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## CHAPTER 2

# ATOMS, MOLECULES, AND IONS

### Problem Categories

*Biological:* 2.79, 2.80.

*Conceptual:* 2.31, 2.32, 2.33, 2.34, 2.61, 2.65, 2.71, 2.72, 2.81, 2.82, 2.93, 2.103, 2.113.

*Descriptive:* 2.24, 2.25, 2.26, 2.49, 2.50, 2.66, 2.70, 2.76, 2.84, 2.85, 2.86, 2.87, 2.88, 2.90, 2.91, 2.92, 2.94, 2.98, 2.101, 2.114.

*Environmental:* 2.122.

*Organic:* 2.47, 2.48, 2.69, 2.105, 2.107, 2.108, 2.115.

### Difficulty Level

*Easy:* 2.7, 2.8, 2.13, 2.14, 2.15, 2.16, 2.23, 2.31, 2.32, 2.33, 2.43, 2.44, 2.45, 2.46, 2.47, 2.48, 2.62, 2.91, 2.92, 2.99, 2.100.

*Medium:* 2.17, 2.18, 2.24, 2.26, 2.34, 2.35, 2.36, 2.49, 2.50, 2.57, 2.58, 2.59, 2.60, 2.61, 2.63, 2.64, 2.65, 2.66, 2.67, 2.68, 2.69, 2.70, 2.71, 2.72, 2.73, 2.74, 2.75, 2.76, 2.79, 2.80, 2.81, 2.82, 2.83, 2.84, 2.85, 2.86, 2.88, 2.89, 2.90, 2.93, 2.94, 2.95, 2.96, 2.98, 2.101, 2.102, 2.103, 2.110, 2.112, 2.114, 2.115.

*Difficult:* 2.25, 2.77, 2.78, 2.87, 2.97, 2.104, 2.105, 2.106, 2.107, 2.108, 2.109, 2.111, 2.113.

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First, convert 1 cm to picometers.

$$? \text{ He atoms} = (1 \times 10^{10} \cancel{\text{ pm}}) \times \frac{1 \text{ He atom}}{1 \times 10^2 \cancel{\text{ pm}}} = 1 \times 10^8 \text{ He atoms}$$

Note that you are given information to set up the unit factor relating meters and miles.

$$r_{\text{atom}} = 10^4 r_{\text{nucleus}} = 10^4 \times 2.0 \cancel{\text{ cm}} \times \frac{1 \cancel{\text{ m}}}{100 \cancel{\text{ cm}}} \times \frac{1 \text{ mi}}{1609 \cancel{\text{ m}}} = 0.12 \text{ mi}$$

For iron, the atomic number  $Z$  is 26. Therefore the mass number  $A$  is:

$$A = 26 + 28 = 54$$

**Strategy:** The 239 in Pu-239 is the mass number. The **mass number ( $A$ )** is the total number of

# Chang Solution Manual For

**Kenneth A. Goldsby**



## Chang Solution Manual For:

Student Solutions Manual for Chemistry Kenneth Goldsby, Raymond Chang, 2012-01-19 The Student Solutions Manual is written by Brandon J Cruickshank Northern Arizona University Raymond Chang and Ken Goldsby This supplement contains detailed solutions and explanations for even numbered problems in the main text The manual also includes a detailed discussion of different types of problems and approaches to solving chemical problems and tutorial solutions for many of the end of chapter problems in the text along with strategies for solving them Note that solutions to the problems listed under Interpreting Modeling Estimating are not provided in the manual

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Student Solutions Manual for Chang's Chemistry Philip C. Keller, Jill L. Keller, Raymond Chang, 1988

*Student Solutions Manual for Chang Chemistry With Advanced Topics* Raymond Chang, 2015-08-03

**Student's Solutions Manual to accompany Chemistry** Raymond Chang, 2009-01-07

**Student Solutions Manual to accompany Chemistry** Raymond Chang, 2006-03-03 By Brandon J Cruickshank Northern Arizona University and Raymond Chang This supplement contains detailed solutions and explanations for all even numbered problems in the main text The manual also includes a detailed discussion of different types of problems and approaches to solving chemical problems and tutorial solutions for many of the end of chapter problems in the text along with strategies for solving them

**Student Solutions Manual for Chemistry 13e** CHANG, 2018-02

*Student Solution Manual to Accompany Chemistry* Raymond Chang, 2004-01-08 The Student Solutions Manual will have all the solutions to the even numbered problems in the text The style of the solutions will match worked examples in the text to help the student learn how to solve the problems

*Solutions Manual to Accompany General Chemistry* Raymond Chang, 1986

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Solutions Manual for "Thermodynamics" by N.A. Gokcen L. Robbin Martin, N. A. Gokcen, 1978

**Solutions Manual to Study Guide and Working Papers for College Accounting** John Ellis Price, M. David Haddock, Horace R. Brock, 1999-04

*Problems and Solutions to Accompany Chang's Physical Chemistry for the Chemical*

*and Biological Sciences* Helen O. Leung, Mark D. Marshall, 2000-08-11 This Solutions Manual to accompany Raymond Chang's Physical Chemistry for the Chemical and Biological Sciences restates each of the 1020 innovative chapter ending problems in the text followed by a detailed solution. Each solution is approached with the same conversational style that the authors use in their own classrooms as they try to teach solutions to the problems rather than simply giving out answers. One hundred forty three figures and diagrams are used to illustrate the solutions. Both authors are recent recipients of the Henry Dreyfus Teacher Scholar award and bring to the manual effective pedagogy as well as the vitality of modern physical chemistry.

Student Solutions Manual to Accompany Chemistry, Twelfth Edition, Raymond Chang, Kenneth A. Goldsby Kenneth A. Goldsby, 2016     *A Manual for Teachers, Including Definitions, Principles, and Rules and Solutions of the More Difficult Problems Higher Arithmetic* John Henry Walsh, 1895     **Practical Manual of Minerals, Mines and Mining** Henry Stafford Osborn, 1888     A Manual of Photography Founded on Hardwich's Photographic Chemistry Thomas Frederick Hardwich, 1873     **Boundary-Layer Theory** Herrmann Schlichting, Klaus Gersten, 2003-05-20 A new edition of the almost legendary textbook by Schlichting completely revised by Klaus Gersten is now available. This book presents a comprehensive overview of boundary layer theory and its application to all areas of fluid mechanics with emphasis on the flow past bodies e.g. aircraft aerodynamics. It contains the latest knowledge of the subject based on a thorough review of the literature over the past 15 years. Yet again it will be an indispensable source of inexhaustible information for students of fluid mechanics and engineers alike.     Laboratory Manual for the Detection of Poisons and Powerful Drugs Wilhelm Autenrieth, William Homer Warren, 1915     Problems and Solutions to Accompany Chang's Physical Chemistry for the Biosciences Mark Marshall, Helen Leung, 2005-05-20 Perhaps nothing can better help students understand difficult concepts than working through and solving problems. By providing a strong pedagogical framework for self study this Solutions Manual will give students fresh insights into concepts and principles that may elude them in the lecture hall. It features detailed solutions to each of the even numbered problems from Raymond Chang's Physical Chemistry for the Biosciences. The authors approach each solution with the same conversational style that they use in their classrooms as they teach students problem solving techniques rather than simply handing out answers. Illustrative figures and diagrams are used throughout. Book jacket

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