

AP Chemistry

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Congratulations on making the decision to take AP Chemistry! This course will move at a fast pace and cover a substantial amount of material, starting with the first day of school.

So that we can spend more time on topics new to you in AP Chemistry, you are expected to be familiar with answering questions and solving problems using the content covered in your first year chemistry course. The attached review assignment covers first-year chemistry topics that will not be taught in AP chemistry.

Copies of the periodic table and the metric prefixes you will be using in AP Chemistry are linked in this assignment. Please note that this periodic table does not include element names. Charges of monatomic ions and key polyatomic ions that need to be memorized are also included. You are encouraged to make flashcards or use the Quizlet ions card deck below to begin learning these ions.

AP Chem Periodic Table & Equations



<https://tinyurl.com/mvfvdduw>



<https://tinyurl.com/583ts6py>

Learn the element symbols. <https://quizlet.com/4174/the-periodic-table-of-the-elements-flash-cards/>



Learn common ions. <https://quizlet.com/33412828/ions-flash-cards/>



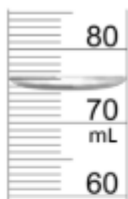
Significant Figures and Measurements

How to make accurate measurements - review video [1.5: Making Measurements - Examples](#)

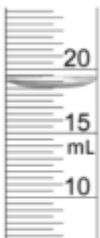
Rules for significant figures - <https://tinyurl.com/27njvp54>

Calculations with significant figures - <https://tinyurl.com/3x6ea5r8>

1. Identify the measurement to the correct number of place values:



a.



b.



c.



d.

2. Identify the number of significant figures.

- 1,245 m
- 10,000 g
- 3.02003×10^{14} m
- 0.030 mL
- 1,000. m
- 10,733 g
- 0.00420 mg
990. Torr
- 325 K
- 0.0004 L

3. Round each of the following to 3 significant figures.

- 3.02003×10^{14} mL
- 130,210 m
- 0.42858 m
- 37500 μ g
- 481.9×10^{-9} cm
- 37.446 m
- 49.0385 L
- 0.00794 mg
- 0.006008 g
- 825,066 mm

4. Perform the following calculations. Your answer should be written in the correct number of significant figures and include units.

- $12 \text{ g} + 0.677 \text{ g} + 86.33 \text{ g}$
- $(355.78 \text{ g}) / (0.056 \text{ g})$
- $97.34 \text{ mL} - 34.1 \text{ mL}$
- $0.14 \text{ mol} \times (6.02 \times 10^{23} \text{ atoms/mol})$
- $$\frac{1.26 \times 10^{-3} \text{ kg}}{(3.2 \text{ m} + 10 \text{ m} + 8.9 \text{ m})(4.3 \times 10^{-6} \text{ s})}$$
- 323×0.0002
- $4008 \div 2.763$
- $66.3 + 27.008$
- $67.45 - 12.2$
- $4.1 \times 6.22 \times 5.478$

Metric Conversions and Dimensional Analysis

SI Units and Conversion Factors - <http://www.kentchemistry.com/links/Measurements/metricconversions.htm>

<https://tinyurl.com/2p8u9v27>

<https://www.dummies.com/article/academics-the-arts/science/chemistry/convert-units-using-conversion-factors-251836/>

Dimensional Analysis -

[https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Chemistry_-_The_Central_Science_\(Brown_et_al.\)%3A_Introduction_-_Matter_and_Measurement/1.06%3A_Dimensional_Analysis](https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Chemistry_-_The_Central_Science_(Brown_et_al.)%3A_Introduction_-_Matter_and_Measurement/1.06%3A_Dimensional_Analysis)

https://www.youtube.com/watch?v=d_WfCwJW0Og

Classification of Matter, Properties, and Change

Classification of Matter -

[https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Chemistry_-_The_Central_Science_\(Brown_et_al.\)%3A_Introduction_-_Matter_and_Measurement/1.02%3A_Classification_of_Matter](https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Chemistry_-_The_Central_Science_(Brown_et_al.)%3A_Introduction_-_Matter_and_Measurement/1.02%3A_Classification_of_Matter)

