

Quiz 1 - Units, Measurements and Density

KEY

- 1) Land area is often measured in hectares in the metric system (1 hectare (ha) = 10,000 m²). In the English system land area is often measured in acres (1 acre = 160 rod²). Using the following equalities, answer the following questions:

$$1 \text{ km} = 10^3 \text{ m} \Rightarrow 1 \text{ km}^2 = 10^6 \text{ m}^2$$

$$5.5 \text{ yards} = 1 \text{ rod}$$

$$40 \text{ rods} = 1 \text{ furlong}$$

$$8 \text{ furlongs} = 1 \text{ mile}$$

$$1 \text{ mile} = 1.6093 \text{ km}$$

$$30.25 \text{ yds}^2 = 1 \text{ rod}^2$$

$$1600 \text{ rods}^2 = 1 \text{ furlong}^2$$

$$64 \text{ furlongs}^2 = 1 \text{ mile}^2$$

$$1 \text{ mile}^2 = 2.5898 \text{ km}^2$$

- a) How many km² is 1 ha?

$$1 \text{ ha} \times \frac{10000 \text{ m}^2}{\text{ha}} \times \frac{1 \text{ km}^2}{10^6 \text{ m}^2} = 0.01 \text{ km}^2$$

- b) How many how many hectares are in 5.5 acres?

$$5.5 \text{ acre} \times \frac{160 \text{ rod}^2}{\text{acre}} \times \frac{1 \text{ furlong}^2}{1600 \text{ rod}^2} \times \frac{1 \text{ mile}^2}{64 \text{ furlong}^2} \times \frac{2.5898 \text{ km}^2}{1 \text{ mile}^2} \times \frac{10^6 \text{ m}^2}{1 \text{ km}^2} \times \frac{1 \text{ ha}}{10000 \text{ m}^2} = 2.2 \text{ ha}$$

- c) If a lot that costs \$6500 is 120 ft by 75 ft, what is the price per acre?

$$\frac{\$6500}{1.0 \times 10^3 \text{ ft}} \times \frac{9 \text{ ft}^2}{\text{yd}^2} \times \frac{30.25 \text{ yds}^2}{\text{rod}^2} \times \frac{160 \text{ rod}^2}{\text{acre}} = \$31,460/\text{acre} \Rightarrow \$31,000/\text{acre}$$

↑ YOU'LL PAY THIS ↑ NOT THIS

- 2) A piece of osmium (a very dense metal) has a density of 22.57g/cm³. How much would a 9.68 g sample of osmium weigh if it is submersed in a sample of mercury, which has a density of 13.53 g/cm³?

$$9.68 \text{ g} \times \frac{\text{cm}^3}{22.57 \text{ g}} = 0.429 \text{ cm}^3$$

← VOLUME OF MERCURY DISPLACED. MASS WILL BE LOWERED BY THE MASS OF Hg DISPLACED

$$0.429 \text{ cm}^3 \times \frac{13.53 \text{ g}}{\text{cm}^3} = 5.80 \text{ g}$$

$$9.68 \text{ g} - 5.80 \text{ g} = 3.88 \text{ g}$$

- 3) You can only find a fahrenheit thermometer to use for an experiment. You measure 96.1 ± 0.2 °F. What is the temperature in °C? What is the uncertainty (hint a temperature change of 5°C is the same as 9°F)?

FIRST

$$96.1 \text{ °F} \Rightarrow \text{°C} = \frac{(96.1 - 32)}{1.8} = 35.6 \text{ °C}$$

THEN

$$\pm 0.2 \text{ °F} \times \frac{5 \text{ °C}}{9 \text{ °F}} = \pm 0.1 \text{ °C}$$

$$\underline{\text{SO}} \quad 35.6 \pm 0.1 \text{ °C}$$