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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, 2.81, 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.

First, convert 1 cm to picometers.

$$7 \text{ He atoms} \rightarrow (1 \times 10^{20} \text{ pm}) \times \frac{1 \text{ He atom}}{1 \times 10^7 \text{ pm}} = 1 \times 10^{13} \text{ He atoms}$$

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

$$r_{\text{atom}} = 10^4 \text{ fm} = 10^4 \times 2.9 \text{ cm} \times \frac{1 \text{ m}}{100 \text{ cm}} \times \frac{1 \text{ mi}}{1609 \text{ m}} = 0.12 \text{ mi}$$

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

# Chemistry Chang Solution Manual

**Raymond Chang, Brandon J.  
Cruickshank**

## **Chemistry Chang Solution Manual:**

Student Solutions Manual for Chemistry Kenneth Goldsby, Professor, Raymond Chang, Dr., 2018-02-01    **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.    **Student Solutions Manual for Chang Chemistry With Advanced Topics** Raymond Chang, 2015-08-03    **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's Solutions Manual to accompany Chemistry Raymond Chang, 2009-01-07    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.    Student Solutions Manual for Chang's Chemistry Philip C. Keller, Jill L. Keller, Raymond Chang, 1988    Student Solutions Manual for Chemistry 13e CHANG, 2018-02

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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      Solutions Manual to Accompany Chemistry Raymond Chang,1984      Student Solution Manual to Accompany Chemistry ,2015      The Medical Student's Manual of Chemistry Rudolph August Witthaus,1890      **A Manual of Photography Founded on Hardwich's Photographic Chemistry** Thomas Frederick Hardwich,1873      **Manual of Chemistry** William Simon,1895      *Student Solutions Manual Chemistry* Raymond Chang,1994      Manual of Clinical Chemistry Arthur Everett Austin,1907

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