Physical/Chemical Properties and Physical/Chemical Change -

[https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Chemistry_-_The_Central_Science_\(Brown_et_al.\)%3A_Introduction_-_Matter_and_Measurement/1.03%3A_Properties_of_Matter](https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Chemistry_-_The_Central_Science_(Brown_et_al.)%3A_Introduction_-_Matter_and_Measurement/1.03%3A_Properties_of_Matter)

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| <p>6. Identify each as substance (S) or a mixture (M). Then label as element (E), compound (C), solution (S) or heterogeneous (H)</p> <ul style="list-style-type: none">a. Italian salad dressingb. Copper wirec. Aluminum nitrated. Hydrochloric acide. 98% isopropyl alcoholf. Carbon dioxideg. Sodium bicarbonateh. Salt water | <p>7. Identify each as physical property (PP) or chemical property (CP).</p> <ul style="list-style-type: none">a. Flammabilityb. Densityc. Ability to react with oxygend. Tarnishese. Melting pointf. Sublimation pointg. Solubilityh. Odor | <p>8. Identify each as physical change (PC) or chemical change (CC).</p> <ul style="list-style-type: none">a. NaCl Dissolvesb. Iron rustsc. Ice meltsd. Alcohol evaporatese. Wood rotsf. Paper towel absorbs waterg. Pancakes cookh. An apple is cut |
|--|--|---|

Atomic Structure and History

History -

[https://chem.libretexts.org/Courses/Oregon_Institute_of_Technology/OIT%3A_CHE_201_-_General_Chemistry_I_\(Anthony_and_Clark\)/Unit_2%3A_The_Structure_of_the_Atom/2.1%3A_A_History_of_Atomic_Theory](https://chem.libretexts.org/Courses/Oregon_Institute_of_Technology/OIT%3A_CHE_201_-_General_Chemistry_I_(Anthony_and_Clark)/Unit_2%3A_The_Structure_of_the_Atom/2.1%3A_A_History_of_Atomic_Theory)

Atom Structure -

[https://chem.libretexts.org/Courses/Oregon_Institute_of_Technology/OIT%3A_CHE_201_-_General_Chemistry_I_\(Anthony_and_Clark\)/Unit_2%3A_The_Structure_of_the_Atom/2.2%3A_The_Structure_of_the_Atom_and_How_We_Represent_It](https://chem.libretexts.org/Courses/Oregon_Institute_of_Technology/OIT%3A_CHE_201_-_General_Chemistry_I_(Anthony_and_Clark)/Unit_2%3A_The_Structure_of_the_Atom/2.2%3A_The_Structure_of_the_Atom_and_How_We_Represent_It)

Electron Configurations -

https://chem.libretexts.org/Courses/Valley_City_State_University/Chem_115/Chapter_2%3A_Atomic_Structure/2.4_Electron_Configurations

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| <p>9. Research these two models of the atom: the Bohr (planetary) model and the electron cloud model. Write a paragraph(s) describing both (you may use diagrams), discuss which one is more accurate, and also discuss why the less accurate model is still used.</p> | <p>10. For each give number of protons (p^+), number of electrons (e^-), number of neutrons (n^0)</p> <p>a. $^{79}\text{Br}^{1-}$ b. $^{26}\text{Mg}^{2+}$ c. ^{112}Cd d. ^{222}Rn</p> | <p>11. Write the long-hand electron configuration</p> <p>a. Cu^{2+} b. Ar c. Mg d. S^{2-}</p> | <p>12. Write the short hand (noble gas) configuration</p> <p>a. Sb^{3-} b. Nh c. Rn d. Fr^+</p> |
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Periodic Table - Structure and Trends

Organization of the Periodic Table -

[https://chem.libretexts.org/Courses/Oregon_Institute_of_Technology/OIT%3A_CHE_201_-_General_Chemistry_I_\(Anthony_and_Clark\)/Unit_3%3A_Nuclei_Ions_and_Molecules/3.2%3A_A_Brief_History_of_the_Organization_of_the_Periodic_Table](https://chem.libretexts.org/Courses/Oregon_Institute_of_Technology/OIT%3A_CHE_201_-_General_Chemistry_I_(Anthony_and_Clark)/Unit_3%3A_Nuclei_Ions_and_Molecules/3.2%3A_A_Brief_History_of_the_Organization_of_the_Periodic_Table)

