

**ALE 12. The Mole Concept**(Reference: Chapter 3 - *Silberberg 5<sup>th</sup> edition*)

**Important!!** For answers that involve a calculation you must show your work neatly using dimensional analysis with correct significant figures and units to receive full credit. No work, no credit. Report numerical answers to the correct number of significant figures. **CIRCLE ALL NUMERICAL RESPONSES.**

**Section 3.1 The Mole Concept**

1. The atomic mass of Cl is 35.45 amu and that of Al is 26.98 amu. What are the masses in grams of ...

a.) 2.0 mol of Al atoms? Circle your answer.

b.) 3.0 mol of Cl atoms? Circle your answer.

c.) 3.0 mol chlorine molecules? Circle your answer.

2. a.) Why might the expression “1.00 mol of nitrogen” be confusing?

b.) What change would remove any uncertainty?

c.) For what other elements might a similar confusion exist? Why?

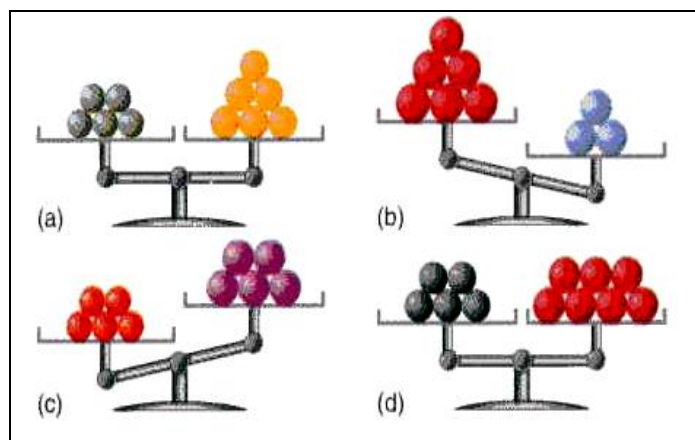
3. Each of the following balances weighs the indicated number of atoms of two elements. Which element, *left*, *right* or *neither*, has...

a.) the higher molar mass on balance “a”?

b.) more atoms per gram on balance “b”?

c.) fewer atoms per gram on balance “c”?

d.) more atoms per mole on balance “d”?



4. You need to calculate the number of  $P_4$  molecules that can form from 2.5g of  $Ca_3(PO_4)_2$ . Explain how you would proceed, that is, write a solution “plan” without doing any calculations.
5. Calculate the **molar mass** of each of the following to two decimal places.
- a.) Dinitrogen tetroxide Circle your answer.
- b.) Calcium acetate Circle your answer.
6. Calculate each of the following quantities:
- a.) The number of moles of chlorine atoms in 0.0425 g of  $C_2H_4Cl_2$ . Circle your answer.
- b.) The total number of ions in 38.1 g calcium fluoride,  $CaF_2$ . Circle your answer.

c.) Mass in grams of 3.52 mol of chromium (III) sulfate decahydrate Circle your answer.

d.) Mass in grams of  $9.64 \times 10^{24}$  molecules of dichlorine heptaoxide Circle your answer.

e.) Number of moles and formula units in 56.2 g of lithium sulfate Circle your answer.

f.) Number of lithium ions, sulfate ions, S atoms and O atoms in the mass in the previous problem (i.e. in 56.2 g of lithium sulfate) Circle each answer.

Li<sup>+</sup> ions:

S atoms:

Oxygen atoms:

7. Calculate the mass % of iodine, I, in strontium periodate. Circle your answer.

8. Oxygen is required for metabolic combustion of foods. Calculate the number of atoms in 38.0 g of oxygen gas, the amount absorbed into the blood from the lungs at rest in 15 minutes. Circle your answer.
9. Propane,  $C_3H_8$ , is widely used in liquid form as a fuel for barbecue grills and camp stoves. For 75.3 g of propane, calculate the following:
- a.) the moles of the compound in the sample Circle your answer.
  
  
  
  
  
  
  
  
  
  
  - b.) the grams of carbon in the sample Circle your answer.
10. The effectiveness of a nitrogen fertilizer is determined mainly by the % N. Calculate the %N in each fertilizer and then rank them in terms of their effectiveness (i.e by their %N).
- a. potassium nitrate Circle your answer.
  
  
  
  
  
  
  
  
  
  
  - b. ammonium nitrate Circle your answer.
  
  
  
  
  
  
  
  
  
  
  - c. ammonium sulfate Circle your answer.
  
  
  
  
  
  
  
  
  
  
  - d. urea,  $CO(NH_2)_2$  Circle your answer.

Ranking by % N: \_\_\_\_\_

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