AP Chemistry
Summer Assignment

Name: _____
Date:

To be completed prior to the 2025-2026 school year for AP Chemistry:

Part 1: Letter of Introduction (10 points) [Skills practice grade]

Your first digital assignment is to successfully send an email to your AP Chemistry Teacher.

Mr. Davila
Email: jdavila@mpspride.org

Due Date: Monday June 16th 2025

Draft an email following these ***rules:***

1) Use written, full sentences. Do not abbreviate words like you are on the Twitter machine or Facebook with a friend. Use spell check!!
2) Make the Subject: AP Chemistry: Introduction to "<Insert your name here>"
3) Begin the email with a formal salutation, like "Mr. Davila,"
4) Now introduce yourself (your name) and tell me a little about yourself like:
   (1) What do you like to do (hobbies, sports, music, interests, etc)?
   (2) Do you have a job?
   (3) Tell me a little about what is important to you – friends, family, pets, etc.
   (4) What are your strengths/weaknesses academically?
   (5) What is your career goal?
   (6) Is this your first AP course?
   (7) Why are you taking this class?
   (8) What are your study skills?
   (9) Etc. Anything interesting?

Part 2: Chemistry: Basics (20 points each) [Skills practice grade]

Utilize Internet Resources or notes from first year chemistry to complete the following problems. The **URLs below** represent a fraction of the available chemistry addresses available. Please feel free to expand the list and find other websites that help prepare you for the coming year. We recommend that you complete as many online quizzes as possible, take detailed notes, and practice the items indicated in the packet. There are **linked resources** for a refresher if you have lost your notes from your first year of Chemistry.

The goal of these assignments is to give you a basic introduction/review of things that should be in your Chemistry toolkit when we start. You may complete them over the summer, before the summer or the week before school starts. My recommendation is do what works best for you. The first Unit test will be within the first two weeks and most of the problems in this assignment allow you to review to feel prepared for the first few unit tests that will move rapidly. AP Chemistry uses mathematical routines more often than Honors chemistry.

You do not need to use the linked resources to complete the assignment. Any basic chemistry textbook can help you find the information needed to complete the summer assignments.

General Chemistry Sites:

Khan Academy
Fiveable AP Chemistry
Jeremy Krug YouTube
ChemTeam
ChemFiesta
Chemistry Geek
AP Chemistry College Board
ChemmyBear
Bozeman Science AP Chem
Crash Course AP Chem
Study.com AP Chem
KNOWT.COM AI

Quizzes (multiple choice and free response):

https://www.appracticeexams.com/ap-chemistry/practice-exams/

Digital Textbook

OpenStax - UConn Chemistry Textbook

Assignment #1 (July 12th)

1. Write the most common guidelines to determine significant figures (digits) with an example?

2. Use **conversion factor labeling** method to convert the following:

a. 515 m = _____ miles.
b. 200 in = _____ meters
c. 325 days = _____ seconds.
d. 20 gallons = _____ ml
e. 3 meters = _____ centimeters
f. 10 kilometers = _____ meters
g. 15,050 milligrams = _____ grams
h. 3,264 milliliters = _____ liters
i. 9,674,444 grams = _____ kilograms

3. Classify each of the following as units of mass, volume, length, density, energy, or pressure.

a. mg
b. mL
c. cm^3
d. mm
e. kg/m^3
f. kJ
g. atm
h. cal.

4. Most laboratory experiments are performed at room temperature at 25˚C. Express this temperature in:

a. ˚F
b. K

5. How many significant figures are in each of the following?

Example	Number of Significant Figures	Example	Number of Significant Figures
a. 1.92 mm		**f.** 100	
b. 0.030100 kJ		**g.** 1001	
c. 6.022×10^{23} atoms		**h.** 0.001	
d. 460.00 L		**i.** 0.0101	
e. 0.00036 cm^3			

6. Record the following in correct scientific notation:

Example	Scientific Notation	Example	Scientific Notation
a. 350,000 cal		**c.** 0.0000000809 Å	
b. 0.0000721 mol		**d.** 765,400,000 atoms	

7. Calculate the following to the correct number of significant figures. Addition and Subtraction Rules. Multiplication and Division Rules

a. 1.27 g ÷ 5.296 cm^3 =
b. 12.235 g ÷ 1.01 L =
c. 12.2 g + 0.38 g =
d. 17.3 g + 2.785 g
e. 2.1 **x** 3.21
f. 200.1 **x** 120
g. 17.6 + 2.838 + 2.3 + 110.77

