

The Math of Chemistry

Name: _____

<p>Density You have a 23.6 g piece of gallium with a volume of 4.0 cm³. Calculate the density of gallium.</p>	<p>Density You have a 3.6 g piece of nickel. What is the volume of your piece? (use Table S to find density)</p>	<p>Density You have 12.4 ml of bromine. What is the mass of your sample? (use Table S to find density)</p>
<p>Percent Error A student calculated the density of iron to be 7.204. What is the student's percent error? (use Table S to find density)</p>	<p>Temperature A student heats water to a temperature of 69.8 °C. How many degrees Kelvin is this?</p>	<p>Temperature A sample of gas is heated to 401K. How many degrees Celsius is this?</p>
<p>% Composition by Mass A penny has a total mass of 3.1g. Zinc makes up 2.9 g of the penny. What is the % by mass of zinc in the penny?</p>	<p>% Composition by Mass C₃H₆ has a total mass of 42 g. What is the % composition by mass of carbon in the compound?</p>	<p>Parts Per Million What is the concentration, in parts per million, of dissolved oxygen in a pond if a sample has 3.5 g of O₂ in every 147.1 g of pond water?</p>
<p>Combined Gas Law A sample of gas has a volume of 12L at 273K and 187.5 kPa. What will be the new volume when the pressure is changed to 300kPa and the temp. is changed to 375K.</p>	<p>Combined Gas Law A sample of gas at 101.3 kPa has a volume of 4.5L and a temp. of 86.2 °C. If the pressure is increased to 116 kPa and the volume is decreased to 3.5L, what will the new temp. be?</p>	<p>Combined Gas Law A sample of gas has a volume of 6L and a pressure of 1.5atm. If the pressure is increased to 2.0 atm, what will the new volume be?</p>
<p>Weighted Atomic Mass Boron has 2 natural isotopes: ¹⁰B (10.013 amu) has 19.9% abundance, and ¹¹B (11.009 amu) has 80.1% abundance. Calculate the weighted atomic mass of Boron.</p>	<p>Empirical Formula What is the empirical formula of a compound that is 40% sulfur and 60% oxygen by weight? (hint: use a 100g sample to calculate)</p>	<p>Empirical Formula A hydrocarbon has a gram formula mass of 86 g/mol. What is the molecular formula of this compound? And, what is the empirical formula?</p>

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<p><i>Titration</i> A 25 mL solution of 0.5 M NaOH is titrated until neutralized into a 50 mL sample of HCl. What is the concentration of the HCl?</p>	<p><i>Radioactive Decay</i> A sample of ^{14}C has a half life of 5730 years. How many half lives have elapsed after 14,000 years?</p>	<p><i>Radioactive Decay</i> The half life of ^{233}U is 1.62×10^5 years. How much time has elapsed after 2.5 half lives?</p>
<p><i>Heat</i> How much heat is required to melt a 45.8 g sample of ice?</p>	<p><i>Heat</i> If 42,000 J is required to vaporize a sample of water, what was the mass of the water?</p>	<p><i>Heat</i> How much heat is required to raise the temperature of 5.9 g of water from 50 °C to 80 °C?</p>
<p><i>Heat</i> If 9500 joules are added to 50g of liquid water at 20 °C, what will be the new temperature of the water?</p>	<p><i>Heat</i> How much heat will be liberated (given off) if 60g of water is cooled from 80 °C to 65 °C?</p>	<p><i>Heat</i> If a piece of hot metal is put into a 100g sample of liquid water at 25 °C, and the temperature of the water rises until it reaches 32 °C, how much heat energy did the metal lose?</p>
<p><i>Metric Conversion</i> A piece of glass tubing is 4.6m long. How many mm is this?</p> <p>Express your answer in proper scientific notation:</p>	<p><i>Metric Conversion</i> A liquid has a volume of 35.4 mL. How many liters is this?</p>	<p><i>Metric Conversion</i> A gardener buys a 2.50 kg bag of fertilizer. How many grams is this?</p>
<p><i>Metric Conversion</i> The pressure of a gas is recorded as 55,601 Pascals. How many kPa is this?</p>	<p><i>Metric Conversion</i> A chemist has 0.75 mg of mercury. How many grams is this?</p> <p>Express your answer in proper scientific notation:</p>	<p><i>Metric Conversion</i> If the density of liquid water is 1 g/cm^3, and $1 \text{ ml} = 1 \text{ cm}^3$, what is the mass of 200ml of water?</p>

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<p>Pressure Conversion A pressure of 154.7 kPa is equal to how many atmospheres?</p>	<p>Pressure Conversion A pressure of 3.6 atm is equal to how many kPa?</p>	<p>Molar Mass/Gram Formula Mass Calculate the gram formula mass of H₂SO₄.</p>
<p>Molar Mass/Gram Formula Mass How many grams are in one mole of Ca(NO₃)₂?</p>	<p>Gram → Mole Conversions If you have 372.6 grams of C₂H₈N, how many moles is this?</p>	<p>Gram → Mole Conversions How many moles is a 43.9 gram sample of Al₂(SO₄)₃?</p>
<p>Mole → Gram Conversions A chemist wants to measure out exactly 5 moles of Magnesium. How many grams is this?</p>	<p>Mole → Gram Conversions If I want exactly 1.567 moles of Fe₂O₃, how many grams would I measure out on a balance?</p>	<p>Mole → Mole Ratios How many moles of oxygen react with 2.4 moles of iron in this reaction? $4\text{Fe}_{(s)} + 3\text{O}_{2(g)} \rightarrow 2\text{Fe}_2\text{O}_{3(s)}$</p>
<p>Mole → Mole Ratios In this reaction, what is the ratio of moles of oxygen used to moles of CO₂ produced? $2\text{CO}_{(g)} + \text{O}_{2(g)} \rightarrow 2\text{CO}_{2(g)}$</p>	<p>Mole → Mole Ratios How many moles of aluminum are needed to react completely with 1.2 mole of FeO? $2\text{Al}_{(s)} + 3\text{FeO}_{(s)} \rightarrow 3\text{Fe}_{(s)} + \text{Al}_2\text{O}_{3(s)}$</p>	<p>Mole → Mole Ratios How many grams of hydrogen are needed to react with 3.2 moles of P₄? $\text{P}_{4(g)} + 6\text{H}_{2(g)} \rightarrow 4\text{PH}_{3(g)}$</p>
<p>Molarity What is the molarity of a solution that has 14.5 moles of NaCl dissolved into water to make 500ml of solution?</p>	<p>Molarity How many moles of KCl will we need to make 2L of a 3.0M solution? How many grams of KCl is this?</p>	<p>Molarity What is the volume of a 4.0M solution of HCl made with 35.8 g of HCl?</p>

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