<https://chemistrytalk.org/how-to-read-the-periodic-table/>

Periodic Trends -

[https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Supplemental_Modules_and_Websites_\(Inorganic_Chemistry\)/Descriptive_Chemistry/Periodic_Trends_of_Elemental_Properties/Periodic_Trends](https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Supplemental_Modules_and_Websites_(Inorganic_Chemistry)/Descriptive_Chemistry/Periodic_Trends_of_Elemental_Properties/Periodic_Trends)

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| <p>13. Which groups (vertical column) of elements represent the most reactive metals and the most reactive nonmetals?</p> <p>14. Which group of elements is chemically inert?</p> <p>15. Which types of elements form positively charged ions (cations)?</p> <p>16. Which types of elements form negatively charged ions (anions)?</p> <p>17. Where on the Periodic Table will you find the elements with the most metallic character?</p> <p>18. Where on the Periodic Table will you find the elements with the most nonmetallic character?</p> <p>19. How do the periods (horizontal rows) of the Periodic Table correspond to the number of electron energy levels for a certain element?</p> <p>20. How do the groups of the Periodic Table correspond to the number of valence electrons for a certain element? *(note: this rule will not apply to the transition metals.)</p> | <p>21. Order the following elements in order of increasing electronegativity</p> <p>Ca, S, C, Li, Mg</p> <p>22. Order the following elements in order of increasing atomic radius</p> <p>Na, Ar, Zn, Se, Sr</p> <p>23. Order the following elements in order of increasing ionization energy</p> <p>O, Cr, P, Kr, Br</p> <p>24. Of the following element sets state which has the higher value</p> <p>a. Atomic radius: Mg S b. Ionization energy: Y Co c. Electronegativity: I Cl d. Ionic radius: Sr^{2+} I^-</p> | <p>25. Rank the following elements by increasing atomic radius: carbon, aluminum, oxygen, potassium.</p> <p>26. Rank the following elements by increasing electronegativity: sulfur, oxygen, neon, aluminum.</p> <p>27. Why does fluorine have a higher ionization energy than iodine?</p> <p>28. Why do elements in the same family generally have similar properties?</p> <p>29. What trend in atomic radius occurs down a group on the periodic table? What causes this trend?</p> <p>30. What trend in ionization energy occurs across a period on the periodic table? What causes this trend?</p> |
|---|--|--|

Nomenclature

<https://tinyurl.com/mrybsf6r>

Ionic Compounds -

https://chem.libretexts.org/Courses/College_of_Marin/CHEM_114%3A_Introductory_Chemistry/05%3A_Molecules_and_Compounds/5.07%3A_Naming_Ionic_Compounds#:~:text=Ionic%20compounds%20are%20named%20by,of%20roman%20numerals%20in%20parentheses.

Covalent (Molecular) Compounds

https://chem.libretexts.org/Courses/College_of_Marin/CHEM_114%3A_Introductory_Chemistry/05%3A_Molecules_and_Compounds/5.08%3A_Naming_Molecular_Compounds

Acids

https://chem.libretexts.org/Courses/College_of_Marin/CHEM_114%3A_Introductory_Chemistry/05%3A_Molecules_and_Compounds/5.09%3A_Naming_Acids

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| <p>31. Name the following compounds:</p> <ol style="list-style-type: none">K_2O$MnCl_2$Cu_2O$ZnCO_3$$BaCr_2O_7$$Fe(CN)_3$$Mg_3(PO_4)_2$ | <p>33. Name the following compounds:</p> <ol style="list-style-type: none">SO_3N_2O_5NH_3PCl_5P_4S_5 <p>34. Write formulas for the following compounds:</p> <ol style="list-style-type: none">Antimony tribromideCarbon disulfideNitrogen trifluoridephosphorus triiodideDinitrogen trioxide | <p>35. Name the following acids:</p> <ol style="list-style-type: none">$HClO_2$HNO_3H_2SO_4HClH_2SO_3 <p>36. Write formulas for the following acids:</p> <ol style="list-style-type: none">Hydrosulfuric acidNitrous acidCarbonic acidHydrocyanic acidChloric acid |
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Chemical Bonding and Intermolecular Forces

