

Chemistry 121
Spring 2004
Test 1
FORM A

Name: KEY

Instructions: You have 75 minutes to complete this 100-point exam. You may use a simple scientific calculator. No programmable calculators allowed.

$$^{\circ}F = \left(\frac{9^{\circ}F}{5^{\circ}C}\right)(^{\circ}C) + 32^{\circ}F$$

$$^{\circ}C = \left(\frac{5^{\circ}C}{9^{\circ}F}\right)(^{\circ}F - 32^{\circ}F)$$

$$1 \text{ in} = 2.54 \text{ cm}$$

$$1000\text{g} = 1\text{kg}$$

$$1000 \text{ mg} = 1 \text{ g}$$

I. MULTIPLE CHOICE: (30 pts, 3 points each) Carefully and clearly circle the best answer.

1. The correct elemental symbol for silicon is:

- a. S
- b. Se
- C c. Si
- d. Sc

2. Which element has properties similar to arsenic, As?

- A a. Sb
- b. Se
- c. Ge
- d. S

3. The melting point of sodium is 98°C , what is this in Kelvin?

- a. 175 K
- B b. 371 K
- c. -175 K
- d. -371 K

$$98 + 273 = 371$$

4. Which of the following elements is an alkaline earth metal?

- a. Na
- b. F
- D c. Cr
- d. Sr

5. A calcium atom has 20 neutrons. Its mass number is:

- a. 40.08
- b. 20
- C c. 40
- d. 60

6. An atom of vanadium (V) loses 2 electrons. It is now called a(n)

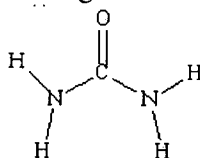
- a. Anion
b. Element
c. Isotope
d. Cation
- D

7. What ion is likely to form from selenium (Se)?

- a. Se^+
b. Se^{2+}
c. Se^{-2} ← 6A
d. Se^-
- C

8. What is the chemical formula of the following molecule?

- a. CN_2OH_4
b. H_2NCONH_2
c. ON_2CH_4
d. $\text{CH}_4\text{N}_2\text{O}$
- D



9. If sodium acetate, NaCH_3CO_2 , breaks up, what ions will result?

- a. Na^+ , CH_3 , CO_2
b. Na , CH_3CO_2
c. Na^+ , CH_3CO_2^-
d. Na^{2+} , $\text{CH}_3\text{CO}_2^{2-}$
- C

10. The smallest particle of an element that retains the chemical properties of the element is a(n):

- a. atom
b. ion
c. solid
d. molecule
- A

II. Short Answer and Calculations (80 pts): Clearly indicate your answer in the space provided. Partial credit will be given for correct work. If I cannot read the work, it will not be graded.

1. (10 pts) Name the following compounds:

a. SCl_2

sulfur dichloride

b. PF_3

phosphorous trifluoride

c. CaSO_4

calcium sulfate

d. Fe_2O_3

iron (III) oxide

e. NH_4NO_3

ammonium nitrate

2. (10 pts) Give the correct formula for the following compounds:

a. Sulfur hexafluoride

SF_6

b. Sodium carbonate

Na_2CO_3

c. Magnesium hydroxide

$\text{Mg}(\text{OH})_2$

d. Chromium (II) chloride

CrCl_2

e. Copper (II) hydroxide hexahydrate

$\text{Cu}(\text{OH})_2 \cdot 6\text{H}_2\text{O}$

3. (10 pts) What is the volume of 3.00 g alcohol that has a density of 0.785 g/mL?

$$3.00 \text{ g} \times \frac{\text{mL}}{0.785 \text{ g}} = 3.82 \text{ mL}$$

4. (10 pts) What is the molar mass of ammonium sulfide, $(\text{NH}_4)_2\text{S}$?

2 N	$2(14.01) = 28.02$
8 H	$8(1.008) = 8.064$
1 S	$1(32.06) = 32.06$
	<hr/>
	68.14 g/mol

5. (10 pts) How many molecules are there in 2.35 g of ammonium sulfide? (HINT: use molar mass from previous problem)

$$2.35 \text{ g } (\text{NH}_4)_2\text{S} \times \frac{\text{mol } (\text{NH}_4)_2\text{S}}{68.14 \text{ g } (\text{NH}_4)_2\text{S}} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}}$$
$$= 2.08 \times 10^{22} \text{ molecules } (\text{NH}_4)_2\text{S}$$

6. (15 pts) Element Q on Planet Qurtok has 2 stable isotopes, ^{49}Q (49.06885 g/mol) and ^{52}Q (51.96590 g/mol). What is the percent abundance of each isotope if the molar mass of Q is 49.9576 g/mol?

$$\frac{49.06885(x) + 51.96590(1-x)}{49.9576} \quad 1-x = 1-0.6932 = 0.3068$$

$$49.06885x + 51.96590 - 51.96590x = 49.9576$$

$$-2.89705x = -2.0083$$

$$x = 0.6932$$

69.32% ^{49}Q and 30.68% ^{52}Q

7. (15 pts) Vitamin C (also called Ascorbic Acid) can be found in citrus fruit, berries, broccoli, tomatoes, etc. It is composed of carbon (40.91%), hydrogen (4.55%) and oxygen (54.55%) and has a molar mass of 176 g/mol. What are Vitamin C's empirical and molecular formulas?

Assume 100. g

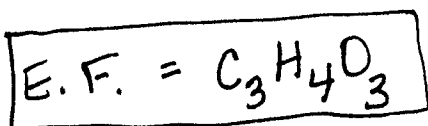
$$40.91 \text{ g C} \times \frac{\text{mol C}}{12.01 \text{ g C}} = 3.406 \text{ mol C}$$

$$4.55 \text{ g H} \times \frac{\text{mol H}}{1.008 \text{ g H}} = 4.51 \text{ mol H}$$

$$54.55 \text{ g O} \times \frac{\text{mol O}}{16.00 \text{ g O}} = 3.409 \text{ mol O}$$

$$\frac{\text{C}}{\text{O}} = \frac{3.406}{3.409} = \frac{1}{1}$$

$$\frac{\text{H}}{\text{C}} = \frac{4.51}{3.406} = \frac{1.32 \cdot 3}{1 \cdot 3} = \frac{4}{3}$$



$$\text{MM} = 88.06 \text{ g/mol}$$

$$\frac{\text{MM of MF}}{\text{MM of EF}} = \frac{176}{88.06} = \frac{2}{1}$$

