

AP Chemistry Summer Assignment

Due Date: The 3rd day of school.

(It is preferred that you turn it in on the first day of class, BUT just in case you have any questions I am giving you a few extra days...just don't procrastinate and most of it should be done on the first day)

Weight of Assignment: A minor assignment during the first quarter. Test on content of Assignment will occur at the end of the first week of school. Also, there will be a quiz on the polyatomic ions which are to be memorized 5 days after school starts.

Welcome to AP Chemistry! I look forward to working with each of you next year. AP Chemistry is a rigorous course in which we will have to cover two college semesters of introductory chemistry and introductory chemistry laboratory in one high school year. This means we will have to move quickly through the content. The first four chapters of your AP Chemistry text are mainly review of what you have learned the entire year of your first year in high school chemistry. Your assignment will be to review the first two chapters before you come back to school next year. Chapters 3 & 4 are the more heavily math based chapters, we will review those the 2nd & 3rd week of school. This review will ensure that you are ready to dive into the new chemistry concepts of the AP Chemistry Curriculum.

Below is a list of videos which you can use to help complete your written assignment. Unfortunately, you cannot have your text book over the summer, so you will need to use these videos to help you review if you don't remember the concept in the problems attached. You may also google concepts or email me at kholland@wcpss.net. I may not check my email everyday over the summer, so if you email me don't expect an immediate answer to your question.

Videos:

Chapter 1: Chemical Foundations - This chapter covers the scientific method, units of measurement, significant figures, dimensional analysis, temperature, density & classifications of matter.

Chapter 2: Atoms, Molecules, and Ions - The chapter covers the history of the atomic models, fundamental chemical laws, atomic structure, molecules and ions, the periodic table & compound naming.

<https://www.youtube.com/playlist?list=PLVqkjsKI25jyqiW-GtjnpVv5BtYy1aRB>

The first 3 videos from this youtube playlist cover Chapter 1 & 2! This source may be helpful throughout the entire year if you are absent!

Written assignment:

Complete the attached problem sets for Chapters 1 & 2. These questions should be done on loose-leaf notebook paper in blue ink/black ink/pencil. If the problem requires a mathematical calculation, I require all steps to be shown for full credit. If you are in doubt as to how much work should be shown, remember, it is better to show too much rather than not enough☺ At completion of the assignment, turn to the answer key and check your final answers. When you check your answers, make all corrections or additions in red ink. After you correct your answers, circle the number of any problem you would like me to address in class the first week of school.

Memorize:

On the AP exam, certain pieces of information are not given. For instance, your periodic table does not have the name of the elements on it. No table for polyatomic ions is given either. In addition, the AP test is a timed test. So, the better you know the information the faster you can work through the test. Attached is a list of information I would like you to have memorized for the first day of class. You will have a quiz the second week of school on all of the polyatomic ions. I will give you the date the first week of school.

Please note, this should be all review! **Reminder, the purpose of this assignment is to review your high school chemistry content. The more you put into it, the more you will get out of it!** It will be counted as a minor assignment the first quarter. If you have any questions over the summer, feel free to contact me! I look forward working with you next year. Until then, I hope you enjoy your summer!

Mrs. Holland

Chapter 1 Problem Set

These problems are from the end of Chapter 1 in the AP Chemistry textbook. I have numbered them with the numbers from the text book so that you can check your answer with the provided answer key after you complete the problem set.

Reminder, you are to do the problems in pencil or ink and then check the problems with a red pen and make the problems you have questions on!

29. How many significant figures are there in each of the following values?

- a. 6.07×10^{-15} b. 0.003840 c. 17.00 d. 8×10^8
e. 463.8052 f. 300 g. 301 h. 300.

31. Round off each of the following numbers to the indicated number of significant digits, and write the answer in standard scientific notation.

