Avogadro's Number and the Mole

The mathematical relationships derived from the mole concept are:

a) number of moles (n) = $\frac{\text{number of particles (atoms or molecules)(p)}}{\text{number of particles in one mole (Avogadro's Number)}(N_A)}$

or $n = \frac{p}{N_A}$

b) number of moles, $n = \frac{\text{mass of the substance (m) in g}}{\text{molar mass (M) in g mol}^{-1}} = \frac{m}{M}$

1. How many atoms are present in:
a) 3.3 mol of Kr (b) 2.25 mol of W (c) 1.41 mol of Ho (d) 1.23 mol of Ir

2. How many moles are there in:
a) 2.75×10^{21} atoms of Kr (b) 2.95×10^{24} atoms of Zr (c) 7.92×10^{22} atoms of Fr

3. How many moles are there in:
a) 8.72×10^{17} molecules of CO (b) 1.22×10^{22} molecules of KCN
c) 8.72×10^{17} molecules of SO_3 (d) 3.93×10^{18} molecules of H_3PO_4

4. What is the number of carbon atoms in 3 moles of sucrose molecules, $C_{12}H_{22}O_{11}$?

5. What is the mass of each of the following:
a) 1.55 moles $CuCl_2$ (b) 0.522 mol NaClO (c) 6.55 mol $KClO_3$ (d) 0.225 mol $NiCl_2.6H_2O$

6. What is the number of molecules in each of the following:
a) 40.2 g $CaSO_4$ (b) 0.111g C_2H_5OH (c) 7.14 g Al_2S_3 (d) 54.54 g $H_2C_2O_4$

7. What is the mass of:
a) 3.33×10^{18} molecules of CH_4 (b) 7.85×10^{26} molecules of $Ca(HCO_3)_2$
d) 5.57×10^{27} molecules of Sb_2S_3 (d) 1.10×10^{20} molecules of $AuCl_3$

8. The number of moles of oxygen atoms present in each of the following is:
a) 7.0 g $CO_{(s)}$ molecules (b) 14.2 g $H_2C_2O_{4\,(aq)}$ (c) 156.0 g $NH_4NO_{3(s)}$
d) 392 g $H_2SO_{4(aq)}$ (e) 3.42 g $C_{12}H_{22}O_{11(s)}$ (f) 1.25 g $HMnO_{4(aq)}$

9. Name all the chemicals in question in questions 5 – 8.

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