8. Give the chemical symbols for the following elements.

Carbon	Sulfur	Titanium	NItrogen	Helium

9. Write the Latin and Common names for each of the elements symbols:

Na	Au	Ag	Sn
Hg	**K**	**Fe**	**Pb**

10. A solid white substance A is heated strongly in the absence of air. It decomposes to form a new white substance B and a gas C. The gas has exactly the same properties as the product obtained when carbon is burned in an excess of oxygen. Based on these observations, can we determine whether solids A and B and the gas C are elements or compounds? Explain your conclusions for each substance.

11. Label each of the following as either a **physical process** or a **chemical process**.

Situation	**Physical or Chemical**
Corrosion of aluminum metal.	
Melting of ice.	
Pulverizing an aspirin.	
Digesting a candy bar.	
Explosion of nitroglycerin (dynamite)	
Milk turning sour	
Burning of paper	
Forming frost on a cold night	
Bleaching of hair with hydrogen peroxide	
A copper wire is hammered flat	

Assignment #2 (July 26th)

12. Calculate the mass of O_2 produced if 2.50 g $KClO_3$ are completely decomposed by heating.

13. Write the formula of the compounds? (Use crossing-charges method)

Chemical Name	**Chemical Formula**
Calcium Sulfate	
Ammonium Phosphate	
Lithium Nitrite	
Potassium Perchlorate	
Barium Oxide	
Zinc Sulfide	

14. Define the words:

Term	**Definition**
Atomic Number	
Atomic Mass	
Mass Number	
Molecular Formula	
Structural Formula	
Empirical Formula	
Isotopes	
Cation	
Anion	
Metalloid	
Allotrope	
Stoichiometry	

15. Determine the number of molecules in 2.23 mol of nitrogen (N_2) molecules.

16. List the following as diatomic molecule, Molecular compound, Ionic compound, Atomic element.

F_2	**Cl_2**	**C**	**NaCl**
KF	**CO_2**	**H_2**	**Ag**
Fe_2O_3	**MgO**	**O_2**	**I_2**

17. What is the difference between

a. Chlorine atom and Chloride ion?

b. Sodium atom and Sodium ion?

18. How many grams of nitrogen are present in 2.3 moles of nitrogen gas?

19. Calculate the mass in grams of each of the following:

a. 6.02×10^{23} atoms of Mg

b. 3.01×10^{23} Formula units of $CaCl_2$

Assignment #3 (August 9th)

20. What mass of copper is required to replace silver from 4.00 g of silver nitrate dissolved in water?

$$Cu_{(s)} + AgNO_3 \rightarrow Cu(NO_3)_2 + Ag$$

21. Write the chemical formulas for the following compounds:

Calcium Carbonate	**Ammonium Phosphate**	**Sodium Chloride**	**Sodium Oxide**
Calcium Sulfate	**Sodium Nitrate**	**Magnesium Acetate**	**Potassium Cyanide**
Zinc Nitrate	**Iron (III) Phosphate**	**Nickel (II) Fluoride**	

22. Define

a. Law of Conservation of Mass

b. Law of Multiple Proportion

23. An isotope of Iodine used in thyroid disorders $^{131}_{153}\mathbf{I}$ has how many

#Protons in Nucleus	#Neutrons in Nucleus	#Electrons in I^- ion	# Neutrons and Protons in I^- isotope

24. Calculate the molar masses (g/mol) of

Ammonia (NH_3)	Baking Soda ($NaHCO_3$)	Osmium Metal (Os)

25. Convert the following to moles

a. 3.86 grams of Carbon Dioxide

b. 6.0×10^5 g of Hydrazine (N_2H_4), a rocket propellant.

26. The molecular formula of morphine, a pain-killing narcotic, is $C_{17}H_{19}NO_3$.

a. What is the Molar Mass?

b. Which element contributes least to the molar mass?

