Atomic mass conversions

These are great test questions. Try them for practice

1. How many grams of each of the constituent elements are contained in one mole (one gram-formula weight) of the following compounds: (a) CH_4, (b) Fe_2O_3, (c) Ca_3P_2?

2. How many atoms of each element are contained in the same amount of compound? (a) CH_4, (b) Fe_2O_3, (c) Ca_3P_2?

3. Calculate the number of grams in a mole (or gram-formula weight) of each of the following common substances: (a) calcite $CaCO_3$, (b) quartz SiO_2, (c) cane sugar $C_{12}H_{22}O_{10}$, (d) gypsum $CaSO_4 \bullet 2\ H_2O$ (e) white lead $Pb(OH)_2 \bullet 2\ PbCO_3$.

4. How many pounds are in a pound-mole (or pound-formula weight) of each of the following ores: (a) galena PbS, (b) smithsonite $ZnCO_3$, (c) malachite $CuCO_3 \bullet Cu(OH)_2$?

5. What is the average weight, in grams, of (a) one hydrogen atom, (b) one oxygen atom, (c) one uranium atom?

6. What is the weight of one molecule, in grams, of (a) CH_3OH, (b) $C_{60}H_{122}$ (c) $C_{1200}H_{2000}O_{1000}$?

7. How many atoms of the element are contained in (a) 32.7 g Zn (b) 7.09 g Cl (c)95.4 g Cu. (d) 4.21 g Fe, (e) 0.378 g S?

8. How many moles are represented by: (a)24.5 g H_2SO4, (b) 4.00 g O_2?

9. (a) How many atoms of Ba and of Cl are contained in 107.0 g of $Ba(ClO_3)_2 \bullet H_2O$? (b) How many molecules of water of hydration are in this same amount?

10. How many atoms of Fe and of S are contained in (a) 1 g of FeS_2 (pyrite), (b) 1 kg of FeS_2? (c) How many grams of S are contained in exactly 1 kg of FeS_2?

Atomic mass conversions-Answer Key

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1. Σ molar mass of atoms(a) 16.04 g/moles (b) 159.69 g/moles (c) 182.18 g/moles

2. Σ molar mass of atoms x N_A (a) 9.66×10^{24} CH_4 molecules (b) 9.62×10^{25} Fe_2O_3 formulae (c) 1.10×10^{26} Ca_3P_2 formulae

3. Σ molar mass of atoms (a) 100.09 g/moles (calcite) $CaCO_3$, (b) 60.08 g/moles (quartz)SiO_2, (c) 326.30 g/moles (cane sugar) $C_{12}H_{22}O_{10}$, (d) 172.17 g/moles (gypsum) $CaSO_4 \bullet 2\ H_2O$ (e) 775.63 g/moles (white lead) $Pb(OH)_2 \bullet 2\ PbCO_3$.

4. Molar mass ÷ lbs/g (a) 239.27 g/moles, 0.528 moles galena PbS, (b) 125.40 g/moles , 0.276 moles smithsonite $ZnCO_3$ (c) 594.10g/mol, 1.31 moles malachite $CuCO_3 \bullet Cu(OH)_2$

5. Molar mass x g/amu(a) 1.68×10^{-24} g/ hydrogen atom, (b) $2.673.97 \times 10^{-23}$ g/oxygen atom, (c) 3.97×10^{-22} g/ uranium atom

6. Molar mass x g/amu (a)32.04 amu, 5.341×10^{-23} g/CH_3OH, (b) 843.61 amu, 1.4063×10^{-21} g/$C_{60}H_{122}$ (c) 32,428.04 amu, $5.405\ 754 \times 10^{-20}$ g/ $C_{1200}H_{2000}O_{1000}$?

7. Mass ÷ molar mass x N_A (a) 3.011×10^{23} Zn atoms (b) 1.02×10^{23} Cl atoms (c) 9.04×10^{23} Cu#(d) 4.54×10^{23} Fe atoms(e) 7.10×10^{21} atoms S

8. Mass ÷ molar mass (a)0.250 moles H_2SO4, (b) 0.13 moles O_2

9. Mass molar mass x N_A x ratio atoms to compound. 0.3321 moles $Ba(ClO_3)_2 \bullet H_2O$(a) 2.000×10^{23} Ba ions, 3.999×10^{23} Cl atoms (b) 2.000×10^{23} water molecules

10. (a) 5.03×10^{21} Fe in 1.00 g of FeS_2 (pyrite),1.01×10^{23} S atoms in 1.00 g of FeS_2 (pyrite), (b) 5.03×10^{24} Fe in 1.00 kg of FeS_2 (pyrite),1.01×10^{24} S atoms in 1.00 kg of FeS_2 (pyrite), (c) 534 g S in 1 kg of FeS_2?