

## Answers to Exercise 1.1 Using Appropriate Units

1. *For these questions, there may be more than one reasonable answer. As long as your sentences make sense (and the unit conversion is done correctly), they're fine.*

(a) My grandmother is 720 months old.

My grandmother is 60 years old. *sounds better (12 months = 1 year)*

(b) My brother is 1 meter tall. *no need to convert to a "better" unit*

(c) The temperature was only 270 K so I had to wear a sweater.

The temperature was only -3°C so I had to wear a sweater. *sounds better  
(0 °C = 273.15 K)*

(d) The density of water is 1000 g/L. *or 1000 mg/mL*

The density of water is 1 g/mL (or 1 kg/L). *sounds better (1000 mL = 1 L; 1000 g = 1 kg)*

2.

(a) hair, dust, many vitamins, many medicines, etc.

(b) book, beaker, piece of fruit, serving of pasta, etc.

(c) person, dog, cat, bag of kitty litter (or salt for water softener), piece of furniture, etc.

3.

(a)  $0.529 \text{ \AA} \times \frac{1 \text{ m}}{10^{10} \text{ \AA}} = 5.29 \times 10^{-11} \text{ m}$

(b)  $0.529 \text{ \AA} \times \frac{1 \text{ m}}{10^{10} \text{ \AA}} \times \frac{10^{12} \text{ pm}}{1 \text{ m}} = 5.29 \times 10^1 \text{ pm} = 52.9 \text{ pm}$

(c)  $0.529 \text{ \AA} \times \frac{1 \text{ m}}{10^{10} \text{ \AA}} \times \frac{10^9 \text{ nm}}{1 \text{ m}} = 5.29 \times 10^{-2} \text{ nm} = 0.0529 \text{ nm}$

*Older sources will report atomic radii and related distances in Ångströms (Å).*

*Modern literature should report them in picometers (pm).*

4.  $100 \text{ nm}^3 \times \frac{10^9 \text{ pm}^3}{1 \text{ nm}^3} = 10^{11} \text{ pm}^3$

*When converting squared/cubed units with SI prefixes, remember that the prefix is applied to all two/three dimensions so you have to do the conversion in each dimension:*

$$1 \text{ nm} = 1\,000 \text{ pm}$$

therefore  $(1 \text{ nm})^3 = (1\,000 \text{ pm})^3$  *or*  $(1 \text{ nm})^3 = (10^3 \text{ pm})^3$

therefore  $1 \text{ nm}^3 = 1\,000\,000\,000 \text{ pm}^3$  *or*  $1 \text{ nm}^3 = 10^9 \text{ pm}^3$