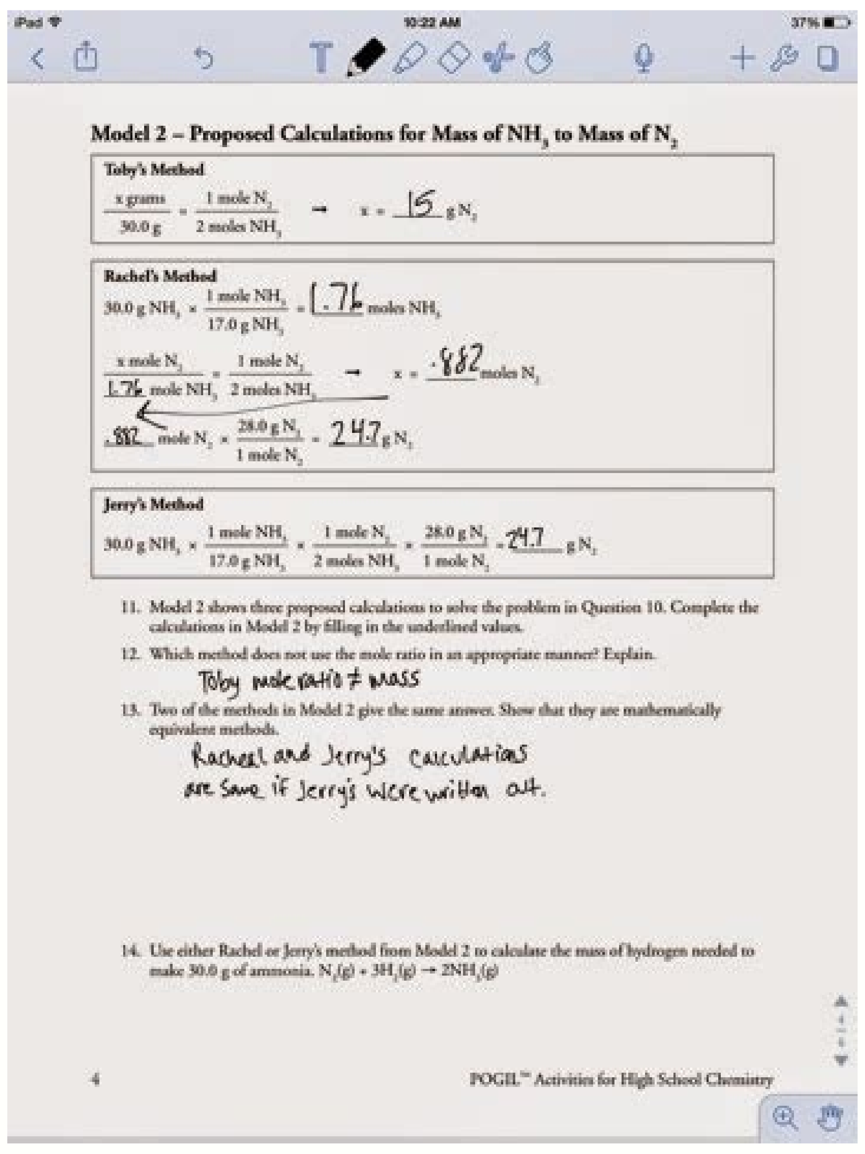
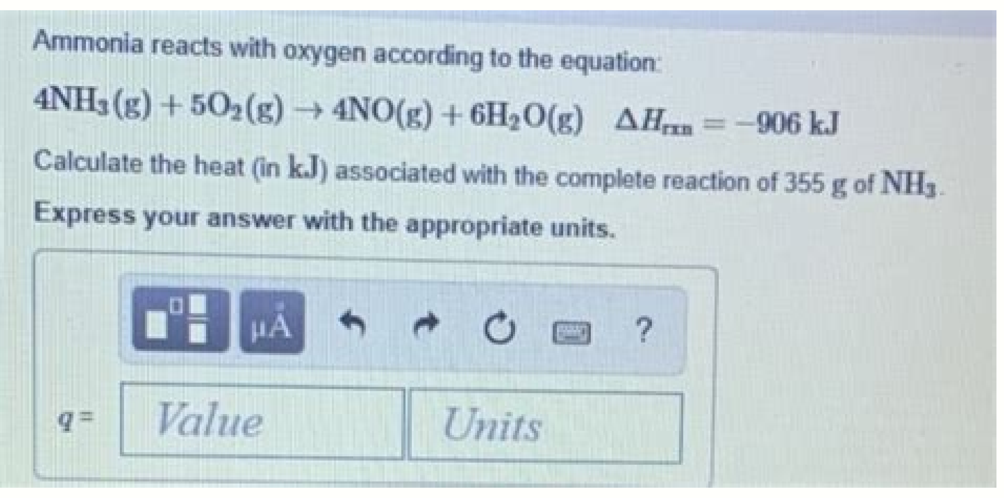
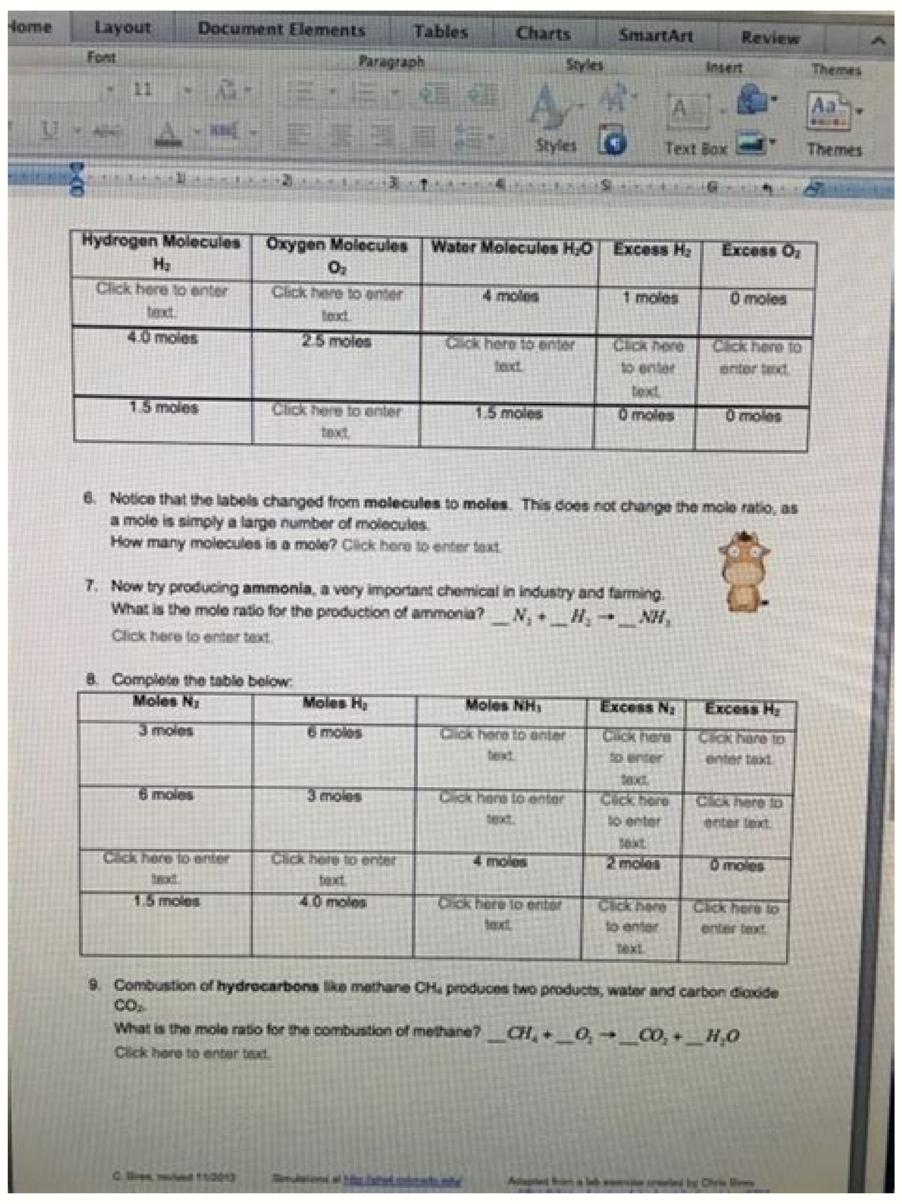
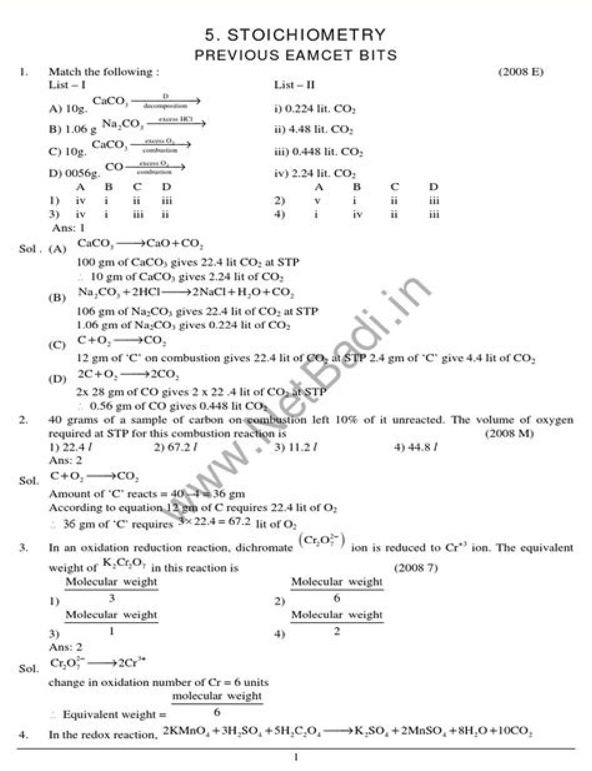
Mole ratio post lab answers





$$X_a = \frac{\text{mol}}{\text{mol total}} \qquad P_a = XP_{total}$$





Mole ratio answer key. Mole ratio practice answer key. Finding the ratio of moles of reactants in a chemical reaction post lab answers.