- a. 0.00034159 to three sig figs b. 103.351×10^2 to four sig figs
c. 17.9915 to five sig figs d. 3.365×10^5 to three sig figs

35. Evaluate each of the following, and write the answer to the appropriate number of significant figures.

- a. $212.2 + 26.7 + 402.09$ b. $1.0028 + 0.221 + 0.10337$
c. $52.331 + 26.01 - 0.9981$ d. $2.01 \times 10^2 + 3.014 \times 10^3$
e. $7.255 - 6.8350$

37. Perform the following mathematical operations and express the result to the correct number of significant figures.

- a. $\frac{2.526}{3.1} + \frac{0.470}{0.623} + \frac{80.705}{0.4326}$
b. $(6.404 \times 2.91)/(18.7 - 17.1)$
c. $6.071 \times 10^{-5} - 8.2 \times 10^{-6} - 0.521 \times 10^{-4}$
d. $(3.8 \times 10^{-12} + 4.0 \times 10^{-13})/(4 \times 10^{12} + 6.3 \times 10^{13})$
e. $\frac{9.5 + 4.1 + 2.8 + 3.175}{4}$

39. Perform each of the following conversions.

- a. 8.43 cm to millimeters b. 2.41×10^2 cm to meters
c. 294.5 nm to centimeters d. 1.445×10^4 m to kilometers
e. 235.3 m to millimeters f. 903.3 nm to micrometers

41. Perform the following unit conversions

- b. The circumference of the earth is 25,000 mi at the equator. What is the circumference in meters?
c. A rectangular solid measures 1.0 m by 5.6 m by 2.1 dm. Express the volume of the solid in cubic meters, liters, cubic inches and cubic feet.

43. Use the following exact conversion factors to perform the stated calculations:

$$5.5 \text{ yd} = 1 \text{ rod} \qquad 40 \text{ rod} = 1 \text{ furlong} \qquad 8 \text{ furlongs} = 1 \text{ mile}$$

- a. The Kentucky Derby race is 1.25 miles. How long is the race in rods, furlongs, meters and kilometers?
b. A marathon race is 26 miles 385 yards. What is this distance in rods, furlongs, meters and kilometers?

47. For a pharmacist dispensing pills or capsules, it is often easier to weigh the medication to be dispensed than to count the individual pills. If a single antibiotic capsule weighs 0.65 g, and a pharmacist weighs out 15.6 g of capsules, how many capsules have been dispensed?

51. Would a car traveling at a constant speed of 65 km/hr violate a 40 mi/h speed limit?
53. You are in Paris, and you want to buy some peaches for lunch. The sign in the fruit stand indicates that peaches cost 2.45 euros per kilogram. Given that 1 euro is equivalent to approximately \$1.32, calculate what a pound of peaches will cost in dollars.
59. Convert the following Celsius temperatures to Kelvin.
- the temperature of someone with a fever, 39.2°C
 - a cold wintery day, -25°C
 - The lowest possible temperature, -273°C
 - the melting temperature of sodium chloride, 801°C
60. Convert the Kelvin temperature to Celsius.
- the temperature that registers the same value on both the Fahrenheit and Celsius scales, 233 K
 - the boiling point of helium, 4 K
 - the temperature at which many chemical quantities are determined, 298 K
 - the melting point of tungsten, 3680 K
65. A material will float on the surface of a liquid if the material has a density less than that of the liquid. Given that the density of water is approximately 1.0 g/mL, will a block of material having a volume of $1.2 \times 10^4 \text{ in}^3$ and weighing 350 lb float or sink when placed in a reservoir of water?
69. Diamonds are measured in carats, and 1 carat = 0.200 g. The density of diamond is 3.51 g/cm³.
- What is the volume of a 5.0-carat diamond?
 - What is the mass in carats of a diamond measuring 2.8 mL?
71. A sample containing 33.42 g of metal pellets is poured into a graduated cylinder initially containing 12.7 mL of water, causing the water level in the cylinder to rise to 21.6 mL. Calculate the density of the metal.
77. The density of osmium (the densest metal) is 22.57 g/cm³. If a 1.00 kg rectangular block of osmium has two dimensions of 4.00 cm x 4.00 cm, calculate the third dimension of the block.
81. Classify each of the following as homogeneous or heterogeneous mixtures.
- | | | |
|------------------------|------------------------|--------------------------|
| a. a door | b. the air you breathe | c. a cup of black coffee |
| d. the water you drink | e. salsa | f. you lab partner |
83. Classify each of the following as mixture or pure substance. Of the pure substances, which are elements and which are compounds?
- | | | | |
|---------------|------------|---------------|------------|
| a. water | b. blood | c. the oceans | d. iron |
| e. brass | f. uranium | g. wine | h. leather |
| i. table salt | | | |
87. Classify the following as physical or chemical changes.
- Moth balls gradually vaporize in a closet.
 - Hydrofluoric acid attacks glass and is used to etch calibration marks on glass laboratory utensils.
 - A French chef making a sauce with brandy is able to boil off the alcohol from the brandy, leaving just brandy flavoring.
 - Chemistry majors sometimes get holes in the cotton jeans they wear to lab because of acid spills.