Ionic Compounds - <https://openstax.org/books/chemistry-2e/pages/7-1-ionic-bonding>

Covalent Compounds -

<https://openstax.org/books/chemistry-2e/pages/7-2-covalent-bonding#:~:text=Covalent%20bonds%20are%20fo>

[rmed%20between,ionization%20energies%20and%20electron%20affinities\).](#)

Introduction to Ionic Bonding and Covalent Bonding

Intermolecular Forces - <https://openstax.org/books/chemistry-2e/pages/10-1-intermolecular-forces>

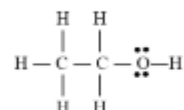
37. Identify the type of bonding AND justify your answer.

- Sulfur & Hydrogen
- Sulfur and cesium
- Chlorine and bromine
- Calcium and chlorine
- Copper and sulfur
- NaCl
- MgB₁₂
- NBr₃

38. Identify the strongest intermolecular force for each pair AND justify your answer:

a. Methane and Methane (CH₄)

b. Ethanol and Ethanol

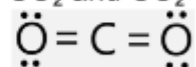


c. Water and Water

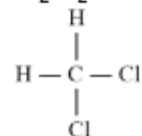
d. NH₃ and NH₃

e. HCl and HCl

f. CO₂ and CO₂



g. CH₂Cl₂ and CH₂Cl₂



Chemical Reactions

Types of Chemical Reactions -

https://chem.libretexts.org/Courses/Valley_City_State_University/Chem_121/Chapter_5%3A_Introduction_to_Redox_Chemistry/5.3%3A_Types_of_Chemical_Reactions#:~:text=The%20five%20basic%20types%20of,into%20more%20than%20one%20category.

Balancing Chemical Equations - Introduction to Balancing Chemical Equations

39. Identify the type of chemical reaction represented by each equation below:

- $A + B \rightarrow AB$
- $AB \rightarrow A + B$
- $A + BC \rightarrow B + AC$
- $AB + CD \rightarrow AD + CB$
- $C_xH_yO_z + O_2 \rightarrow CO_2 + H_2O$
- $2\text{Na}(s) + \text{Cl}_2(g) \rightarrow 2\text{NaCl}(s)$
- $2\text{NaBr}(aq) + \text{Cl}_2(g) \rightarrow 2\text{NaCl}(s) + \text{Br}_2(l)$
- $3\text{Na}_3\text{PO}_4 + 3\text{KOH} \rightarrow 3\text{NaOH} + \text{K}_3\text{PO}_4$
- $\text{C}_3\text{H}_8\text{O} + 4\text{O}_2 \rightarrow 3\text{CO}_2 + 3\text{H}_2\text{O}$
- $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$

40. Balance each of the following skeleton equations:

- $__\text{Fe} + __\text{P}_4 \rightarrow __\text{Fe}_3\text{P}_2$
- $__\text{Ca} + __\text{H}_2\text{O} \rightarrow __\text{Ca}(\text{OH})_2 + __\text{H}_2$
- $__\text{Ba}(\text{OH})_2 + __\text{H}_3\text{PO}_4 \rightarrow __\text{Ba}_3(\text{PO}_4)_2 + __\text{H}_2\text{O}$
- $__\text{(NH}_4)_2\text{CO}_3 + __\text{Al}(\text{ClO}_3)_3 \rightarrow __\text{Al}_2(\text{CO}_3)_3 + __\text{NH}_4\text{ClO}_3$
- $__\text{NH}_4\text{NO}_3(s) \rightarrow __\text{N}_2(g) + __\text{O}_2(g) + __\text{H}_2\text{O}(g)$
- $__\text{C}_8\text{H}_{10}\text{O}_2(l) + __\text{O}_2(g) \rightarrow __\text{H}_2\text{O}(g) + __\text{CO}_2(g)$

