South Pasadena • AP Chemistry Name _____ Period ___

Summer Review Station 1

(Ch 1) - MEASUREMENTS

Write in the number of significant figures for each of the following measurements:

_**3**_ 3.00 mL _**3**_ 0.00290 g _**4**_ 50.00 m _**2**_ 0.070 kg _**1**_ 400 L

Combine the masses 0.0562 kg, 124.213 g and 1635 mg. The answer should be reported as: _**182.0**_ g

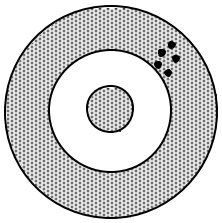
56.**2** g + 124.21**3** g + 1.63**5** g = 182.**0**4**8** **round number off to largest digit with uncertainty… tenths**

You measure a 5.75 mL sample of mercury with a mass of 77.05 g. The measured density is __**13.4 g/mL**__

density = mass/volume = 77.05 g / 5.75 mL = 13.4 g/mL

Mercury's accepted density is 13.53 g·mL^{-1}. The % error in your measurement is: ___**0.96 %**____

100 x (13.53 – 13.4) / 13.53 = 0.96 %

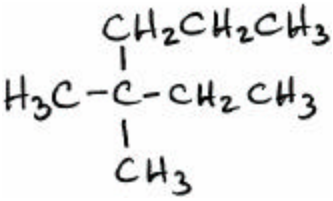


Is this person accurate? _**N**_
not on the bull's eye

Is the person precise? _**Y**_
closely grouped

Summer Review Station 2

(Ch 1) - MATTER



This molecule contains _**2 (C & H)**_ elements and _**26**_ atoms.

The molecular formula for this substance is: ___**C_8H_{18}**____

Calculate the number of seconds in 5.25 years using unit analysis: (1 year = 365.25 days)

$$5.25 \text{ years} \times \frac{365.25 \text{ days}}{1 \text{ year}} \times \frac{24 \text{ hours}}{1 \text{ day}} \times \frac{3600 \text{ sec}}{1 \text{ hour}} = \mathbf{165677400 \text{ sec}} = \mathbf{166{,}000{,}000 \text{ sec} = 1.66 \times 10^8 \text{ sec}}$$

A **calculator** displays the answer to a problem as **53.29841**

Report this answer to:

____**53.298**____ 5 significant figures

____**53.3**_____ 3 significant figures

____**50**_____ 1 significant figure

Summer Review — Station 3

(Ch 2)—ATOMS & FAMILIES

Subatomic Particles

Use the following key:
(each answer may be used once, more than once, or not at all)

A) proton
B) neutron
C) electron
D) proton and neutron

_**A**_ Determines the identity of the atom.
_**C**_ Makes up the size of the atom.
_**D**_ Makes up the mass of the atom.
_**A**_ Has a charge of +1
_**D**_ Has a mass of 1 amu
_**C**_ Has a mass of 1/1837th amu

Chemical Families

Use the following key:
(each answer may be used once, more than once, or not at all)

A) alkali metal family
B) noble gas family
C) halogen family
D) alkaline earth metal family

_**B**_ Very unreactive.
_**C**_ Forms 1- ions.
_**A**_ Very reactive with water.
_**B**_ All gases.
_**D**_ Forms 2+ ions.
_**A**_ Cs is a member of this family.

Summer Review — Station 4

(Ch 2)—SUBATOMIC PARTICLES & EXPERIMENTS

Substance	# protons	# neutrons	# electrons
^{7}Li	**3**	**4**	**3**
$^{63}Cu^{2+}$	**29**	**34**	**27**
$^{127}I^{-}$	**53**	**74**	**54**

Scientists

Use the following key:
(each answer may be used once, more than once, or not at all)

A) John Dalton
B) Ernest Rutherford
C) Democritus
D) J.J. Thomson

_**B**_ Most of the mass of the atom is in the nucleus.
_**A**_ Billiard Ball Model
_**C**_ Atomos = indivisible
_**B**_ Gold Foil/alpha particle Experiment
_**D**_ Plum Pudding Model
_**D**_ Studied cathode ray tubes

Summer Review — Station 5

(Ch 3)-MEASURING CHEMICALS

Calculate the molar mass of $Ba(NO_3)_2$.

Ba: 137.33
N_2: 28.02
O_6: 96.00 = 261.35 g/mol

Calculate the percent composition of each element in the following compound.

$Ba(NO_3)_2$	Ba = $\frac{137.33}{261.35} x100$ = **52.5%**	N = $\frac{28.02}{261.35} x100$ = **10.7%**	O = $\frac{96.00}{261.35} x100$ = **36.7 %**

Write the formula for ionic compounds made from these ions:

Name	Cation	Anion	Formula
sodium phosphate	**Na^+**	**PO_4^{3-}**	**Na_3PO_4**
stannic chloride	**Sn^{4+}**	**Cl^-**	**$SnCl_4$**
aluminum hydroxide	**Al^{3+}**	**OH^-**	**$Al(OH)_3$**
ammonium sulfate	**NH_4^+**	**SO_4^{2-}**	**$(NH_4)_2SO_4$**

Summer Review — Station 6

(Ch 3)-MOLE PROBLEMS

Solve the following mole problems:

How many molecules of CO_2 (MM = 44.0 g/mol) are in 17.75 grams of CO_2?

$$17.75\ g\ CO_2 \times \frac{1\ mole\ CO_2}{44.0\ g\ CO_2} \times \frac{6.02 \times 10^{23}\ molecules\ CO_2}{1\ mole\ CO_2} = \mathbf{2.43 \times 10^{23}\ molecules\ CO_2}$$

What volume (in Liters) does 20.0 grams of butane, C_4H_{10}, occupy at STP? (MM C_4H_{10} = 58.14 g/mol)

$$20.0\ g\ C_4H_{10} \times \frac{1\ mole\ C_4H_{10}}{58.14\ g\ C_4H_{10}} \times \frac{22.4\ L\ C_4H_{10}}{1\ mole\ C_4H_{10}} = \mathbf{7.71\ L\ C_4H_{10}}$$

List the 7 diatomic elements:	**H**	**N**	**O**	**F**	**Cl**	**Br**	**I**
	H_2	**N_2**	**O_2**	**F_2**	**Cl_2**	**Br_2**	**I_2**

Summer Review — Station 7

(Ch 4) - REACTIONS

Balance these equations and classify their type (single replacement, double replacement, etc.)