Mole Ratios and Reaction Stoichiometry, Online Chemistry Lab Manual. Authored by: Physical Sciences Department, Santa Monica College. Located at: �Attribution: CC BY-NC 4.0 Prelab Assignment: Mole Ratios and Reaction Stoichiometry, Online Chemistry Lab Manual. Authored by: Physical Sciences Department, Santa Monica College. Located at: �Attribution: CC BY-NC 4.0 Lab Report: Mole Ratios and Reaction Stoichiometry, Online Chemistry Lab Manual. Authored by: Physical Sciences Department, Santa Monica College. Located at: �Attribution: CC BY-NC 4.0 What is the optimum mole ratio for the formation of CO2 from the reaction of sodium bicarbonate and acetic acid? You have already learned how to balance chemical equations in terms of molecules, for example see the following equations. (1) Mg(s) + O2(g) → MgO (2) This information can also be interpreted in terms of moles (of molecules). (3) 2 moles of Mg reacts with 1 mole of O2 to produce 2 moles of MgO Why is this useful? With a balanced equation we can predict the moles of products that a given amount of reactants (in moles) will produce. When moles are used, we are then able to count the number of molecules produced by weighing (in grams). Predicting the amount of product formed or determining the amount of reactants needed for a reaction to occur is called stoichiometry. Most stoichiometry calculations are performed using exact mole ratios of reactants and products. In real life, however, many commercial processes for preparing compounds are carried out using an excess amount of one reactant (and thus a limiting amount of the other). For example, if you mix 2.5 moles of O2 with 1 mole of C3H8, 3 moles of CO2 will not be produced because there is not enough O2 added to 'use up' all of the C3H8. Once the O2 is consumed, no more products can be formed, even though some C3H8 remains. In this situation, because the amount of O2 limits the amount of product that can be formed, it is called the limiting reactant or limiting reagent. Therefore, if two reactants are not mixed in the correct mole ratio, the reaction will not go to completion and you will have less product produced and one or more left over reagents. When bicarbonate is mixed with acid, it breaks down into CO2 and H2O. Your task is to design and carry out an investigation to determine the optimum mole ratio for the formation of CO2 by mixing various amounts of sodium bicarbonate and acetic acid. By comparing the amount of carbon dioxide generated when varying amounts of sodium bicarbonate react with a given amount of acetic acid, you should be able to determine the optimum mole ratio of sodium bicarbonate and acetic acid and be able to identify the limiting reactant in the other reactions. 1.00 M Acetic Acid (HC2H3O2) Sodium Bicarbonate (NaHCO3) Graduated cylinders (1000 mL & 25 mL) Plastic tray Electronic balance Beaker (400 mL) Side-arm flask w/ tubing Ring Stands/Rings Eye droppers Caution: Handle acetic acid with care. Caution: Wear goggles at all times, as pressure is built up in this reaction. Figure 1: Gas collection set-up You will need to collect gas by water displacement in order to measure the amount of CO2 produced after the mixing of acetic acid and sodium bicarbonate in different molar ratios. Once you have determined the amount of sodium bicarbonate you will need to use in each reaction, conduct your experiments. Be sure to keep in mind the goals of the investigation. 1 Determine the optimum mole ratio of sodium bicarbonate and acetic acid. 2 Write the balanced equation based on your data. 3 Identify the limiting reactant in the each of the reactions. NOTE: It may be helpful to prepare a graph of mL of CO2 vs. moles of NaHCO3. Please print the worksheet for this lab. You will need this sheet to record your data. Interactive Poster Session Once your group has completed your work, prepare a whiteboard that you can use to share and justify your ideas. See the handout provided for details on this process. Report Once you have completed your research, you will need to prepare an investigation report that consists of three sections. Your report should answer these questions in 2 pages or less. This report must be typed and any diagrams, figures, or tables should be embedded into the document. Generally, you need one page for the first two sections and the second page for third section. Section 1: What concept were you investigating, and how does it relate to the guiding question? What is the optimum mole ratio for the formation of CO2 from the reaction of sodium bicarbonate and acetic acid? See the introduction for information on reaction stoichiometry, limiting reagents, and mole ratios, and then specifically link these