

## Chemistry 68 – Practice Exam 1

Show all work for full credit. Answers without supporting work will receive zero credit. All numbers that require units that do not have units written will result in the loss of three (3) points each time. All numbers in scientific notation should be in correct scientific notation (i.e.,  $3.15 \times 10^4$ , not  $31.5 \times 10^3$  or 3.15E4 or 3.15e4). Each instance of incorrect scientific notation will result in the loss of three (3) points.

1. Classify the following as a ***pure substance***, a ***homogenous mixture*** or a ***heterogeneous mixture***.

- a. sodium chloride      **pure substance**
- b. rain water      **homogeneous mixture**
- c. oxygen gas      **pure substance**
- d. coca cola      **homogeneous mixture**
- e. blood      **heterogeneous mixture**

2. When iron rusts in moist air, the product is typically a mixture of two iron–oxygen compounds. In one compound, there is an equal number of iron and oxygen atoms. In the other compound, there are three oxygen atoms for every two iron atoms. Write the formulas for the two iron oxides.

**FeO and Fe<sub>2</sub>O<sub>3</sub>**

3. The surface temperature of the sun is 5778 K. On the Rankine (°R) scale water freezes at 491.67 °R. The size of the °R and the °F are the same. What is the surface temperature of the sun in °R?

$$(5778 \text{ K} - 273.15 \text{ K}) \times \frac{9 \text{ }^\circ\text{R}}{5 \text{ K}} + 491.67 \text{ }^\circ\text{R} = 1.0400 \times 10^4 \text{ }^\circ\text{R}$$

4. Write formulas for the following names:

- a. sulfurous acid  $\text{H}_2\text{SO}_3(\text{aq})$
- b. diselenium dibromide  $\text{Se}_2\text{Br}_2$
- c. ammonium chromate  $(\text{NH}_4)_2\text{CrO}_4$
- d. chromium(ii) cyanate  $\text{Cr}(\text{CNO})_2$
- e. magnesium phosphate  $\text{Mg}_2(\text{PO}_4)_2$
- f. water  $\text{H}_2\text{O}$
- g. hydroiodic acid  $\text{HI}(\text{aq})$
- h. barium iodide  $\text{BaI}_2$
- i. trinitrogen tetraboride  $\text{N}_3\text{B}_4$
- j. manganese(iii) cyanide  $\text{Mn}(\text{CN})_3$
- k. mercury(ii) carbonate  $\text{HgCO}_3$
- l. aluminium sulfate  $\text{Al}_2(\text{SO}_4)_3$

5. Calculate the **relative average atomic mass** of an element that has the three isotopes listed below. The following data is given:

Isotope Mass	Abundance
322.9557631 amu	32.467%
324.9567743 amu	44.786%
325.9578863 amu	22.747%

$$(0.32467)(322.9557631 \text{ u}) = 104.854047606 \text{ u}$$

$$(0.44786)(324.9567743 \text{ u}) = 145.535140938 \text{ u}$$

$$(0.22747)(325.9578863 \text{ u}) = 74.1456403967 \text{ u}$$

$$104.854047606 \text{ u} + 145.535140938 \text{ u} + 74.1456403967 \text{ u} = 324.534828941 \text{ u} \\ = 324.53 \text{ u}$$

6. Name the following compounds:

- a.  $\text{Li}_3\text{PO}_3$                       lithium phosphate
- b.  $\text{NH}_3$                               ammonia
- c.  $\text{NO}_3$                                 nitrogen trioxide
- d.  $\text{Na}_2\text{O}_2$                             sodium peroxide
- e.  $\text{Hg}_2\text{Br}_2$                             mercury(I) bromide
- f.  $\text{Ca}_3\text{P}_2$                               calcium phosphide

7. A metal cylinder is 26.45% chromium by mass, 55.49% aluminium by mass and the rest is cobalt. The density of the cylinder is 0.1855 lb in<sup>-3</sup>. If the radius is 16.432 cm and the height is 44.631 cm. How many grams of cobalt were used to create the cylinder?  $V_{\text{cylinder}} = \pi r^2 h$ , 1 in = 2.54 cm (exact), 1 lb = 453.59 g

$$\begin{aligned} ? \text{ g Co} &= \pi (16.432 \text{ cm cyl})^2 (44.631 \text{ cm}) \times \left( \frac{1 \text{ in cyl}}{2.54 \text{ cm cyl}} \right)^3 \times \frac{0.1855 \text{ lb cyl}}{\text{in}^3 \text{ cyl}} \times \frac{(100.00 \text{ lb cyl} - 26.45 \text{ lb Cr} - 55.49 \text{ lb Al}) \text{ lb Co}}{100.00 \text{ lb cyl}} \\ &= 77.3976639829 \text{ lb Co} = 77.40 \text{ lb Co} \end{aligned}$$

8. Complete the following table:

Name of Element	Isotope symbol	Mass Number	Atomic Number	Number of Protons	Number of Neutrons	Number of Electrons
Nitrogen	<sup>15</sup> <sub>7</sub> N	15	7	7	8	7
chromium	<sup>50</sup> <sub>24</sub> Cr	50	24	24	26	24
Calcium	<sup>43</sup> <sub>20</sub> Ca	43	20	20	23	20
phosphorus	<sup>28</sup> <sub>15</sub> P	28	15	15	13	15