

CHS CHEMISTRY SUMMER ASSIGNMENT – 2026-2027

The summer assignment is due **the first day of class**. Please bring it to class with you.

Expect a test on the information contained in this packet within the first week of returning to school.

Course Requirements

You must MEMORIZE the following ions. They will not be given to you on any Oakland Catholic exam or on any of your Pitt exams.

Cations That You Need to Know

Group 1A, Group 2A, Al^{3+} , and NH_4^+ (ammonium ion)

Anions That You Need to Know

F^-	fluoride	Cl^-	chloride
I^-	iodide	Br^-	bromide
O^{2-}	oxide	N^{3-}	nitride
S^{2-}	sulfide	P^{3-}	phosphide
CO_3^{2-}	carbonate	OH^-	hydroxide
NO_3^-	nitrate	NO_2^-	nitrite
SO_4^{2-}	sulfate	SO_3^{2-}	sulfite
PO_4^{3-}	phosphate	$\text{C}_2\text{H}_3\text{O}_2^-$	acetate
CrO_4^{2-}	chromate	$\text{Cr}_2\text{O}_7^{2-}$	dichromate
MnO_4^-	permanganate	CN^-	cyanide
ClO_4^-	perchlorate	ClO_3^-	chlorate
ClO_2^-	chlorite	ClO^-	hypochlorite
SCN^-	thiocyanate	O_2^{2-}	peroxide

Note: ALL answers should be rounded to the proper number of significant figures and include units. Circle or underline your final answers. Please be aware that you may have to research extra information (ex. densities) on the internet. I suggest using your chem I notes as reference.

- 1) Write the number 1200 three ways: with 2, 3, and 4 significant figures
- 2) Electrons in a beam of electrons travel 187cm in 52.1 μs . Calculate the speed of the electrons in m/s. [cm is centimeter; μs is microsecond and m/s is meters per second]

- 3) A container has a volume of $1.05 \times 10^3 \text{ cm}^3$. When filled with gas, the mass of the container + gas is 837.6 g. The mass of the container alone is 836.2g. To the correct number of significant figures, what is the density of the gas (in grams/mL)?
- 4) Perform the following conversion: What is the cost of gasoline in \$US per gallon for fuel in London that costs £0.75 per liter? (£1 = \$1.34 , at the time of making this assignment)
- 5) Classify each of the following as to pure substances or mixtures. If an item is a mixture, specify if it is heterogeneous or homogeneous. (You may need to research types of mixtures)
- | | |
|----------------|----------------------|
| a) Concrete - | e) Air - |
| b) Seawater - | f) Tomato juice - |
| c) Magnesium - | g) Iodine crystals - |
| d) Gasoline - | h) Nickel |
- 6) Name the following elements:
- | | | |
|-------|-------|-------|
| a) H | e) F | i) Ba |
| b) Mg | f) Sn | j) Se |
| c) Pb | g) Cu | k) Tl |
| d) Si | h) Ca | |
- 7) A solid white substance A is heated strongly in the absence of air. It decomposes to form a new white solid B and a gas C. The gas has exactly the same properties as the product obtained when carbon is burned with excess oxygen. What can you say about whether solids A and B and the gas C are elements or compounds?

8) Write the following measurements in “long form” (not scientific notation):

- | | |
|--|----------------------------|
| a) 6.5×10^{-9} cm | e) 12.5×10^{-8} s |
| b) 3.35×10^{-4} mL | f) 3.5×10^3 L |
| c) 2.5×10^{-3} mol | g) 6.54×10^9 fs |
| d) 4.23×10^{-12} m ³ | |

9) Perform the following conversions:

- | | |
|-------------------------------|----------------------------------|
| a) 2.52×10^3 kg to g | c) 6.25×10^{-4} s to ms |
| b) 0.0023 mm to nm | |

10) Convert the following pressures (1 atm = 760 mmHg = 101.3 kPa)

- a) 500 mmHg to atm
- b) 2.35 atm to kPa
- c) 350 kPa to mmHg

11) Identify the following as an exact number (E) or a measurement (M).

- | | |
|---|--|
| a) the mass of a paper clip - _____ | g) the number of students in your first period class last year - _____ |
| b) the surface area of a dime - _____ | h) the temperature of the sun - _____ |
| c) the number of inches in a mile - _____ | i) the mass of a postage stamp - _____ |
| d) the number of ounces in a pound - _____ | j) the number of mL in a cubic meter of water - _____ |
| e) the number of microseconds in a week - _____ | |
| f) the mass of 15 ounce can of coffee - _____ | |

12) What is the number of significant figures in the following measured quantities?

- | | | |
|----------------------|---------------------------------------|-------------------------|
| a) 1282 kg - _____ | e) 0.0105 L - _____ | i) 7,194,300 cm - _____ |
| b) 0.00296 s - _____ | f) 9.7750×10^{-4} cm - _____ | j) 435.983 K - _____ |
| c) 8.070 mm - _____ | g) 1.689×10^{-3} km - _____ | k) 204.080 g - _____ |
| d) 8070 mm - _____ | h) 0.0234 m ² - _____ | |

13) Round each of the following numbers to three significant figures and express each in scientific notation.

a) 143700

c) 890,000

b) 0.09750

d) 6.764×10^4

14) Carry out the following operations, and express the answer with the appropriate number of significant figures:

a) $1.24056 + 75.80 =$

b) $23.67 - 75 =$

c) $8900 \times 112.3 =$

d) $78132 / 2.50 =$

15) A lake has an area of 15500 mi² express the answer is m²?

16) If a person has 285 mg of cholesterol per 100. mL of blood, and a total blood volume of 5.3 L, how many grams of cholesterol does the person have in total in his blood?

17) An asthma drug dose is 6.0 mg/kg of body mass. What should the dose be, in grams, for a 175 lb person?

18) If an electric car goes 225 km on a single charge, how many charges are required for the 2850 mile trip from New York to Los Angeles? Assume the car is fully charged at the start of the trip in New York.

19) Surgeons removed 10. kg of fat from a patient by a procedure called liposuction. One fat cell has a mass of 8.0×10^{-7} g. How many fat cells were removed?

20) The world record for the marathon is 2 hours 4 minutes and 26 seconds. The race length is 26 miles and 385 yards. What was the average speed during the race in km/hr?

21) Two students determine the percentage of lead in samples as a laboratory exercise. The true value is 22.52%. Student #1 had results that were 22.52%, 22.48%, and 22.52%. Student #2 had results that were 22.64%, 22.58%, and 22.62%.

a) Calculate the average for each student and tell which data set is more accurate

b) Which student was the most precise? Why?

22) Perform the following conversions:

a) How many atoms of iron are in a sample of 15.5 moles?

b) How many grams would a sample of 1.6×10^{23} atoms of silver weigh?

c) How many atoms of oxygen are found in a sample of 36.03 grams of water?

23) Complete the following stoichiometry problems.

- a) According to the balanced equation: $2 \text{H}_2 + 1 \text{O}_2 \rightarrow 2 \text{H}_2\text{O}$, how many moles of water could be formed from the reaction of 15 moles of O_2 ?
- b) According to the balanced equation: $4 \text{Fe} + 3 \text{O}_2 \rightarrow 2 \text{Fe}_2\text{O}_3$, how many grams of iron (III) oxide can be formed from the reaction of 4.5 moles of iron?
- c) According to the balanced equation: $4 \text{Fe} + 3 \text{O}_2 \rightarrow 2 \text{Fe}_2\text{O}_3$, how many grams of oxygen are necessary to fully react with 25.5 grams of iron?

24) How many protons, neutrons, and electrons are in each of the following:

- | | |
|--------------------------|--------------------------|
| a) ^{55}Mn | d) $^{79}\text{Se}^{2-}$ |
| b) ^{40}Ar | e) ^{184}W |
| c) $^{65}\text{Zn}^{2+}$ | f) ^{235}U |

25) The following nuclides are used in medicine. Indicate how many protons and neutrons there are in each.

