

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.

(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 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.

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

(2 points) What is the mass of a 120 cm³ chunk of depleted uranium (density=19.1 g/cm³)?

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

(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 3³=27 times larger.
The cost should therefore be 27 times higher = 27 · \$37 = \$999 .

(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	$a \propto 1/b^2$

(2 points) Evaluate the following expression:

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

(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:

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

(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 $r=6.38 \times 10^6 \text{ m}$:

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

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

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

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

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

$$1 \mu\text{m} = 10^{-6} \text{ m}$$

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

$$1 \text{ mm} = 10^{-3} \text{ m}$$

$$1 \text{ nm} = 10^{-9} \text{ m}$$

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

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

(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 $m = -1$,

$y = mx + b$ becomes

$$5 = -1(-1) + b \text{ so } b = 5 - 1 = 4.$$

