Chemistry 115 Name

Dr. Cary Willard

Quiz 5A (20 points) March 10, 2009

All work must be shown to receive credit. Avogadro’s number 6.022 x 1023/mol

1. (3 points) Calculate the molar mass of caffeine, (C8H10N4O2)

$$8\left(C\right)+10\left(H\right)+4\left(N\right) + 2\left(O\right)$$

$$=8\left(12.01\right)+10\left(1.008\right)+4\left(14.01\right) + 2\left(16.00\right)$$

$$=96.08+10.08+56.04 + 32.00=194.20 g/mol$$

1. (3 points) Calculate the mass of 6.32 moles of caffeine.

$$?g C\_{8}H\_{10}N\_{4}O\_{2}=6.32 mol C\_{8}H\_{10}N\_{4}O\_{2}×\frac{194.2 g C\_{8}H\_{10}N\_{4}O\_{2}}{1 mol C\_{8}H\_{10}N\_{4}O\_{2}}=1230 g C\_{8}H\_{10}N\_{4}O\_{2}$$

1. (3 points) Calculate the number of moles of carbon in 5.29 moles of caffeine.

$$?mol C=5.29 mol C\_{8}H\_{10}N\_{4}O\_{2}×\frac{8 mol C}{1 mol C\_{8}H\_{10}N\_{4}O\_{2}}=42.3 mol C$$

1. (3 points) Calculate the number of atoms of carbon in 3.50 mol of caffeine.

$$?atom C=3.50 mol C\_{8}H\_{10}N\_{4}O\_{2}×\frac{8 mol C}{1 mol C\_{8}H\_{10}N\_{4}O\_{2}}×\frac{6.022×10^{23}atom C}{1 mol C}$$

$$=1.68×10^{25}atom C$$

1. (3 points) Calculate the mass of 7.38 x 1018 molecules of caffeine.

$$?g C\_{8}H\_{10}N\_{4}O\_{2}$$

$$=7.38×10^{18} molec C\_{8}H\_{10}N\_{4}O\_{2}×\frac{1 mol C\_{8}H\_{10}N\_{4}O\_{2}}{6.022×10^{23}molec C\_{8}H\_{10}N\_{4}O\_{2} }×\frac{194.2 g C\_{8}H\_{10}N\_{4}O\_{2}}{1 mol C\_{8}H\_{10}N\_{4}O\_{2}}$$

$$=2.38×10^{-3}g C\_{8}H\_{10}N\_{4}O\_{2}$$

1. (5 points) Determine the empirical formula of a compound that is composed of 69.9% iron and 30.1% oxygen.

$$69.9 g Fe×\frac{1 mol Fe}{55.85 g Fe}=1.25 mol Fe$$

$$30.1 g O×\frac{1 mol O}{16.00 g O}=1.88 mol O$$

$$Fe\_{\frac{1.25}{1.25}}O\_{\frac{1.88}{1.25}}=Fe\_{1}O\_{1.50}=Fe\_{2}O\_{3}$$

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Quiz 5B (20 points) March 10, 2009

All work must be shown to receive credit. Avogadro’s number 6.022 x 1023/mol

1. (3 points) Calculate the molar mass of caffeine, (C8H10N4O2)

$$8\left(C\right)+10\left(H\right)+4\left(N\right) + 2\left(O\right)$$

$$=8\left(12.01\right)+10\left(1.008\right)+4\left(14.01\right) + 2\left(16.00\right)$$

$$=96.08+10.08+56.04 + 32.00=194.20 g/mol$$

1. (3 points) Calculate the mass of 5.77 moles of caffeine.

$$?g C\_{8}H\_{10}N\_{4}O\_{2}=5.77 mol C\_{8}H\_{10}N\_{4}O\_{2}×\frac{194.2 g C\_{8}H\_{10}N\_{4}O\_{2}}{1 mol C\_{8}H\_{10}N\_{4}O\_{2}}=1120 g C\_{8}H\_{10}N\_{4}O\_{2}$$

1. (3 points) Calculate the number of moles of carbon in 9.17 moles of caffeine.

$$?mol C=9.17 mol C\_{8}H\_{10}N\_{4}O\_{2}×\frac{8 mol C}{1 mol C\_{8}H\_{10}N\_{4}O\_{2}}=73.4 mol C$$

1. (3 points) Calculate the number of atoms of carbon in 5.30 mol of caffeine.

$$?atom C=5.30 mol C\_{8}H\_{10}N\_{4}O\_{2}×\frac{8 mol C}{1 mol C\_{8}H\_{10}N\_{4}O\_{2}}×\frac{6.022×10^{23}atom C}{1 mol C}$$

$$=2.55×10^{25}atom C$$

1. (3 points) Calculate the mass of 8.47 x 1018 molecules of caffeine.

$$?g C\_{8}H\_{10}N\_{4}O\_{2}$$

$$=8.47×10^{18} molec C\_{8}H\_{10}N\_{4}O\_{2}×\frac{1 mol C\_{8}H\_{10}N\_{4}O\_{2}}{6.022×10^{23}molec C\_{8}H\_{10}N\_{4}O\_{2} }×\frac{194.2 g C\_{8}H\_{10}N\_{4}O\_{2}}{1 mol C\_{8}H\_{10}N\_{4}O\_{2}}$$

$$=2.73×10^{-3}g C\_{8}H\_{10}N\_{4}O\_{2}$$

1. (5 points) Determine the empirical formula of a compound that is composed of 72.4% iron and 27.6% oxygen.

$$72.4 g Fe×\frac{1 mol Fe}{55.85 g Fe}=1.30 mol Fe$$

$$27.6 g O×\frac{1 mol O}{16.00 g O}=1.73 mol O$$

$$Fe\_{\frac{1.30}{1.30}}O\_{\frac{1.73}{1.30}}=Fe\_{1}O\_{1.33}=Fe\_{3}O\_{4}$$