SCH 3U - Avogadro's Constant Problem Set

Helpful hint:

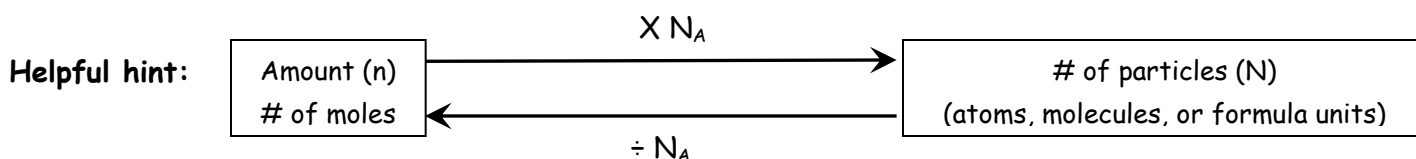| Amount (n) # of moles	$X\ N_A$ $\longrightarrow$ $\longleftarrow$ $\div N_A$	# of particles (N) (atoms, molecules, or formula units)
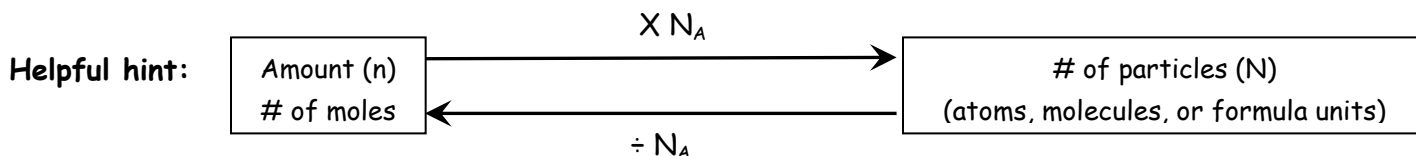
1. A small pin contains 0.0178 mol of iron. How many atoms of iron are in the pin?
2. A sample contains 0.02 mol of gold. How many atoms of gold are in the sample?
3. A sample of Al_2O_3 contains 7.71×10^{24} formula units. How many moles of aluminum oxide are there?
4. How many formula units are contained in 0.21 mol of magnesium nitrate?
5. A vat of cleaning solution contains 8.03×10^{26} molecules of ammonia (NH_3). How many moles of ammonia are in the vat?
6. A litre of water contains 55.6 mol of water. How many molecules of water are in the sample?
7. A typical bottle of nail polish remover contains 2.5 mol of ethyl acetate ($C_4H_8O_2$).
    a. How many molecules of ethyl acetate are in the bottle?
    b. How many atoms are in the bottle?
    c. How many carbon atoms are in the bottle?
8. Consider a 0.829 mol sample of sodium sulfate (Na_2SO_4).
    a. How many formula units are in the sample?
    b. How many sodium ions are in the sample?
9. A sample of cyanic acid HCN, contains 1.11×10^{22} molecules. How many moles of cyanic acid are in the sample?
10. CHALLENGE QUESTION: A sample of pure acetic acid, CH_3COOH, contains 1.40×10^{23} carbon atoms.
    a. How many molecules of acetic acid are there? Hint: think about how many carbon atoms are in each molecule.
    b. How many moles of acetic acid are there?

ANSWERS:
1. 1.07×10^{22} atoms   2. 1×10^{22} atoms   3. 12.8 mol   4. 1.3×10^{23} formula units   5. 1.33×10^3 mol
6. 3.35×10^{25} molecules 7. a) 1.5×10^{24} molecules b) 2.1×10^{25} atoms   c) 6.0×10^{24} C atoms
8.a) 4.99×10^{23} formula units   b) 9.98×10^{23} Na^+ ions 9. 0.0184 mol   10.a) N = 7.00×10^{22} molecules   b) 0.116 mol

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