

Name: _____ Section: _____

Challenging Mole Conversions (High School/College "Stuff")

Directions: The following questions were taken from the website <http://faculty.vansd.org/14544/chemistry/chemworksheets/index.html>. Do your best to apply your understanding of dimensional analysis and moles to answer the questions on a separate sheet of paper. The answers have also been provided below, therefore you can check as you go. These are "pretty much" the same thing that we have been doing in class; however, some questions require additional steps - just think about it and you will be able to figure it out. **GOOD LUCK!**

1. Aspartame is an artificial sweetener that is 160 times sweeter than sucrose (table sugar) when dissolved in water. It is marketed as Nutra-Sweet. The molecular formula for aspartame is $C_{14}H_{18}N_2O_5$.

- Calculate the molar mass of aspartame.
- How many moles of molecules are present in 10.0 g of aspartame?
- Calculate the mass in grams of 1.56 mol of aspartame.
- How many molecules are in 5.0 mg of aspartame?
- How many atoms of nitrogen are in 1.2 g of aspartame?
- What is the mass in grams of 1.0×10^9 molecules of aspartame?
- What is the mass in grams of one molecule of aspartame?

2. Dimethylnitrosamine, $(CH_3)_2N_2O$ is a carcinogenic (cancer causing) substance that may be formed in foods, beverages or gastric juices from the reaction of nitrite ion (used as a food preservative) with other substances.

- What is the molar mass of dimethylnitrosamine?
- How many moles of $(CH_3)_2N_2O$ molecules are present in 250 mg of dimethylnitrosamine?
- What is the mass of 0.050 mole of dimethylnitrosamine?
- How many atoms of hydrogen are in 1.0 mole of dimethylnitrosamine?
- What is the mass of 1.0×10^6 molecules of dimethylnitrosamine?
- What is the mass, in grams, of one molecule of dimethylnitrosamine?

Answers:

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| 1a) 294.34 g/mol | 1b) 3.40×10^{-2} mol $C_{14}H_{18}N_2O_5$ | 1c) 4.59×10^2 g $C_{14}H_{18}N_2O_5$ | 1d) 1.0×10^{19} molecules $C_{14}H_{18}N_2O_5$ |
| 1e) 4.9×10^{21} atoms N | 1f) 4.9×10^{-13} g $C_{14}H_{18}N_2O_5$ | 1g) 4.9×10^{-22} g $C_{14}H_{18}N_2O_5$ | |
| 2a) 74.10 g/mol | 2b) 3.4×10^{-3} mole $C_2H_6N_2O$ | 2c) 3.7 g $C_2H_6N_2O$ | 2d) 3.6×10^{24} atoms H |
| 2e) 1.2×10^{-16} g $C_2H_6N_2O$ | 2f) 1×10^{-22} g $C_2H_6N_2O$ /1 molecule | | |