# Example Questions for Quiz 1 - Solutions

**Here are some questions that are similar to what will be on Quiz 1. I can guarantee that questions modeled after the graph question and the earth density question will be on the quiz. Ones similar to some of the lower-point questions will be used to make the points total to 20 points. Partial credit will be given.**

1. (2 points) What is the volume of a block of wood that is 5 cm x 10 cm x 20 cm?

$$V = l \cdot w \cdot h = (20\,\text{cm}) \cdot (5\,\text{cm}) \cdot (10\,\text{cm}) = 1000\,\text{cm}^3 = 0.00100\,\text{m}^3$$

2. (2 points) You are given a cube with 5-cm long sides that has a mass of 1418 g. Assume the cube is uniform and made of one material. Calculate its density **and** use the table of densities in your Equation Sheet to determine the material.

$$\rho = \frac{1418\,\text{g}}{(5\,\text{cm}) \cdot (5\,\text{cm}) \cdot (5\,\text{cm})} = 11.34\,\text{g/cm}^3 \qquad \textbf{Material = Lead}$$

3. (2 points) What is the mass of a 120 $cm^3$ chunk of depleted uranium (density=19.1 $g/cm^3$)?

$$\rho = \frac{m}{V} \quad \text{so} \quad m = \rho V = (19.1\,\text{g/cm}^3) \cdot (120\,\text{cm}^3) = 2292\,\text{g} = 2.292\,\text{kg} \approx 2.29\,\text{kg}$$

4. (2 points) There are two cubes of gold, but one has sides that are 3 times as large as the other. The smaller is worth $37. What would the larger one cost if it is valued at the same price per gram?

**The volume of a cube is proportional the cube of its sides.**
**So if a side is 3 times longer, the volume is $3^3 = 27$ times larger.**
**The cost should therefore be 27 times higher $= 27 \cdot \$37 = \$999$ .**

6. (2 points) Draw lines that connect the following quantities with the matching formula:
(**Instead of drawing lines, the answers are placed on the correct line.**)

| | |
|---|---|
| *a* is directly proportional to *b* | $a \propto b$ |
| *a* is inversely proportional to *b* | $a \propto 1/b$ |
| *a* is directly proportional to the square of *b* | $a \propto b^2$ |
| *a* is inversely square proportional to the square of *b* | $a \propto 1/b^2$ |

6. (2 points) Evaluate the following expression:

$$\frac{\frac{1}{5} \cdot \frac{3}{4}}{\frac{2}{3}} = \frac{1}{5} \cdot \frac{3}{4} \cdot \frac{3}{2} = \frac{9}{40}$$

7. (2 points) Given the equation $V = I \cdot R$ , write an expression for *I* in terms of *V* and *R*, and also write an expression for *R* in terms of *V* and *I*:

$$\frac{V}{R} = \frac{I \cdot R}{R} = I \quad \text{so} \quad I = \frac{V}{R} \qquad\qquad \frac{V}{I} = \frac{I \cdot R}{I} \quad \text{so} \quad R = \frac{V}{I}$$

8. (5 points) Calculate the average density of the earth using the following formula with the earth mass being $m = 5.97 \times 10^{24}\,\text{kg}$ and the earth mean radius being $r = 6.38 \times 10^{6}\,\text{m}$ :

$$\rho = \frac{m}{V} = \frac{m}{\frac{4}{3}\pi r^3} = \frac{5.97 \times 10^{24}\,\text{kg}}{\frac{4}{3}\pi (6.38 \times 10^{6}\,\text{m})^3} = 5488\,\text{kg/m}^3$$

9. (2 points) What is the SI unit for mass? **kilogram, kg (NOT gram, g)**

10. (2 points) What is the SI unit for time? **second, s**

11. (2 points) What is the SI unit for distance? **meter, m**

12. (4 points) Fill in the appropriate exponents in the following:

$1\,\mu\text{m} = 10^{-6}\,\text{m}$ $\quad$ $1\,\text{km} = 10^{3}\,\text{m}$ $\quad$ $1\,\text{mm} = 10^{-3}\,\text{m}$ $\quad$ $1\,\text{nm} = 10^{-9}\,\text{m}$

13. (4 points) Convert the density of lead of 11.34 g/cm$^3$ to SI units of kg/m$^3$.

$$11.34\,\frac{\text{g}}{\text{cm}^3} \cdot \frac{1\,\text{kg}}{1000\,\text{g}} \cdot \left(\frac{100\,\text{cm}}{1\,\text{m}}\right)^3 = 11.34 \times 10^3\,\frac{\text{kg}}{\text{m}^3} = 11340\,\frac{\text{kg}}{\text{m}^3}$$

14. (5 points) Using the coordinate system below, plot the points (-1,5), (2,2), (3,1) and see that they form a straight line. Draw suitable axes with scale numbers. Also, determine the slope *m* and y-intercept *b* of that line.

Slope: $m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$

$$m = \frac{5-1}{-1-3} = \frac{4}{-4} = -1$$

**or** $\frac{5-2}{-1-2} = -1$ **or** $\frac{1-2}{3-2} = -1$

**or ..., all giving *m* = –1**

y-Intercept: $b = 4$

**obtained from the graph or from *y=mx + b* with m and any one point.**

**For example:**
**Using point (–1,5) and m = –1 ,**
***y* = *m x* + *b* becomes**
**5 = –1 (–1) + *b* so *b* = 5 – 1 = 4.**