Mole Conversions and Stoichiometry

Molar Mass and Mole Conversions -

[https://chem.libretexts.org/Courses/Sacramento_City_College/SCC%3A_CHEM_330_-_Adventures_in_Chemistry_\(Alviar-Agnew\)/05%3A_Chemical_Accounting/5.03%3A_Avogadro's_Number_and_the_Mole](https://chem.libretexts.org/Courses/Sacramento_City_College/SCC%3A_CHEM_330_-_Adventures_in_Chemistry_(Alviar-Agnew)/05%3A_Chemical_Accounting/5.03%3A_Avogadro's_Number_and_the_Mole)

[https://chem.libretexts.org/Courses/Sacramento_City_College/SCC%3A_CHEM_330_-_Adventures_in_Chemistry_\(Alviar-Agnew\)/05%3A_Chemical_Accounting/5.04%3A_Molar_Mass-_Mole-to-Mass_and_Mass-to-Mole_Conversions](https://chem.libretexts.org/Courses/Sacramento_City_College/SCC%3A_CHEM_330_-_Adventures_in_Chemistry_(Alviar-Agnew)/05%3A_Chemical_Accounting/5.04%3A_Molar_Mass-_Mole-to-Mass_and_Mass-to-Mole_Conversions)

Stoichiometry

https://chem.libretexts.org/Bookshelves/Introductory_Chemistry/Introductory_Chemistry/08%3A_Quantities_in_Chemical_Reactions/8.03%3A_Making_Molecules-_Mole-to-Mole_Conversions

https://chem.libretexts.org/Bookshelves/Introductory_Chemistry/Introductory_Chemistry/08%3A_Quantities_in_Chemical_Reactions/8.04%3A_Making_Molecules-_Mass-to-Mass_Conversions

https://chem.libretexts.org/Bookshelves/Introductory_Chemistry/Introductory_Chemistry/08%3A_Quantities_in_Chemical_Reactions/8.05%3A_Stoichiometry

Limiting Reactants

https://chem.libretexts.org/Bookshelves/Introductory_Chemistry/Introductory_Chemistry/08%3A_Quantities_in_Chemical_Reactions/8.06%3A_Limiting_Reactant_and_Theoretical_Yield

https://chem.libretexts.org/Bookshelves/Introductory_Chemistry/Introductory_Chemistry/08%3A_Quantities_in_Chemical_Reactions/8.07%3A_Limiting_Reactant_Theoretical_Yield_and_Percent_Yield_from_Initial_Masses_of_Reactants

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| <p>41. Calculate the molar mass of each of the following:</p> <ol style="list-style-type: none">Ca(OH)₂CH₃COOHNH₄C₂H₃O₂Pb(CO₃)₂Al(ClO₃)₃ <p>42. Convert each of the following:</p> <ol style="list-style-type: none">500 atoms Fe to moles87.2 g Pb(CO₃)₂ to formula units4 mol C₆H₁₂O₆ to molecules452 g Argon to moles | $2\text{C}_2\text{H}_2 + 5\text{O}_2 \rightarrow 4\text{CO}_2 + 2\text{H}_2\text{O}$ <p>43. Complete the following calculations based on the given chemical reaction.</p> <ol style="list-style-type: none">13.7 g C₂H₂ react. How many grams of CO₂ produced?How many grams C₂H₂ are needed to completely react with 18.5g O₂?How many moles of water are produced when 32g O₂ react? | $2\text{BF}_3 + 3\text{H}_2 \rightarrow 2\text{B} + 6\text{HF}$ <p>44. Use the equation above to answer the following questions:</p> <ol style="list-style-type: none">If 0.10 mol of BF₃ is reacted with 0.25 mol H₂, which reactant is the limiting reactant?What is the maximum amount (in grams) of HF that can be produced from these amounts?If 3.8 g HF are produced, what is the percent yield. |
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