

Chemistry 121
Test 1
Spring 2007

You have 75 minutes to complete this 100 point test. Please mark each answer clearly and show all work. You may use a simple scientific calculator. NO GAPHING CALCULATORS.

I. (10 pts) Multiple Choice: Circle the best answer

1. In chemistry, the numbers in front of formulas in a balanced equation are referred to as:

- B** a. Isotopes
 b. Coefficients
c. Products
d. Reactants

2. What are the total number of protons and electrons in a chromium(VI) cation?

- D** a. 27 protons, 27 electrons
b. 24 protons, 24 electrons
c. 27 protons, 21 electrons
 d. 24 protons, 18 electrons

3. Which one of the following ionic compounds has the correct formula?

- C** a. NaO
b. Mg₂O
 c. CaO
d. K₂O₃

4. Which one of the following numbers has 4 significant figures?

- A** a. 1.000
b. 0.0001
c. 1000
d. None of the above

5. Which of the following choices is the correct answer to this math problem: $14.509 - 2.39651 + 13.0$

- C** a. 25.11249
b. 25.11
 c. 25.1
d. 25

II. (30 pts) Calculations and Explanations: Clearly show all work for full credit.

1. (8 pts) An element has three naturally occurring isotopes with the following masses and percent abundances. (a) Calculate the average atomic weight of this element and (b) give the chemical name of the element.

Isotopic Mass (u)	Abundance
38.964	93.26%
39.964	0.01000%
40.962	6.730%

$$\begin{aligned} (38.964u)(0.9326) &= 36.34u \\ (39.964u)(0.0001000) &= 0.003996u \\ (40.962u)(0.06730) &= 2.757u \\ \hline &39.10u \end{aligned}$$

Element Name: Potassium

2. (8 pts) Acetic acid is an ingredient in vinegar. Pure acetic acid has a strong vinegar smell but is corrosive to the skin. What volume (in L) of pure acetic acid has a mass of 3.500×10^5 mg if the density of acetic acid is 1.053 g/mL?

$$3.500 \times 10^5 \text{ mg} \times \frac{1 \text{ g}}{1000 \text{ mg}} \times \frac{1 \text{ mL}}{1.053 \text{ g}} \times \frac{1 \text{ L}}{1000 \text{ mL}} = 0.3324 \text{ L}$$

3. (8 pts) The Insurance Institute for Highway Safety (IIHS) rates the structural integrity of automobiles using a frontal crash test during which the cars are accelerated to 40.0 mi/hr. What is this speed in m/s? (1 mi = 1.609 km)

$$\frac{40.0 \text{ mi}}{\text{hr}} \times \frac{1.609 \text{ km}}{1 \text{ mi}} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{1 \text{ hr}}{3600 \text{ s}} = 17.9 \frac{\text{m}}{\text{s}}$$

4. (6 pts) Explain the difference between precision and accuracy as it applies to chemical measurements.

Precision is how close a set of measurements are to each other and accuracy is how close a measurement is to the actual answer

III. (52 pts) Atomic Notation and Naming

1. (12 pts) Complete the blanks in the following table:

Name	Symbol	Number of Protons	Number of Neutrons	Mass Number
Calcium	Ca	20	22	42
Arsenic	As	33	45	78
Titanium	Ti	22	25	47
Bromine	Br	35	45	80

2. (20 pts) Name the following compounds:

- | | |
|---|--|
| a. $\text{Ca}_3(\text{PO}_4)_2$ | <u>calcium phosphate</u> |
| b. Al_2O_3 | <u>aluminum oxide</u> |
| c. S_2Cl_4 | <u>disulfur tetrachloride</u> |
| d. $\text{Mn}(\text{OH})_2$ | <u>manganese(II) hydroxide</u> |
| e. $\text{Ti}(\text{HPO}_4)_2$ | <u>titanium(IV) hydrogen phosphate</u> |
| f. NS_3 | <u>nitrogen trisulfide</u> |
| g. KrCl_5 | <u>krypton pentachloride</u> |
| h. $\text{FeSO}_4 \cdot 6 \text{H}_2\text{O}$ | <u>iron(II) sulfate hexahydrate</u> |
| i. Na_2Se | <u>sodium selenide</u> |
| j. OBr_2 | <u>oxygen dibromide</u> |

3. (20 pts) Give the chemical formula for each of the following compounds

- | | |
|----------------------------|------------------------------|
| a. Sodium sulfate | f. Calcium hydrogen sulfite |
| Na_2SO_4 | $\text{Ca}(\text{HSO}_3)_2$ |
| b. Copper(II) chromate | g. Selenium difluoride |
| CuCrO_4 | SeF_2 |
| c. Strontium hydroxide | h. Carbon tetrabromide |
| $\text{Sr}(\text{OH})_2$ | CBr_4 |
| d. Diphosphorous pentoxide | i. Ammonium carbonate |
| P_2O_5 | $(\text{NH}_4)_2\text{CO}_3$ |
| e. Nitrogen trichloride | j. Nickel(II) phosphide |
| NCl_3 | Ni_3P_2 |

