

Advanced Placement Chemistry ~ Summer Review Packet

Learning Target 1 – *I can count the number of significant figures in a measurement.*

1) Count the number of significant figures in the following measurements:

- a) 2.71 g _____ b) 0.00047 kg _____ c) 7.0×10^5 m _____ d) 1,030 L _____
e) 150 pencils _____ f) 37500 g _____ g) 0.1010 cm _____

Learning Target 2 – *I can convert numbers to scientific notation while applying significant figures.*

2) Express each of the following in proper scientific notation (Pay attention to sig figs and units)

- a) 0.000125 m _____ b) 155.0 mL _____
c) 123,030,000 kg _____ d) 481.9×10^{-9} cm _____

Learning Target 3 – *I can add, subtract, multiply, and divide with the correct number of significant figures.*

3) Calculate the correct answer with proper units and sig figs for each of the following:

- a) $12 \text{ g} + 0.677 \text{ g} + 86.33 \text{ g} =$ _____
b) $(355.78 \text{ g}) / (0.056 \text{ g}) =$ _____
c) $97.34 \text{ mL} - 34.1 \text{ mL} =$ _____
d) $14.68 \times 5 =$ _____

4) Perform the following calculations with scientific notation and report your answer with the correct number of significant figures.

- a) $0.14 \times (6.02 \times 10^{23}) =$ _____
b) $\frac{(9.875 \times 10^4) - (9.795 \times 10^4)}{9.875 \times 10^4} \times 100 \% =$ _____ (assume 100 is exact)
c) $\frac{(3.8 \times 10^{-12}) + (4.0 \times 10^{-13})}{(4 \times 10^{12}) + (6.3 \times 10^{13})} =$ _____

Learning Target 4 – *I can use conversions to solve dimensional analysis problems.*

5) Solve the following problems using conversions and dimensional analysis.

- a) A large railroad car is filled with 1745 gallons of milk. The car springs a leak in the bottom, and milk starts dripping out at a rate of 204.84 mL/sec. If the train is traveling at a speed of 65.4 miles per hour, calculate how many miles it will travel before all the milk has drained out of the car. (1 gal = 3.78 L, 1 mile = 5280 ft, 1 in = 2.54 cm)

- b) The world record for the hundred meter dash is 9.77 seconds. What is the corresponding average speed in units of m/sec, km/hr, ft/sec, and miles/hr?

Learning Target 5 – *I can explain density and use the density equation to find an unknown.*

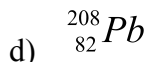
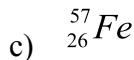
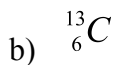
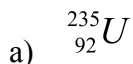
- 6) A rectangular block has dimensions of 2.9 cm x 3.5 cm x 10.0 cm. The mass of the block is 615.0 grams. What are the volume and the density of the block?
- 7) The density of pure silver is 10.5 g/mL at 20°C. If 5.25 grams of pure silver pellets are added to a graduated cylinder containing 11.2 mL of water, to what volume will the water in the cylinder rise?

Learning Target 6 – *I can define and explain terms that identify physical/chemical characteristics of matter.*

- 8) Define the following terms:
- a) Solid –
 - b) Liquid –
 - c) Gas –
 - d) Pure substance –
 - e) Homogeneous mixture –
 - f) Heterogeneous mixture –
 - g) Chemical change –
 - h) Physical change –
- 9) Identify the following as a physical property, physical change, chemical property, or chemical change:
- a) Ethanol has a density of 0.697 g/mL.
 - b) The solution turns blue upon mixing water and food coloring.
 - c) Wood burns in an oven.
 - d) Methyl alcohol is highly flammable.
 - e) Ice melts in a beaker.
 - f) Methyl ethanoate smells like apples.
 - g) A car crashes into a wall.
 - h) Sugar dissolves in water.

Learning Target 7 – I can identify the number of protons, neutrons, and electrons in atoms and isotopes.

- 10) What number of protons and neutrons are contained in the nucleus of each of the following atoms?
Assuming each atom is uncharged, what number of electrons are present?



- 11) Complete the following table:

Name	Mass #	Atomic #	# of Protons	# of Neutrons	# of Electrons	Symbol
Gallium	70					
						${}_{15}^{31}\text{P}^{-3}$
Strontium-80						
						${}_{25}^{55}\text{Mn}^{+2}$

Learning Target 8 – I can define and use the Law of Definite Proportions and the Law of Multiple Proportions.