Chapter 2 Problem Set

19. Explain the law of conservation of mass, the law of definite proportion, and the law of multiple proportions.
21. The contributions of J.J. Thomson and Ernest Rutherford led the way to today's understanding of the structure of the atom. What were their contributions?
23. The number of protons in an atom determines the identity of the atom. What does the number and arrangement of the electrons in an atom determine? What does the number of neutrons in an atom determine?
35. A sample of chloroform is found to contain 12.0 g of carbon, 106.4 g of chlorine and 1.01 g of hydrogen. If a second sample of chloroform is found to contain 30.0 g of carbon, what is the total mass of chloroform in the second sample?
49. What are the symbols of the following metals: sodium, radium, iron, gold, manganese, lead?
51. Give the names of the metals that correspond to the following symbols: Sn, Pt, Hg, Mg, K, Ag
53. Classify the following elements as metals or nonmetals:

Mg	Si	Rn	Ti	Ge	Eu
Au	B	Am	Bi	At	Br

55. For each of the following sets of elements, label each as either noble gases, halogens, alkali metals, alkaline earth metals, or transition metals.

a. Ti, Fe, Ag	b. Mg, Sr, Ba	c. Li, K, Rb
d. Ne, Kr, Xe	e. F, Br, I	

57. Write the nuclear symbol for each of the following (${}^A_Z X$)

- $Z = 8$, number of neutrons = 9
- the isotope of chlorine in which $A = 37$
- $Z = 27$, $A = 60$
- number of protons = 26, number of neutrons = 31
- the isotope of iodine with a mass number of 131
- $Z = 3$, number of neutrons = 4

61. How many protons, neutrons and electrons does each of the atoms have?

a. ${}^{79}\text{Br}$	b. ${}^{81}\text{Br}$	c. ${}^{239}\text{Pu}$
d. ${}^{133}\text{Cs}$	e. ${}^3\text{H}$	f. ${}^{56}\text{Fe}$

63. For each of the following ions, indicate the number of protons and electrons the ions contain.

a. Ba^{2+}	b. Zn^{2+}	c. N^{3-}	d. Rb^+
e. Co^{3+}	f. Te^{2-}	g. Br^-	

65. What is the symbol for an ion with 63 protons, 60 electrons, and 88 neutrons? If an ion contains 50 protons, 68 neutrons, and 48 electrons, what is the symbol?

67. Complete the following table:

Symbol	# of protons	# of neutrons	# of electrons	Net Charge
^{238}U	20	28		2+
^{89}Y	23	28	20	
	35	44	36	
	15	16		3-

69. Would you expect each of the following atoms to gain or lose electrons when forming ions? What ion is the most likely in each case?

