

Chemistry 121
Test 1, Version A
Fall 2007

You have 50 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 compounds on the left side of a balanced equation are referred to as:
 - a. Isotopes.
 - b. Coefficients.
 - c. Products.
 - d. Reactants.

2. Which of the following ions has 30 protons and 28 electrons?
 - a. Zn²⁺
 - b. Ni²⁺
 - c. Ce²⁺
 - d. None of the above

3. Which one of the following ionic compounds has the correct formula?
 - a. Ca₂O₂
 - b. MgS
 - c. KF₃
 - d. AlO

4. Which one of the following numbers has 2 significant figures?
 - a. 2.500
 - b. 0.0250
 - c. 0.000025
 - d. None of the above

5. When 345 degrees Kelvin is converted to Celsius, the temperature is _____.
 - a. 345 °C.
 - b. 618 °C.
 - c. 72 °C.
 - d. None of the above.

II. (15 pts) Calculations: Clearly show all work for full credit.

1. (5 pts) An element has two 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 |
|-------------------|-----------|
| 78.9183 | 50.69% |
| 80.92 | 49.31% |

$$\begin{aligned}
 (78.9183 \text{ u})(0.5069) &= 40.00 \text{ u} \\
 (80.92 \text{ u})(0.4931) &= 39.90 \text{ u} \\
 \hline
 &79.90 \text{ u}
 \end{aligned}$$

Element Name: bromine

2. (5 pts) Ethylene glycol (antifreeze) has a density of 1.55 g/mL. What is the volume in L of 4.1 kg of this liquid?

$$4.1 \text{ kg} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \text{ mL}}{1.55 \text{ g}} \times \frac{1 \text{ L}}{1000 \text{ mL}} = 2.6 \text{ L}$$

3. (5 pts) Convert 2.56 gal to milliliters. (4 qt = 1 gal, 1L = 1.057 qt)

$$2.56 \text{ gal} \times \frac{4 \text{ qt}}{1 \text{ gal}} \times \frac{1 \text{ L}}{1.057 \text{ qt}} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 9.69 \times 10^3 \text{ mL}$$

or 9690 mL

III. (72 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 |
|-----------|--------|-------------------|--------------------|-------------|
| scandium | Sc | 21 | 21 | 42 |
| Sulfur | S | 16 | 17 | 33 |
| zirconium | Zr | 40 | 42 | 82 |
| lead | Pb | 82 | 125 | 207 |

2. (30 pts) Name the following compounds:

- a. NF_3 nitrogen trifluoride
- b. CsI cesium iodide
- c. I_2O_5 diiodine pentaoxide
- d. PbCl_4 lead(IV) chloride
- e. CoSO_4 cobalt(II) sulfate
- f. NH_4I ammonium iodide
- g. KrCl_5 Krypton pentachloride
- h. $\text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2$ copper(II) acetate
- i. $\text{BeCl}_2 \cdot 2\text{H}_2\text{O}$ beryllium chloride dihydrate
- j. NO nitrogen monoxide

3. (30 pts) Give the chemical formula for each of the following compounds.

- a. Sodium hydrogen sulfate NaHSO_4
- b. Chromium(III) phosphate trihydrate $\text{CrPO}_4 \cdot 3\text{H}_2\text{O}$
- c. Lead(II) chromate PbCrO_4
- d. Disulfur tetrafluoride S_2F_4
- e. Carbon tetrachloride CCl_4
- f. Rubidium permanganate RbMnO_4
- g. Chlorine monoxide ClO
- h. Diphosphorus pentasulfide P_2S_5
- i. Silver(I) nitrate AgNO_3
- j. Magnesium nitride Mg_3N_2

IV. (3 pts) Periodic Table: Give examples of the following using the **CHEMICAL NAME** of the element, not the symbol:

1. a halogen fluorine, chlorine, bromine, etc.
2. a noble gas helium, neon, argon, etc
3. an alkaline earth metal beryllium, magnesium, etc

Name: _____

- V. (10 pts) **Essay:** In 4 – 6 grammatically correct sentences, answer ONE of the following questions.
- Describe the experiment that Millikan performed when he determined the charge on an electron.
 - Explain how Rutherford deduced the presence of neutrons.

See "Facets of Chemistry" in Chapter 1.