- | | |
|------------------|------------------|
| a) phosphorus-32 | d) technetium-99 |
| b) chromium-51 | e) iodine-131 |
| c) cobalt-60 | f) thallium-201 |

26) Fill in all the gaps in the table assuming all the atoms are neutral.

Symbol	^{39}K				
Protons		25			82
Neutrons		30	64		
Electron			48	56	
Mass #				137	207

27) Fill in the gaps of the table:

Symbol	$^{52}\text{Cr}^{3+}$	$^{131}\text{I}^-$			
Protons			47		33
Neutrons			60	69	42
Electron			46	48	
Net Charge				2+	3-

28) Indicate if each element is a metal, nonmetal, or metalloid. If the element is a metal, indicate if it is a transition metal.

- | | |
|----------------|------------|
| a) silver | e) cadmium |
| b) helium | f) calcium |
| c) phosphorous | g) bromine |
| d) aluminum | h) arsenic |

29) How many hydrogen atoms are there in the following?

- | | | |
|------------------------------------|--|----------------------------------|
| a) $\text{C}_2\text{H}_5\text{OH}$ | b) $\text{Ca}(\text{C}_2\text{H}_3\text{COO})_2$ | c) $(\text{NH}_4)_2\text{HPO}_4$ |
|------------------------------------|--|----------------------------------|

30) Each of the following elements can form an ion in a chemical reaction. By referring to the periodic table or other references, predict the charge of the most stable ion of each:

- | | |
|-------|-------|
| a) Al | d) I |
| b) Ca | e) Cs |
| c) S | |

31) Predict the formula and the name of the compound formed by the following pairs of elements.

- Ga and F -
- Li and H, -
- Al and I -

37) Provide the name or chemical formula appropriate for each of the following molecular substances.

- | | |
|-------------------------|-------------------|
| a) NF_3 | d) IF_5 |
| b) dinitrogen tetroxide | e) XeO_3 |
| c) SF_6 | |

38) Write the balanced chemical equation for each of the following reactions:

- a) zinc carbonate can be heated to form zinc oxide and carbon dioxide.
- b) On treatment with hydrofluoric acid (HF), silicon dioxide forms silicon tetrafluoride and water.
- c) sulfur dioxide reacts with water to form sulfurous acid (H_2SO_3).

39) The element oxygen has three naturally occurring isotopes: oxygen – 16, oxygen -17, and oxygen – 18. Discuss the similarities and differences between these three types of atoms.

40) Consider the elements Ar, H, Ga, Al, Ca, Br, Ge, K, and O. Pick the one that best fits each of the following descriptions.

- | | |
|----------------------------|---------------------------------------|
| a) an alkali metal | e) a metalloid |
| b) an alkaline earth metal | f) a nonmetal listed in group 1 |
| c) a noble gas | g) a metal that forms a $3+$ ion |
| d) a halogen | h) an element that resembles aluminum |

In addition to the questions above, it is highly recommended that you watch (and take notes on) the following videos to review or learn key topics that will be covered within the first few weeks of class. The recommended videos are as follows:

1. Empirical and Molecular Formulas:

- a. Introduction: <https://www.youtube.com/watch?v=wnRaBWvhYKY>
- b. Calculations Type 1: <https://www.youtube.com/watch?v=JeSSucG-CVw>
- c. Calculations Type 2: <https://www.youtube.com/watch?v=uvR7zNJ1KoI>

2. Stoichiometry:

- a. Intro and Basics: <https://www.youtube.com/watch?v=7Cfq0ilw7ps>
- b. Limiting and Excess Reactants: <https://www.youtube.com/watch?v=JYwbrimJuSE>

3. Predicting Products of Reactions:

- a. <https://www.youtube.com/watch?v=AFNqO1OcJfQ>