- a. Ra b. In c. P d. Te e. Br f. Rb

71. Name the compounds in part a-d and write the formulas for the compounds in parts e-h.

- a. NaBr e. tin (II) fluoride
b. Rb_2O f. aluminum selenide
c. CaS g. potassium nitride
d. Al_3 h. magnesium phosphide

73. Name each of the following compounds:

- a. CsF b. Li_3N c. Ag_2S d. MnO_2 e. TiO_2 f. Sr_2P_3

75. Name each of the following compounds:

- a. BaSO_3 b. NaNO_2 c. KMnO_4 d. $\text{K}_2\text{Cr}_2\text{O}_7$

79. Name each of the following compounds:

- a. CuI b. CuI_2 c. CoI_2 d. Na_2CO_3 e. NaHCO_3

83. Write the formula for each of the following compounds:

- a. sulfur difluoride b. sulfur hexafluoride
c. sodium dihydrogen phosphate d. lithium nitride
e. chromium (III) carbonate f. tin (II) fluoride
g. ammonium acetate h. ammonium hydrogen sulfate
i. cobalt (III) nitrate j. mercury (I) chloride
k. potassium chlorate l. sodium hydride

85. Write the formula for each of the following compounds:

- a. sodium oxide b. sodium peroxide
c. potassium cyanide d. copper (II) nitrate
e. selenium tetrabromide f. iodic acid
g. lead (IV) sulfide h. copper (I) chloride
i. gallium arsenide j. cadmium selenide
k. zinc sulfide l. nitrous acid m. diphosphorous pentoxide

THINGS TO MEMORIZE BEFORE DAY 1

1. All Element Names and Symbols from the Continental Periodic Table A fun way to do this is (and learn how to spell them correctly!) is to do the periodic table quiz on Sporcle.com or find a periodic table app! The one on Sporcle includes even the lanthanides and actinides so you'll be even more prepared!

2. Polyatomic Ions:

ammonium	NH_4^+
mercury I	Hg_2^{2+}
hydronium	H_3O^+
acetate	CH_3COO^-
bicarbonate	HCO_3^-
bisulfate	HSO_4^-
thiocyanate	SCN^-
hypochlorite*	ClO^-
chlorite*	ClO_2^-
chlorate*	ClO_3^-
perchlorate	ClO_4^-
permanganate	MnO_4^-
hydroxide	OH^-
cyanide	CN^-
nitrite	NO_2^-
nitrate	NO_3^-
dihydrogen phosphate	H_2PO_4^-
peroxide	O_2^{2-}
sulfite	SO_3^{2-}
sulfate	SO_4^{2-}
biphosphate	HPO_4^{2-}
carbonate	CO_3^{2-}
thiosulfate	$\text{S}_2\text{O}_3^{2-}$
chromate	CrO_4^{2-}
dichromate	$\text{Cr}_2\text{O}_7^{2-}$
oxalate	$\text{C}_2\text{O}_4^{2-}$
phosphite	PO_3^{3-}
phosphate	PO_4^{3-}

* Any halogen can replace chlorine in this ion system
ex. BrO_2^- is called bromite

3. Solubility Rules of Salts

A salt is an ionic compound that cannot be classified as an acid, a base, an oxide, or a hydride. These rules are used to predict which salts will dissociate (break apart into ions) in aqueous solution, thus being “soluble”, and which salts will not, thus being “insoluble”.

Note: “Insoluble” means it will not dissolve in water at concentrations of 0.1M or greater...because all salts have *some degree* of solubility.

1. All salts containing group 1 (alkali metal) cations (Li^+ , Na^+ , K^+ , Cs^+ , Rb^+) and the ammonium cation (NH_4^+) are soluble.
2. All nitrates (NO_3^-) are soluble.
3. All acetates (CH_3COO^-) are soluble.
4. All chlorates (ClO_3^-) and perchlorates (ClO_4^-) are soluble.
5. Chlorides (Cl^-), bromides (Br^-), and Iodides (I^-) are soluble EXCEPT those of silver, lead, or mercury I (Hg_2^{2+})
6. Sulfates (SO_4^{2-}) are soluble EXCEPT those of silver, lead, mercury (I), Ca, Sr, and Ba.
7. Sulfides (S^{2-}) are insoluble EXCEPT those of alkali metals, ammonium, calcium, strontium, and barium.
8. Phosphates (PO_4^{3-}), chromates (CrO_4^{2-}), dichromates ($\text{Cr}_2\text{O}_7^{2-}$), carbonates (CO_3^{2-}), and sulfites (SO_3^{2-}) are insoluble except those of alkali metals or ammonium.