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| | IA | | | | | | | | | | | | | | | | | | VIIIA | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 H 1.008 | | | | | | | | | | | | | | | | | | | 2 He 4.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 3 Li 6.94 | 4 Be 9.01 | | | | | | | | | | 5 B 10.81 | 6 C 12.01 | 7 N 14.01 | 8 O 16.00 | 9 F 19.00 | 10 Ne 20.18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 11 Na 22.99 | 12 Mg 24.31 | | | | | | | | | | 13 Al 26.98 | 14 Si 28.09 | 15 P 30.97 | 16 S 32.06 | 17 Cl 35.45 | 18 Ar 39.95 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 19 K 39.10 | 20 Ca 40.08 | 21 Sc 44.96 | 22 Ti 47.90 | 23 V 50.94 | 24 Cr 52.00 | 25 Mn 54.94 | 26 Fe 55.85 | 27 Co 58.93 | 28 Ni 58.71 | 29 Cu 63.55 | 30 Zn 65.37 | 31 Ga 69.72 | 32 Ge 72.59 | 33 As 74.92 | 34 Se 78.96 | 35 Br 79.90 | 36 Kr 83.80 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 37 Rb 85.47 | 38 Sr 87.62 | 39 Y 88.91 | 40 Zr 91.22 | 41 Nb 92.91 | 42 Mo 95.94 | 43 Tc [98] | 44 Ru 101.1 | 45 Rh 102.9 | 46 Pd 106.4 | 47 Ag 107.9 | 48 Cd 112.40 | 49 In 114.8 | 50 Sn 118.7 | 51 Sb 121.8 | 52 Te 127.60 | 53 I 126.90 | 54 Xe 131.30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 55 Cs 132.9 | 56 Ba 137.3 | 71 Lu 175 | 72 Hf 178.5 | 73 Ta 181 | 74 W 183.9 | 75 Re 186.2 | 76 Os 190.2 | 77 Ir 192.2 | 78 Pt 195.1 | 79 Au 197 | 80 Hg 200.59 | 81 Tl 204.4 | 82 Pb 207.2 | 83 Bi 209 | 84 Po [209] | 85 At [210] | 86 Rn [222] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 87 Fr [223] | 88 Ra [226] | 103 Lr [262] | 104 [261] | 105 [262] | 106 [263] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1"> <tr> <td>57 La 138.9</td> <td>58 Ce 140.1</td> <td>59 Pr 140.9</td> <td>60 Nd 144.2</td> <td>61 Pm [145]</td> <td>62 Sm 150.4</td> <td>63 Eu 152</td> <td>64 Gd 157.3</td> <td>65 Tb 158.9</td> <td>66 Dy 162.5</td> <td>67 Ho 164.93</td> <td>68 Er 167.3</td> <td>69 Tm 168.9</td> <td>70 Yb 173</td> </tr> <tr> <td>89 Ac [227]</td> <td>90 Th 232</td> <td>91 Pa [231]</td> <td>92 U 238</td> <td>93 Np [237]</td> <td>94 Pu [244]</td> <td>95 Am [243]</td> <td>96 Cm [247]</td> <td>97 Bk [247]</td> <td>98 Cf [251]</td> <td>99 Es [252]</td> <td>100 Fm [257]</td> <td>101 Md [258]</td> <td>102 No [259]</td> </tr> </table> | | | | | | | | | | | | | | | | | | | 57 La 138.9 | 58 Ce 140.1 | 59 Pr 140.9 | 60 Nd 144.2 | 61 Pm [145] | 62 Sm 150.4 | 63 Eu 152 | 64 Gd 157.3 | 65 Tb 158.9 | 66 Dy 162.5 | 67 Ho 164.93 | 68 Er 167.3 | 69 Tm 168.9 | 70 Yb 173 | 89 Ac [227] | 90 Th 232 | 91 Pa [231] | 92 U 238 | 93 Np [237] | 94 Pu [244] | 95 Am [243] | 96 Cm [247] | 97 Bk [247] | 98 Cf [251] | 99 Es [252] | 100 Fm [257] | 101 Md [258] | 102 No [259] |
| 57 La 138.9 | 58 Ce 140.1 | 59 Pr 140.9 | 60 Nd 144.2 | 61 Pm [145] | 62 Sm 150.4 | 63 Eu 152 | 64 Gd 157.3 | 65 Tb 158.9 | 66 Dy 162.5 | 67 Ho 164.93 | 68 Er 167.3 | 69 Tm 168.9 | 70 Yb 173 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 89 Ac [227] | 90 Th 232 | 91 Pa [231] | 92 U 238 | 93 Np [237] | 94 Pu [244] | 95 Am [243] | 96 Cm [247] | 97 Bk [247] | 98 Cf [251] | 99 Es [252] | 100 Fm [257] | 101 Md [258] | 102 No [259] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |