

How many sig figs would be in the answer to:

$$(6.25)/(74.113)$$

$$(1.45)(0.08431)(6.022 \times 10^{23})$$

$$97.381 + 4.2502 + 0.99195$$

$$171.5 + 72.915 - 8.23$$

Try the following:

1) If a tungsten atom has a diameter of about 280 picometers, how many centimeters would a line of 5×10^9 tungsten atoms cover? $1 \text{ pm} = 1 \times 10^{-12} \text{ m}$

2a) The radius of smaller atoms is on the order of 0.1 nanometers ($1 \text{ nm} = 1 \times 10^{-9} \text{ m}$). Express this in centimeters and in inches ($1 \text{ in} = 2.54 \text{ cm}$ exactly).

2b) What is the volume of this atom in cm^3 ? Volume of a sphere = $(4/3)\pi r^3$.

3) If the area of the US is about 9826630 km^2 , what is the area in square meters (m^2)? Round your answer to 2 sig figs.

4) A soda can holds about 0.355 L. How many soda cans could the Earth's oceans fill if the volume of salt water in the oceans is about $1.3 \times 10^9 \text{ km}^3$? $1 \text{ m}^3 = 1000 \text{ L}$

5) If a chocolate chip cookie is 40% chocolate by mass and 1 cookie has a mass of 25 grams, how many cookies would you have to eat in order to have consumed 500 g of chocolate?

6) The density of ethanol is 0.785 g/mL. What is the mass of 105 mL of ethanol?

7) If a wine is 12% ethanol by volume, how many grams of ethanol are in 150 mL of wine?

How many sig figs would be in the answer to:

$$(6.25)/(74.113) = \mathbf{463} \text{ (3sf)} \qquad (1.45)(0.08431)(6.022 \times 10^{23}) = \mathbf{4.94 \times 10^{24}} \text{ (3sf)}$$

$$97.381 + 4.2502 + 0.99195 = \mathbf{102.623} \text{ (6sf)} \qquad 171.5 + 72.915 - 8.23 = \mathbf{236.2} \text{ (4sf)}$$

Try the following:

- 1) If a tungsten atom has a diameter of about 280 picometers, how many centimeters would a line of 5×10^9 tungsten atoms cover? $1 \text{ pm} = 1 \times 10^{-12} \text{ m}$

$$5 \times 10^9 \text{ atoms} \times \frac{280 \text{ pm}}{1 \text{ atom}} \times \frac{1 \times 10^{-12} \text{ m}}{1 \text{ pm}} \times \frac{1 \text{ cm}}{1 \times 10^{-2} \text{ m}} = 140 \text{ cm} = 100 \text{ cm}$$

- 2a) The radius of smaller atoms is on the order of 0.1 nanometers ($1 \text{ nm} = 1 \times 10^{-9} \text{ m}$). Express this in centimeters and in inches ($1 \text{ in} = 2.54 \text{ cm}$ exactly).

$$0.1 \text{ nm} \times \frac{1 \times 10^{-9} \text{ m}}{1 \text{ nm}} \times \frac{1 \text{ cm}}{1 \times 10^{-2} \text{ m}} = 1 \times 10^{-8} \text{ cm} \qquad 1 \times 10^{-8} \text{ cm} \times \frac{1 \text{ in}}{2.54 \text{ cm}} = 4 \times 10^{-9} \text{ in}$$

- 2b) What is the volume of this atom in cm^3 ? Volume of a sphere = $(4/3)\pi r^3$, where r = radius.

$$Volume = V = \frac{4}{3} \pi (1 \times 10^{-8} \text{ cm})^3 = \frac{4}{3} \pi (1 \times 10^{-8} \text{ cm})(1 \times 10^{-8} \text{ cm})(1 \times 10^{-8} \text{ cm}) = 4 \times 10^{-24} \text{ cm}^3$$

- 3) If the area of the US is about 9826630 km^2 , what is the area in square meters (m^2)? Round your answer to 2 sig figs.

$$9826630 \text{ km}^2 \times \left(\frac{1 \times 10^3 \text{ m}}{1 \text{ km}} \right)^2 = 9.8 \times 10^{12} \text{ m}^2$$

- 4) A soda can holds about 0.355 L. How many soda cans could the Earth's oceans fill if the volume of salt water in the oceans is about $1.3 \times 10^9 \text{ km}^3$? $1 \text{ m}^3 = 1000 \text{ L}$

$$1.3 \times 10^9 \text{ km}^3 \times \left(\frac{1 \times 10^3 \text{ m}}{1 \text{ km}} \right)^3 \times \frac{1000 \text{ L}}{1 \text{ m}^3} \times \frac{1 \text{ can}}{0.355 \text{ L}} = 3.7 \times 10^{21} \text{ cans} \quad \text{-- sorry!}$$

- 5) If a chocolate chip cookie is 40% chocolate by mass and 1 cookie has a mass of 25 grams, how many cookies would you have to eat in order to have consumed 500 g of chocolate?

$$500 \text{ g chocolate} \times \frac{100 \text{ g cookies}}{40 \text{ g chocolate}} \times \frac{1 \text{ cookie}}{25 \text{ g cookie}} = 50 \text{ cookies}$$

- 6a) The density of ethanol is 0.785 g/mL. What is the mass of 105 mL of ethanol?

$$105 \text{ mL ethanol} \times \frac{0.785 \text{ g ethanol}}{1 \text{ mL ethanol}} = 82.4 \text{ g ethanol}$$

- 6b) If a wine is 12% ethanol by volume, how many grams of ethanol are in 150 mL of wine?

$$150 \text{ mL wine} \times \frac{12 \text{ mL ethanol}}{100 \text{ mL wine}} \times \frac{0.785 \text{ g ethanol}}{1 \text{ mL wine}} = 14 \text{ g ethanol} \quad \text{-- sorry!}$$