

Name: _____

Instructor: Mills

Chemistry 100: 2nd Practice Midterm Examination

Answer all five questions. Each question is worth 30 points. Please ensure you have all *five* pages of questions, as well as a formula sheet *before* starting work. For numerical answers, include the correct number of **significant figures** and appropriate **S.I. unit(s)**. For full credit you must....

SHOW ALL WORK

Question	Score
1	
2	
3	
4	
5	
<u>Total</u>	

“Ionic”

Write the formulas and names of nine ionic compounds that may be formed through combining the anions and cations ions listed immediately below.



<u>Ionic Formula</u>	<u>Name of Ionic Compound</u>

State whether your compounds from part 2a are soluble or insoluble:

Soluble Compounds

Insoluble Compounds

“Balance”

Write balanced chemical equations that describe the following processes. Remember to include state symbols in your equations:

- a. The burning of liquid propane (C₃H₈ (l)) in air

- b. The Neutralization of stomach acid (hydrochloric acid solution) with caustic soda (sodium hydroxide solution)

- c. The reaction of solid diphosphorus pentoxide with water to form aqueous phosphoric acid

- d. The decomposition of chalk (CaCO₃), when heated, to form solid calcium oxide and carbon dioxide gas

- e. The reaction of metallic zinc with aqueous sulfuric acid to form aqueous zinc sulfate and hydrogen gas

Extra Credit: State to which one of the five general classes of reaction each of the above processes belong.

“Those Three Equations”

Write *balanced, complete* and *net* ionic equations illustrating the reaction between solutions of barium nitrate and sodium sulfate.

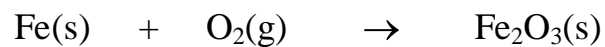
List the names and formulas of five insoluble ionic compounds containing the phosphate anion.

“Moles”

Expect a question relating to converting grams, volume of a gas and number of particles to and from moles of material (see HWK and class notes for examples)

“Slides and Ladders”

For the following *unbalanced* chemical reaction, determine the quantities listed below (Hint: balance the reaction first):



The mass of iron (III) oxide produced when 2.56 g of solid iron is burnt in excess oxygen gas:

The number of oxygen molecules consumed in part (a)

Extra Credit: State to which one of the five general classes of reaction the above processes belongs.

“Electron addresses”

Draw *Lewis symbols* and *‘Dot’ structures* for the following:

Atom or Ion	Lewis Symbol	Dot Structure
C		
O ²⁻		

“Air bag”

Vehicle safety ‘air’ bags actually inflate with nitrogen gas during collisions. If a standard car’s ‘air’ bag has a volume of 36.0 L and inflates to a pressure of 745 Torr at 15 °C, then:

How many moles of N₂ (g) are contained within the inflated ‘air’ bag described above?

If the car’s air bag described above was instead inflated at – 20 °C (i.e. on a Chicago winter’s day), to what pressure would the ‘air’ bag inflate?

Extra credit: Do you think the process described in (b) would be dangerous? Explain.

Data sheet (periodic table also provided)

Density = mass/volume	1 kg = 2.205 lb	1 cm ³ = 1 mL = 1 x10 ⁻⁶ m ³
Density copper (Cu) = 8.95 gcm ⁻³	1 inch = 2.54 cm	1 mile = 1.6039 km
1 a.m.u. = 1.6606 x 10 ⁻²⁴ g	1 ft = 12 inches (exactly)	1 gallon = 3.786 L
Volume cylinder = $\pi r^2 h$	1dm ³ = 1L = 10 ⁻³ m ³	PV = nRT
R = 0.0821 Latm/molK	1 atm = 760 Torr	P ₁ V ₁ /T ₁ = P ₂ V ₂ /T ₂

Common Decimal Prefixes

Prefix	Symbol	Exponential Notation
Giga	G	10 ⁹
Mega	M	10 ⁶
Kilo	k	10 ³
deci	d	10 ⁻¹
centi	c	10 ⁻²
milli	m	10 ⁻³
micro	μ	10 ⁻⁶
nano	n	10 ⁻⁹

Solubility rules:

		Exceptions		Exceptions
Soluble Compounds			Insoluble Compounds	
Compounds containing	NO ₃ ⁻	None	Compounds containing	CO ₃ ²⁻
	Cl ⁻	Ag ⁺ , Hg ²⁺ , Pb ²⁺		NH ₄ ⁺ & group IA cations
	Br ⁻	Ag ⁺ , Hg ²⁺ , Pb ²⁺		PO ₄ ³⁻
	I ⁻	Ag ⁺ , Hg ²⁺ , Pb ²⁺		NH ₄ ⁺ & group IA cations
	SO ₄ ²⁻	Ba ²⁺ , Hg ²⁺ , Pb ²⁺		OH ⁻
				group IA cations Ca ²⁺ , Sr ²⁺ , Ba ²⁺ & NH ₄ ⁺