- 12) Explain:

a) Law of Definite Proportions:

b) Law of Multiple Proportions:

- 13) Solve the following problem:

Tin – Oxygen compound	Tin % by mass	Oxygen % by mass
Stannous oxide	88.10%	11.90%
Stannic oxide	78.70%	21.30%

Tin – Oxygen compound	Tin mass	Oxygen mass
Stannous oxide	100.0 grams	
Stannic oxide	100.0 grams	

- a) Use the Law of Definite Proportions to determine the mass of oxygen needed to combine with the given masses of tin for stannous oxide and stannic oxide.
- b) Does the Law of Multiple Proportions hold true in this case? Explain why or why not.

Learning Target 9 – *I can name and write formulas for ionic compounds.*

14) Name or give the formula for the following compounds:

<u>Name</u>	<u>Formula</u>
Sodium fluoride	_____
_____	K ₂ O
Calcium phosphate	_____
_____	FeCl ₃
Iron (II) chloride	_____
_____	Hg ₂ O
Sodium sulfate	_____
_____	CaCO ₃
Lithium phosphate	_____
_____	SO ₂
Calcium hydroxide	_____
_____	H ₂ SO ₄
Cupric chloride	_____

Learning Target 10 – *I can write and balance equations.*

Write and balance the following equations:

- Iron metal reacts with oxygen to form rust, iron (III) oxide.
- Calcium metal reacts with water to produce aqueous calcium hydroxide and hydrogen gas.
- Aqueous barium hydroxide reacts with aqueous sulfuric acid to produce solid barium sulfate and water.

Learning Target 11 – *I can do conversions associated with moles.*

15) Solve the following problems:

- Calculate the mass of 500. Atoms of iron (Fe).
- How many formula units are present in 87.2 grams of lead (IV) carbonate?

- c) Aspartame is an artificial sweetener that is 160 times sweeter than sucrose (table sugar) when dissolved in water. It is marketed as Nutra-Sweet. The molecular formula of aspartame is $C_{14}H_{18}N_2O_5$.
- Calculate the molar mass of aspartame.
 - Calculate the mass, in grams, of 1.56 mol of aspartame.
 - How many molecules are in 5.0 mg of aspartame?
 - How many atoms of nitrogen are in 1.2 g aspartame?
 - What is the mass of one molecule of aspartame?

Learning Target 12 – *I can calculate percent by mass for an element in a compound.*

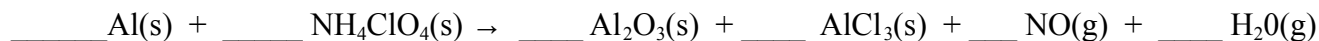
- 16) Calculate the percent by mass for each element in aspartame from the previous problem.

Learning Target 13 – *I can calculate the average atomic mass of an isotope using percent abundance.*

- 17) An element consists of 1.40% of an isotope with a mass of 203.973 amu, 24.10% of an isotope with mass 205.9745 amu, 22.10% of an isotope with mass 206.9759 amu, and 52.40% of an isotope with mass 207.9766 amu. Calculate the average atomic mass and identify the element.

Learning Target 14 – *I can solve stoichiometry problems, include those that use limiting and excess.*

18) The reusable booster rockets of the U.S. space shuttle employs a mixture of aluminum and ammonium perchlorate for fuel. A possible reaction for this is:



- a) Balance the following reaction:
- b) If 4.0 g of aluminum reacted with 15.0 g of ammonium perchlorate, what would be the limiting reactant? How much excess of the other reactant would you have?
- c) Using the above information, how much aluminum chloride would be produced in grams?
- d) If you actually collected 4.18 g of aluminum chloride what would be your percent yield?

19) You add aluminum to a solution of copper (II) chloride and it reacts exothermically. Write and balance the equation below.

- a) If you react 1.25 g of Al, how much copper (II) chloride do you need to add for the Al to fully react?
- b) How much of each product would you collect?

20) When 125.0 g of ethylene (C_2H_4) burns in 60.0 grams of oxygen to give carbon dioxide and water, how many grams of CO_2 are formed? (Hint: balance the equation and determine limiting reactant first)

Learning Target 15 – *I can determine the empirical and molecular formula by calculation.*

21) Phenol is a compound that contains 76.57% carbon, 6.43% hydrogen, and 17.0% oxygen.

a) Calculate the empirical formula.

b) If its molecular weight is 188 g/mol, what would be its molecular formula?

Learning Target 16 - *I can calculate the empirical formula of an unknown hydrocarbon through a combustion reaction and calculation.*

22) One killer of a problem – a GOLD STAR if you can get this one:

Menthol, the substance we can smell in mentholated cough drops, is composed of carbon, hydrogen, and oxygen. A 0.1005 gram sample of menthol is combusted producing 0.2829 g of CO_2 and 0.1159 g of H_2O . What is the empirical formula for menthol? Show work.