Math, Chemistry and Physics

This problem is primarily a math problem. Basic pre-algebra skills are required to solve the problem.

But, to correctly solve the problem, a some basic knowledge of chemistry and physics is helpful.

THIS PROBLEM IS ABOUT VOLUME AND MASS

For this science problem, assume candles and the cake are cylinders.

Mariah is 17 years old.
Mariah has a birthday cake.

The cake is decorated with one candle for each of Mariah's birthdays.
The candles are made of carbon.
Each candle has a radius of 1 cm.
Each candle is 15 cm tall.

Mariah has one cake for her celebration.
The cake is made of Lanthium (La).
The cake's diameter is 60 cm.
The cake is 8 cm tall.

What is the combined total mass of the <u>cake</u> and <u>all candles</u>?

Hints and reminders

Draw a model (a picture) of the problem. Label it with the dimensions.

Think about the math formulas you need in order to calculate the answer.
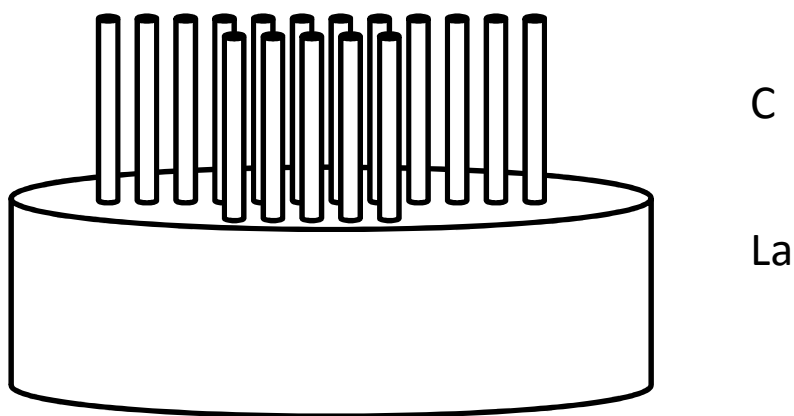Remember to keep your units of measure written along with the number values.

Note: mass per cubic centimeter is NOT the same thing as molar mass.

To calculate the volume of one candle, use the formula for a cylinder.
To calculate the volume of one cake, use the formula for a cylinder.

Oh, ... and remember the cake has more than just one candle.

C

La

Calculation	Number	Units	Description
g_1 = constant	2.27	cm³	grams per cubic centimeter (C)
g_2 = constant	6.17	cm³	grams per cubic centimeter (La)
r = given	1	cm	radius
Pi = constant	3.14	constant	pi
$A = Pi * r^2$	3.14	cm²	area of top of candle
h = given	15	cm	height of one candle
$V_1 = A * h$	47	cm³	volume of one candle
n = implied	17	number	number of candles .. one per year
$V_2 = n * (V_1)$	801	cm³	volume of 17 candles
g_1 = constant	2.27	grams/cm³	mass of carbon in one cubic cm
$m = V_2 * g1$	1,815	grams	total mass of 17 candles
r = 1/2 d (given)	30	cm	radius (1/2 of diameter)
Pi = constant	3.14	pi	pi
$A = Pi * r^2$	2,827	cm²	area of cake's top surface
h = given	8	cm	height of cake
$V_1 = A * h$	22,620	cm³	volume of cake
n = given	1	number	number of cakes
$V_2 = n * (V_1)$	22,620	cm³	volume of all cakes
g_2 = constant	6.17	grams/cm³	mass of lanthim per one cubic cm
$m = V_2 * g2$	139,562	grams	total mass of one cake
Answer (grams)	141,378	grams	total mass

Answer (grams)	141,378	grams
Answer (kg)	141	kg

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Math Worksheet 201