concepts to the guiding question. Section 2: How did you go about your work and why? This is NOT the details of your procedure, but discussion of the processes. For example, describe the method for collecting gas and why this was necessary to answer the guiding question. Section 3: What is your argument? You should include the mole and mass calculations table with mL of CO2 added for each reaction. Discuss the validity and reliability of your data. Make clear your reasoning from mL of CO2 to mole ratio. Include your graph. This is where you not only present your data, but use the values you obtain as evidence in your reasoning. Graphing Website: This third section is where you not only present your data, but also use the values you obtain as evidence in your reasoning. Statements like, "see data table for values" are not acceptable! Purpose: to determine the mole ratio of two reactants in a chemical reaction using the method of continuous variations 0.04.18.014.619.20.0 Using different amounts of each of the reactants resulted in different changes in temperature. Connecting the lines and forming an intersection between those two lines was the point of maximum temperature change. The volumes that produced the maximum temperature change were the 40 mL of sodium hypochlorite and the 10 mL of "solution B", which produced a temperature change of 19.2 degrees Celsius. The ratio of the two volumes of the reactants is the stoichiometric ratio of the reactants, resulting in 4 moles of sodium hypochlorite and 1 mole of "solution B." The method of finding the ratio of moles of reactants in a chemical reaction is called continuous variation. The method of continuous variations involves knowing the concentrations of the two reactants in the solution of the reactants, mixing different ratios of the reactants, and measuring a property dependent on the amount of product produced or the amount of the reactant that remains. The measured property can be the volume of a gas that forms, the mass of a precipitate that forms, the color intensity of a reactant or the product, or the change in temperature. The best possible ratio of the two reactants should produce the greatest amount of product, consume the greatest amount of reactants, and generate the most heat.In this experiment, the property measured is the change in temperature, which is proportional to the amount of reactants involved in the reaction because the volume of the solution is kept constant. The number of total moles of reactants is also kept constant although different mole ratios of the reactants are used for each measurement. Therefore, the maximum change in temperature will result when the best possible ratio of the two reactants is mixed. The best possible ratio of the two reactants is called the stoichiometric ratio. 1. Keeping a constant volume of reactants is important because the mole ratio of the reactants that produces the most heat can be identified. Different amounts of each compound produces various levels of heat; therefore, varying the volume of the reactants will greatly alter the line-of-best-fit and the mole ratio of the reactants. A constant volume keeps the temperature proportional to the amount of reactants being mixed.2. The reactant that gets completely used up first in the reaction is the limiting reagent. From using up all of the limiting reagent, the amount of the other reactant that reacted can be determined, and the reaction stops. 3. The temperature, rather than volume, limits the precision of the data. The thermometer used to take the temperature had increments of 1 degrees Celsius, whereas the graduated cylinder used to take the volume had increments of 0.2 mL. Therefore, the thermometer measurements had one less significant figure than measurements taken by the graduated cylinder, limiting the precision of the data.4. Sodium hypochlorite is the limiting reagent along the upward sloping line of the graph. "Solution B" is the limiting reagent along the downward sloping line of the graph.5. Some physical properties, other than temperature change, that use the method of continuous variations are the color intensity of a reactant or product, the mass of a precipitate that forms, and the volume of a gas evolved.6. It is more accurate to use the point of intersection of the two lines to find the mole ratio, rather than with the mole ratio associated with the greatest temperature change, because the volumes that results in the maximum temperature change may not have been measured. The intersection of the two lines will find the volumes in which maximum temperature change occurs, even if the volumes were not tested.

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