27. Complete the list ionic compounds (name or formula)

Substance	**Name**	**Substance**	**Formula**
Copper (II) Hydroxide		$NaHCO_3$	
Strontium Chromate		$Fe_2(CO_3)_3$	
Ammonium Perchlorate		NaOH	

Assignment #4 (Due: August 23rd)

28. Write a **balanced equation** for the following: Write Net ionic equations when possible.

a. Reaction of boron trifluoride gas with water to give liquid hydrogen fluoride and solid b acid, (H_3BO_3).

b. Reaction of magnesium Oxide with Iron to form Iron (III) Oxide and Magnesium.

c. The decomposition of dinitrogen oxide to its elements.

d. The reaction of solid calcium cyanide ($Ca(CN)_2$) with water to form calcium carbonate and ammonia gas.

e. The reaction of Calcium Carbide solid with water to form calcium hydroxide and acetylene (C_2H_2) gas.

f. Ethane (C_2H_6) burns in air (Oxygen).

g. Hydrogen gas reacts with Oxygen to form Water.
h. Hydrogen reacts with Iodine gas to form Hydrogen Iodide.
i. Sodium reacts with Iodine gas to form Sodium Iodide.
j. Sodium Oxide reacts with water to form sodium hydroxide and Hydrogen gas.
k. Carbon dioxide combines with water to form carbonic acid.
l. Magnesium and nitrogen gas combine to form magnesium nitride.

29. Define limiting reagent, theoretical yield, and actual yield.

Limiting Reagent
Theoretical Yield
Actual Yield

30. Name the five different types of chemical reaction and their general formulas.

1.
2.
3.
4.
5.

31. Define solubility.

32. Name the following:

Formula	**Name**	**Formula**	**Name**
CO_2		P_4S_{10}	
CH_4		C_2H_6	
NI_3		C_3H_8	
PCl_5		CCl_4	

33. Define **Oxidation number**. Find the **Oxidation number** of

Carbon in CO_2
Sulfur in H_2SO_4
Phosphorus in PO_4^{3-}
Manganese in MnO_4^{2-}

34. What is an **Activity series** of metal? How does it help us in studying properties of elements?

35. Define the terms: Exothermic, endothermic reactions? How much heat is required to raise the temperature of 100 grams of water from 25^0C to 82^0C? (Specific Heat of Water: 4.186 J/g ^{o}C) (Some may have to read about this: Textbook: energy basics)

36. A piece of unknown metal with mass 14.9 g is heated to 100^0C and dropped into 75.0 g of water at 20^0C. The final temperature of the system is 28 degree Celsius. What is the specific heat of the metal? (Some may have to read about this: Textbook: energy basics)

37. What is a solute and solvent? Define Molarity?

38. Calculate the molarity of a solution that contains 20.0 grams of sodium hydroxide in 200 ml?

39. How many grams of solute are present in 50.0 ml of 0.360 M sodium chloride?

40. Draw Lewis Structures for the following chemical formulas.

O_3
SF_4

41. Consider the unbalanced equation for the combustion of heptane:

$$\_\_\_\ C_7H_{16\,(g)} + \_\_\_\ O_{2\,(g)} \rightarrow \_\_\_\ CO_{2\,(g)} + \_\_\_\ H_2O_{\,(l)}$$

Balance the equation and determine how many moles or O_2 are required to react with 4.8 moles of C_7H_{16} .

How many grams of water are produced from the combustion of heptane and 4.8 moles of C_7H_{16} .

42. Hydrobromic acid dissolves solid iron according to the reaction:

$$Fe_{\,(s)} + 2\ HBr_{\,(aq)} \rightarrow FeBr_{2\,(aq)} + H_{2\,(g)}$$

What mass of HBr (in g) do you need to dissolve a 2.80 g pure iron bar on a padlock?

What mass of H_2 would the complete reaction or the iron bar produce?

43. Determine the mass of glucose ($C_6H_{12}O_6$) in each glucose solution.

a. 0.55 L of 0.100 M $C_6H_{12}O_6$ solution

b. 122.0 mL of 0.500 M $C_6H_{12}O_6$ solution

44. A laboratory procedure calls for making 100.0 mL of 1.30 M K_2SO_4 solution. What mass of K_2SO_4 (in g) is needed?

45. What is the minimum amount of 6.0 M H_2SO_4 necessary to produce 25.0 g of H_2 (g) according to the reaction of aluminum and sulfuric acid?

$$2\ Al_{(s)} + H_2SO_{4\,(aq)} \rightarrow Al_2(SO_4)_{3\,(aq)} + 3\ H_{2\,(g)}$$