1 C_5H_{12} + **8** O_2 → **5** CO_2 + **6** H_2O — Classify this reaction: **_Combustion (Redox)_**

1 H_2O_2 → **1** H_2O + **½** O_2 **or 2,2,1** — Classify this reaction: **_Decomposition (Redox)_**

2 $AgNO_3$ + **1** K_2CO_3 → **1** Ag_2CO_3 + **2** KNO_3 — Classify this reaction: **_Double Replacement_**

Consider the balanced equation: $N_2(g)$ + 3 $H_2(g)$ → 2 $NH_3(g)$

molar masses: (28.02) (2.02) (17.04)

How many grams of $NH_3(g)$ is formed when 12.80 grams of $H_2(g)$ reacts with 55.25 grams of $N_2(g)$?

Note: Two "Givens" signifies a Limiting Reactant Problem.

$$12.80\text{ g } H_2 \times \frac{1\text{ mol } H_2}{2.02\text{ g } H_2} \times \frac{2\text{ mol } NH_3}{3\text{ mol } H_2} \times \frac{17.04\text{ g } NH_3}{1\text{ mol } NH_3} = \mathbf{71.98\text{ g } NH_3}$$

$$55.25\text{ g } N_2 \times \frac{1\text{ mol } N_2}{28.02\text{ g } N_2} \times \frac{2\text{ mol } NH_3}{1\text{ mol } N_2} \times \frac{17.04\text{ g } NH_3}{1\text{ mol } NH_3} = 67.199 = \boxed{\mathbf{67.20\text{ g } NH_3}}$$ **(Smaller Answer is Correct)**

Summer Review — Station 8

(Ch 4) - EMPIRICAL FORMULAS

Empirical Formulas:

A substance is 33.33% carbon, 7.47% hydrogen, and 59.20% oxygen.

What is its empirical formula? __**$C_3H_8O_4$**__

Assume 100 g of substance:

$$33.33\text{ g C} \times \frac{1\text{ mole C}}{12.01\text{ g C}} = \frac{2.775\text{ mol C}}{2.775} = 1 \times 3 = \mathbf{3}$$

$$7.47\text{ g H} \times \frac{1\text{ mole H}}{1.01\text{ g H}} = \frac{7.396\text{ mol H}}{2.775} = 2.66 \times 3 = \mathbf{8}$$

$$59.20\text{ g O} \times \frac{1\text{ mole O}}{16.00\text{ g O}} = \frac{3.700\text{ mol O}}{2.775} = 1.33 \times 3 = \mathbf{4}$$

Summer Review — Station 9

(Ch 5) - DRIVING FORCES

Circle the **precipitates**:	**PbI_2**	$Ba(OH)_2$	**Ag_2CO_3**	**CaF_2**	K_2SO_3	$(NH_4)_2S$

List the **strong acids**:	**HCl**	**HI**	**HBr**	**H_2SO_4**	**HNO_3**	**$HClO_3$**	**$HClO_4$**	**HIO_4**

Write the balanced molecular, ionic, and net ionic equation for:

Solutions of acetic acid and sodium nitrite are mixed.

$$HC_2H_3O_2 + NaNO_2 \rightarrow HNO_2 + NaC_2H_3O_2$$

HNO_2 decomposes to gases, but you need 2 HNO_2 ® $H_2O + NO + NO_2$… so double the above equation.

$$2HC_2H_3O_2 + 2NaNO_2 \rightarrow 2HNO_2 + 2NaC_2H_3O_2$$

$$2HC_2H_3O_2 + 2NaNO_2 \rightarrow H_2O + NO + NO_2 + 2NaC_2H_3O_2$$

$$2HC_2H_3O_2 + 2Na^+ + 2NO_2^- \rightarrow H_2O + NO + NO_2 + 2Na^+ + 2C_2H_3O_2^-$$

$$\boxed{2HC_2H_3O_2 + 2NO_2^- \rightarrow H_2O + NO + NO_2 + 2C_2H_3O_2^-}$$

Summer Review — Station 10

(Ch 5) - REDOX REACTIONS

Write the balanced net ionic equation for:

Aluminum metal is added to a solution of silver nitrate.

Al° metal must change… into the ion, Al^{3+}

If Al's oxidation number <u>increases</u>, an oxidation number must also <u>decrease</u>… $Ag^+ \rightarrow Ag^\circ$

$$Al + 3AgNO_3 \rightarrow Al(NO_3)_3 + 3Ag$$

$$Al + 3Ag^+ + 3NO_3^- \rightarrow Al^{3+} + 3NO_3^- + 3Ag$$

$$Al + 3Ag^+ \rightarrow Al^{3+} + 3Ag$$

What substance is being **oxidized**? ____**Al**____ Which **atom** is being **reduced**? ___**Ag^+**___

What is the **oxidizing agent**? ___**$AgNO_3$**___

What is the **oxidation number** of N in the nitrate ion, $\underline{N}O_3^-$

$$x + 3(-2) = -1$$

$$x = +5$$