

Student Exploration: Titration

Activity A: Acids and bases

Get the Gizmo ready:

- Click **Reset**. Select **1.0 M HNO₃** for the **Burette** and **Mystery NaOH** for the **Flask**.
- Select **Phenolphthalein** for the **Indicator**.
- You will need a scientific calculator for this activity.



Question: How do acids and bases interact in solution?

1. **Describe:** The equation for the reaction of nitric acid (HNO₃) and sodium hydroxide (NaOH) is shown on the bottom right of the Gizmo.
 - A. What are the reactants in this reaction? HNO₃, NaOH
 - B. What are the products of this reaction? NaNO₃, H₂O
2. **Measure:** A **titration** can be used to determine the concentration of an acid or base by measuring the amount of a solution with a known concentration, called the **titrant**, which reacts completely with a solution of unknown concentration, called the **analyte**. The point at which this occurs is called the **equivalence point**.

Carefully add HNO₃ into the flask until the phenolphthalein begins to lose its color. Stop adding HNO₃ when the color change is permanent.

- A. How much (HNO₃) was required to cause the indicator to change color? 8.9mL
 - B. What can you say about the pH before and after the last drop of HNO₃ was added?
The pH was above 8.2 when it was pink before the last drop, after the last drop it is less than 8.2
3. **Explore:** Click **Reset** and change the indicator to **Bromthymol blue**. Add exactly 8.8 mL of HNO₃ to the flask.
 - A. What does the color of the indicator tell you about the current pH of the flask?
Since it is blue, it tells me that the pH is above 7.6
 - B. Add one more drop of HNO₃. What does the color tell you about the pH now?
Since it is yellow, I know that the pH is below 6.0

Activity B:

Get the Gizmo ready:



Answers To Student Exploration Titration

**J.K. Gilbert, Onno de Jong, Rosária
Justi, David F. Treagust, Jan H. van Driel**



Answers To Student Exploration Titration:

Teaching Science Online Dietmar Kennepohl, 2023-07-03 With the increasing focus on science education growing attention is being paid to how science is taught Educators in science and science related disciplines are recognizing that distance delivery opens up new opportunities for delivering information providing interactivity collaborative opportunities and feedback as well as for increasing access for students This book presents the guidance of expert science educators from the US and from around the globe They describe key concepts delivery modes and emerging technologies and offer models of practice The book places particular emphasis on experimentation lab and field work as they are fundamentally part of the education in most scientific disciplines Chapters include Discipline methodology and teaching strategies in the specific areas of physics biology chemistry and earth sciences An overview of the important and appropriate learning technologies ICTs for each major science Best practices for establishing and maintaining a successful course online Insights and tips for handling practical components like laboratories and field work Coverage of breaking topics including MOOCs learning analytics open educational resources and m learning Strategies for engaging your students online *Reconsidering Science Learning*

Eileen Scanlon, 2004 This informative book looks at science learning in a wide range of contexts It is divided into three parts Part one deals with the arguments put forward for studying science and includes a discussion on what science learners need to know about the nature of science and how decisions about what forms science curricula are made Part two includes articles on the processes by which science is learned and part three deals with inclusivity and diversity in science learning and what widening participation means for science education This is a companion book to *Mediating Science Learning through ICT* also published by RoutledgeFalmer *Reconsidering Science Learning* will be of particular interest to teachers on masters courses in science education and academics with an interest in science education **Dilemmas of Science**

Teaching John Wallace, William Loudon, 2005-06-29 Through the use of case studies and commentaries by senior scholars in the field this unique book provides student teachers with personal and professional insights into some key science education dilemmas **Addison-Wesley Small-scale Chemistry** Dennis D. Staley, Edward L. Waterman, 1995 McGraw-Hill

Yearbook of Science and Technology, 1973 Each vol contains a review of the previous year and a preview of the current year

Improving High School Students' Performance in Chemistry with a Hands-on Approach Mary L. Fredell, 1998

Chemical Education: Towards Research-based Practice J.K. Gilbert, Onno de Jong, Rosária Justi, David F. Treagust, Jan H. van Driel, 2006-03-11 Chemical education is essential to everybody because it deals with ideas that play major roles in personal social and economic decisions This book is based on three principles that all aspects of chemical education should be associated with research that the development of opportunities for chemical education should be both a continuous process and be linked to research and that the professional development of all those associated with chemical education should make extensive and diverse use of that research It is intended for pre service and practising chemistry teachers and

lecturers chemistry teacher educators chemical education researchers the designers and managers of formal chemical curricula informal chemical educators authors of textbooks and curriculum support materials practising chemists and chemical technologists It addresses the relation between chemistry and chemical education curricula for chemical education teaching and learning about chemical compounds and chemical change the development of teachers the development of chemical education as a field of enquiry This is mainly done in respect of the full range of formal education contexts schools universities vocational colleges but also in respect of informal education contexts books science centres and museums

Solutions and Pollution, 1990 *Digital Learning and Teaching in Chemistry* Yehudit Dori, Courtney Ngai, Gabriela Szteinberg, 2023-07-12 Education is always evolving and most recently has shifted to increased online or remote learning *Digital Learning and Teaching in Chemistry* compiles the established and emerging trends in this field specifically within the context of learning and teaching in chemistry This book shares insights about five major themes best practices for teaching and learning digitally digital learning platforms virtual visualisation and laboratory to promote learning in science digital assessment and building communities of learners and educators The authors are chemistry instructors and researchers from nine countries contributing an international perspective on digital learning and teaching in chemistry While the chapters in this book span a wide variety of topics as a whole they focus on using technology and digital platforms as a method for supporting inclusive and meaningful learning The best practices and recommendations shared by the authors are highly relevant for modern chemistry education as teaching and learning through digital methods is likely to persist Furthermore teaching chemistry digitally has the potential to bring greater equity to the field of chemistry education in terms of who has access to quality learning and this book will contribute to that goal This book will be essential reading for those working in chemical education and teaching Yehudit Judy Dori is internationally recognised formerly Dean of the Faculty of Education of Science and Technology at the Technion Israel Institute of Technology and won the 2020 NARST Distinguished Contributions to Science Education through Research Award DCRA for her exceptional research contributions Courtney Ngai and Gabriela Szteinberg are passionate researchers and practitioners in the education field Courtney Ngai is the Associate Director of the Office of Undergraduate Research and Artistry at Colorado State University Gabriela Szteinberg serves as Assistant Dean and Academic Coordinator for the College of Arts and Sciences at Washington University in St Louis **Instructor's Manual** Brian F. Woodfield, Matthew C. Asplund, 2006 NEW Click here to visit the Virtual ChemLab Frequently Asked Questions FAQ document This Instructor's Lab Manual Workbook is similar to the Student Lab Manual Workbook and additionally contains an overview of the full capabilities of the Site License version of Virtual ChemLab installation instructions and the answers for the laboratory assignments provided in the student laboratory workbook This product is available within Virtual ChemLab General Chemistry Instructor Lab Manual Workbook and Student CD Combo Package v2 5 0 13 228010 8 Valuepack and or should be ordered in conjunction with Virtual ChemLab General Chemistry Instructor Site

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<https://legacy.tortoisemedia.com/files/Resources/HomePages/Quick%20Start%20Self%20Help.pdf>

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