Aluno(a): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Licenciatura em Química 09/11/2017.

**Application Problems**

Problems marked with a ♦ involve multiple concepts.

1.  Hydrogen sulfide is a noxious and toxic gas produced from decaying organic matter that contains sulfur. A lethal concentration in rats corresponds to an inhaled dose of 715 molecules per million molecules of air. How many molecules does this correspond to per mole of air? How many moles of hydrogen sulfide does this correspond to per mole of air?

2. Bromine, sometimes produced from brines (salt lakes) and ocean water, can be used for bleaching fibers and silks. How many moles of bromine atoms are found in 8.0 g of molecular bromine (Br2)?

3. Paris yellow is a lead compound that is used as a pigment; it contains 16.09% chromium, 19.80% oxygen, and 64.11% lead. What is the empirical formula of Paris yellow?

4. A particular chromium compound used for dyeing and waterproofing fabrics has the elemental composition 18.36% chromium, 13.81% potassium, 45.19% oxygen, and 22.64% sulfur. What is the empirical formula of this compound?

5. Compounds with aluminum and silicon are commonly found in the clay fractions of soils derived from volcanic ash. One of these compounds is vermiculite, which is formed in reactions caused by exposure to weather. Vermiculite has the following formula:Ca0.7[Si6⋅6Al1.4]Al4O20(OH)4Ca0.7[Si6⋅6Al1.4]Al4O20(OH)4. (The content of calcium, silicon, and aluminum are not shown as integers because the relative amounts of these elements vary from sample to sample.) What is the mass percent of each element in this sample of vermiculite?

6. ♦ Pheromones are chemical signals secreted by a member of one species to evoke a response in another member of the same species. One honeybee pheromone is an organic compound known as an alarm pheromone, which smells like bananas. It induces an aggressive attack by other honeybees, causing swarms of angry bees to attack the same aggressor. The composition of this alarm pheromone is 64.58% carbon, 10.84% hydrogen, and 24.58% oxygen by mass, and its molecular mass is 130.2 amu.

a.  Calculate the empirical formula of this pheromone.

b.  Determine its molecular formula.

c.  Assuming a honeybee secretes 1.00 × 10−11 g of pure pheromone, how many molecules of pheromone are secreted?

7. Amoxicillin is a prescription drug used to treat a wide variety of bacterial infections, including infections of the middle ear and the upper and lower respiratory tracts. It destroys the cell walls of bacteria, which causes them to die. The elemental composition of amoxicillin is 52.59% carbon, 5.24% hydrogen, 11.50% nitrogen, 21.89% oxygen, and 8.77% sulfur by mass. What is its empirical formula?

8. Monosodium glutamate (MSG; molar mass = 169 g/mol), is used as a flavor enhancer in food preparation. It is known to cause headaches and chest pains in some individuals, the so-called Chinese food syndrome. Its composition was found to be 35.51% carbon, 4.77% hydrogen, 8.28% nitrogen, and 13.59% sodium by mass. If the “missing” mass is oxygen, what is the empirical formula of MSG?

9. Ritalin is a mild central nervous system stimulant that is prescribed to treat attention deficit disorders and narcolepsy (an uncontrollable desire to sleep). Its chemical name is methylphenidate hydrochloride, and its empirical formula is C14H20ClNO2C14H20ClNO2. If you sent a sample of this compound to a commercial laboratory for elemental analysis, what results would you expect for the mass percentages of carbon, hydrogen, and nitrogen?

10. Fructose, a sugar found in fruit, contains only carbon, oxygen, and hydrogen. It is used in ice cream to prevent a sandy texture. Complete combustion of 32.4 mg of fructose in oxygen produced 47.6 mg of CO2CO2 and 19.4 mg of H2OH2O. What is the empirical formula of fructose?

11. Coniine, the primary toxin in hemlock, contains only carbon, nitrogen, and hydrogen. When ingested, it causes paralysis and eventual death. Complete combustion of 28.7 mg of coniine produced 79.4 mg of CO2CO2 and 34.4 mg of H2OH2O. What is the empirical formula of the coniine?

12. Copper and tin alloys (bronzes) with a high arsenic content were presumably used by Bronze Age metallurgists because bronze produced from arsenic-rich ores had superior casting and working properties. The compositions of some representative bronzes of this type are as follows:

|  |  |
| --- | --- |
| **Origin** | **% Composition** |
|   | ceCuceCu | AsAs |
| **Dead Sea** | 87.0 | 12.0 |
| **Central America** | 90.7 | 3.8 |

If ancient metallurgists had used the mineral As2S3As2S3 as their source of arsenic, how much As2S3As2S3would have been required to process 100 g of cuprite (Cu2OCu2O) bronzes with these compositions?

13. ♦ The phrase mad as a hatter refers to mental disorders caused by exposure to mercury(II) nitrate in the felt hat manufacturing trade during the 18th and 19th centuries. An even greater danger to humans, however, arises from alkyl derivatives of mercury.

a.  Give the empirical formula of mercury(II) nitrate.

b.  One alkyl derivative, dimethylmercury, is a highly toxic compound that can cause mercury poisoning in humans. How many molecules are contained in a 5.0 g sample of dimethylmercury?

c.  What is the percentage of mercury in the sample?

14. Magnesium carbonate, aluminum hydroxide, and sodium bicarbonate are commonly used as antacids. Give the empirical formulas and determine the molar masses of these compounds. Based on their formulas, suggest another compound that might be an effective antacid.

15. ♦ Nickel(II) acetate, lead(II) phosphate, zinc nitrate, and beryllium oxide have all been reported to induce cancers in experimental animals.

a.  Give the empirical formulas for these compounds.

b.  Calculate their formula masses.

c.  Based on the location of cadmium in the periodic table, would you predict that cadmium chloride might also induce cancer?

[https://chem.libretexts.org/Homework\_Exercises/Exercises%3A\_General\_Chemistry/Exercises%3A\_Averill\_et\_al./03.E%3A\_Ionic\_vs.\_Covalent\_Bonding\_(Exercises)](https://chem.libretexts.org/Homework_Exercises/Exercises%3A_General_Chemistry/Exercises%3A_Averill_et_al./03.E%3A_Ionic_vs._Covalent_Bonding_%28Exercises%29)

**ATIVIDADE**

1. De que forma você abordaria este exercício com os estudantes nas escolas que você irá trabalhar?
2. Qual é a maneira deste exercício se tornar mais fácil para os alunos?
3. Para que nível de ensino ele se aplica?
4. Qual/quais conteúdos são necessários para poder resolver estas questões?
5. Qual seria a função do professor de língua inglesa diante desta atividade interdisciplinar?
6. Quais as estratégias que você utilizaria com seus alunos para tornar a compreensão deste exercício melhor?
7. Planeje esta aula de modo a contemplar o conteúdo de química e pesquise qual conteúdo de língua inglesa poderia ajudar a compreender melhor estas questões.
8. Próxima semana você irá trazer o gabarito das questões (comente as respostas).
9. O **Plano de Aula** deve ser digitado e impresso e entregue até 27/11/2017.
10. Segunda-feira 06/11 não houve aula e dia 29/11 não estarei aqui por conta da Secitex. Teremos dias 20 a 23 a Expotec na escola (a aula será dispensada por conta do evento) e eu estarei viajando para um congresso em Alagoas. Dia 17/11 (sexta-feira) irei dar os 4 horários para compensar estes 2 dias. Favor não faltar neste dia para não prejudicarmos o conteúdo.
11. Nossa nota da 2ª Etapa será a apresentação deste exercício mais atividades escritas.