

Quiz 10/15/10

Wine usually contains 80 to 150 ppm SO_2 (1 ppm = 1 part per million = 1 gram of SO_2 per 1 million grams of wine). The U.S. produced 440 million gal of wine in 1987. Assuming the density of wine is 1.00 g/cm^3 , and that the wine contains 100. ppm of SO_2 , how many grams, moles and molecules of SO_2 were contained in this wine? (1 quart ~ 1 liter)

$$1) (440 \times 10^6 \text{ gal}) \left(\frac{4 \text{ qt}}{1 \text{ gal}} \right) \left(\frac{1 \text{ L}}{1 \text{ qt}} \right) \left(\frac{1 \times 10^3 \text{ cm}^3}{1 \text{ L}} \right)$$

$$\left(\frac{1.00 \text{ g wine}}{1 \text{ cm}^3} \right) \left(\frac{100. \text{ g } \text{SO}_2}{1 \times 10^6 \text{ g wine}} \right) = \boxed{1.76 \times 10^8 \text{ g } \text{SO}_2}$$

$$2) (1.76 \times 10^8 \text{ g } \text{SO}_2) \left(\frac{1 \text{ mole } \text{SO}_2}{64.06 \text{ g } \text{SO}_2} \right) = \boxed{2.75 \times 10^6 \text{ mol } \text{SO}_2}$$

$$3) (2.75 \times 10^6 \text{ mol } \text{SO}_2) \left(\frac{6.022 \times 10^{23} \text{ atoms}}{\text{mol}} \right) = \boxed{1.65 \times 10^{30} \text{ molecules } \text{SO}_2}$$