the temperature had dropped to 22°C. What would be the volume of the balloon when found, if no helium has escaped
3. A sample of gas occupies 10.0 L at 100.0 torr and 27.0°C. Calculate the pressure if the temperature is changed to 127°C while the volume remains constant.
4. A 280.0 mL sample of neon exerts a pressure of 660.0 torr at 26.0°C. At what temperature, °C, would it exert a pressure of 940. torr in a volume of 440.0 mL?
5. If I have 4 moles of a gas at a pressure of 5.6 atm and a volume of 12 liters, what is the temperature?
6. If I have an unknown quantity of gas at a pressure of 121.6 kPa, a volume of 31 liters, and a temperature of 87 °C, how many moles of gas do I have?
7. If I place 3 moles of gas in a container with a volume of 60 liters and at a temperature of 400 K, what is the pressure inside the container?

Part 14 – Lab techniques

- Watch the following videos about each lab technique (as needed)
 1. How to use a volumetric pipet: <https://www.youtube.com/watch?v=VKaJ4G29Tnc>
 2. Filtration and decantation: <https://www.youtube.com/watch?v=ZvxaFCR2-bY>
 3. Using an analytical balance: <https://www.youtube.com/watch?v=4i6V7HTaaSI>
 4. Using a quadruple beam balance: <https://www.youtube.com/watch?v=XTHTBvXFZns>
 5. Using a graduated cylinder: <https://www.youtube.com/watch?v=7ewRaV5baik>
 6. Using a Bunsen burner: <https://www.youtube.com/watch?v=N7ssCM3qM3U>
 7. Using a buret: https://www.youtube.com/watch?v=VsKF_NCE3I
- For each technique or apparatus above, provide a step by step procedure for using each, and write at least 2 safety rules needed when performing this technique in lab.