

Limiting Reactant

For the following reactions, find the following:

- Which of the reactants is the limiting reactant?
 - What is the maximum amount of each product that can be formed?
 - How much of the excess reactant is left over after the reaction is complete?
- See next page for calculations!

1. Consider the following reaction:



a) limiting reactant

Answer the questions above, assuming we started with 30.0 grams of ammonium nitrate and 50.0 grams of sodium phosphate.

$$\begin{array}{l}
 \frac{30.0 \text{ g NH}_4\text{NO}_3}{1} \times \frac{1 \text{ mol NH}_4\text{NO}_3}{80.0 \text{ g NH}_4\text{NO}_3} \times \frac{1 \text{ mol } (\text{NH}_4)_3\text{PO}_4}{3 \text{ mol NH}_4\text{NO}_3} \times \frac{149.12 \text{ g } (\text{NH}_4)_3\text{PO}_4}{1 \text{ mol } (\text{NH}_4)_3\text{PO}_4} = 18.6 \text{ g } (\text{NH}_4)_3\text{PO}_4 \\
 \frac{50.0 \text{ g Na}_3\text{PO}_4}{1} \times \frac{1 \text{ mol Na}_3\text{PO}_4}{162.94 \text{ g Na}_3\text{PO}_4} \times \frac{1 \text{ mol } (\text{NH}_4)_3\text{PO}_4}{1 \text{ mol Na}_3\text{PO}_4} \times \frac{149.12 \text{ g } (\text{NH}_4)_3\text{PO}_4}{1 \text{ mol } (\text{NH}_4)_3\text{PO}_4} = 45.5 \text{ g } (\text{NH}_4)_3\text{PO}_4 \\
 \frac{30.0 \text{ g NH}_4\text{NO}_3}{1} \times \frac{1 \text{ mol NH}_4\text{NO}_3}{80.0 \text{ g NH}_4\text{NO}_3} \times \frac{3 \text{ mol NaNO}_3}{3 \text{ mol NH}_4\text{NO}_3} \times \frac{85.00 \text{ g NaNO}_3}{1 \text{ mol NaNO}_3} = 31.9 \text{ g NaNO}_3
 \end{array}$$

2. Consider the following reaction:



a) limiting reactant

Answer the questions at the top of this sheet, assuming we start with 100.0 grams of calcium carbonate and 45.0 grams of iron (II) phosphate.

$$\begin{array}{l}
 \frac{100.0 \text{ g CaCO}_3}{1} \times \frac{1 \text{ mol CaCO}_3}{100.09 \text{ g CaCO}_3} \times \frac{1 \text{ mol Ca}_3(\text{PO}_4)_2}{3 \text{ mol CaCO}_3} \times \frac{310.18 \text{ g Ca}_3(\text{PO}_4)_2}{1 \text{ mol Ca}_3(\text{PO}_4)_2} = 103.3 \text{ g Ca}_3(\text{PO}_4)_2 \\
 \frac{45.0 \text{ g FePO}_4}{1} \times \frac{1 \text{ mol FePO}_4}{150.82 \text{ g FePO}_4} \times \frac{1 \text{ mol Ca}_3(\text{PO}_4)_2}{2 \text{ mol FePO}_4} \times \frac{310.18 \text{ g Ca}_3(\text{PO}_4)_2}{1 \text{ mol Ca}_3(\text{PO}_4)_2} = 46.3 \text{ g Ca}_3(\text{PO}_4)_2 \\
 \frac{45.0 \text{ g FePO}_4}{1} \times \frac{1 \text{ mol FePO}_4}{150.82 \text{ g FePO}_4} \times \frac{1 \text{ mol Fe}_2(\text{CO}_3)_3}{2 \text{ mol FePO}_4} \times \frac{291.73 \text{ g Fe}_2(\text{CO}_3)_3}{1 \text{ mol Fe}_2(\text{CO}_3)_3} = 43.5 \text{ g Fe}_2(\text{CO}_3)_3
 \end{array}$$

Limiting Reactant Packet

J. Broeckhove, L. Lathouwers



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Time-Dependent Quantum Molecular Dynamics J. Broeckhove, L. Lathouwers, 2013-11-21 From March 30th to April 3rd 1992 a NATO Advanced Research workshop entitled Time Dependent Quantum Molecular Dynamics Theory and Experiment was held at Snowbird Utah The organizing committee consisted of J BROECKHOVE Antwerp Belgium L CEDERBAUM Heidelberg Germany L LATHOUWERS Antwerp Belgium N OHRN Gainesville Florida and J SIMONS Salt Lake City Utah Fifty two participants from eleven different countries attended the meeting at which thirty three talks and one poster session were held Twenty eight participants submitted contributions to the proceedings of the meeting which are reproduced in this volume The workshop brought together experts in different areas of molecular quantum dynamics all adhering to the time dependent approach The aim was to discuss and compare methods and applications The familiarity of the audience with the concepts of time dependent approaches greatly facilitated topical discussions and probing towards new applications A broad area of subject matter was covered including time resolved laser chemistry intramolecular dynamics photodissociation dynamics reactive and inelastic collisions as well as new time dependent methodologies This diversity in applications is reflected in the contributions included in this volume *Food Technology*, 1961 *Research Advances in Quantum Dynamics* Paul Bracken, 2016-08-24 There continue at present many developments in the area of quantum mechanics and quantum dynamics in particular of a very fundamental nature all the way from implications for the foundations of physics to the influence of quantum mechanics on emerging technologies such as the areas of quantum semiconductors and quantum computing both of which are very important examples It is hoped that the papers in this volume will be able to provide a much needed resource for researchers with regard to current fields of research in this dynamic area *Encyclopedia of Spectroscopy and Spectrometry*, 2016-09-22 This third edition of the *Encyclopedia of Spectroscopy and Spectrometry* Three Volume Set provides authoritative and comprehensive coverage of all aspects of spectroscopy and closely related subjects that use the same fundamental principles including mass spectrometry imaging techniques and applications It includes the history theoretical background details of instrumentation and technology and current applications of the key areas of spectroscopy The new edition will include over 80 new articles across the field These will complement those from the previous edition which have been brought up to date to reflect the latest trends in the field Coverage in the third edition includes Atomic spectroscopy Electronic spectroscopy Fundamentals in spectroscopy High

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