

### Zettili Exercise 1.7

Let  $M_{\oplus} \equiv$  Intensity of solar radiation at earth  $= 1360 \frac{\text{kJ}}{\text{m}^2}$

$M_{\odot} \equiv$  Intensity of solar radiation at sun's surface

$R_{\oplus} \equiv$  Radius of earth's orbit  $= 1.5 \cdot 10^{11} \text{ m}$

$R_{\odot} \equiv$  Radius of sun  $= 6.96 \cdot 10^8 \text{ m}$

In steady state, all the power emitted by the sun passes also passes through a sphere of radius  $R_{\oplus}$ :

$$P_{\odot} = 4\pi R_{\odot}^2 M_{\odot} = 4\pi R_{\oplus}^2 M_{\oplus}$$

(a) By the Stefan-Boltzmann law [Eq. (1.1)],  $M_{\odot} = \sigma T_{\odot}^4$ , where

$$\sigma = 5.67 \cdot 10^{-8} \text{ W/m}^2 \text{ K}^4$$

$$T_{\odot} = \left[ \frac{M_{\oplus}}{\sigma} \right]^{1/4} = \left[ \frac{M_{\oplus}}{\sigma} \cdot \frac{R_{\oplus}^2}{R_{\oplus}^2} \right]^{1/4} = \left[ \frac{1360 \text{ W/m}^2}{5.67 \cdot 10^{-8} \text{ W/m}^2 \text{ K}^4} \cdot \frac{(1.5 \cdot 10^{11} \text{ m})^2}{(6.96 \cdot 10^8 \text{ m})^2} \right]^{1/4}$$
$$= \boxed{5780 \text{ K}}$$

By Wien's displacement law [Eq. (1.4)],

$$\lambda_{\text{max}} = \frac{2898.9 \cdot 10^{-6} \text{ mK}}{T_{\odot}} = \frac{2898.9 \cdot 10^{-6} \text{ mK}}{5780 \text{ K}} = \boxed{5.017 \cdot 10^{-7} \text{ m} = 502 \text{ nm}}$$

$$(b) P_{\odot} = 4\pi R_{\odot}^2 M_{\odot}$$

$$= \frac{4\pi \cdot (1.5 \cdot 10^{11} \text{ m})^2 \cdot 1360 \text{ W/m}^2}{\text{m}^2} = \boxed{3.85 \cdot 10^{26} \text{ W}}$$

# Quantum Mechanics Zettili Solutions For Exercises

**Paul A. Tipler, Frank J. Blatt**



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**Instructor's Solutions Manual to Accompany Quanta, Matter and Change** Charles Trapp,Marshall Cady,Carmen Giunta,2009-01-01 This Instructors solutions manual to accompany Quanta Matter and Change provides

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**Student Solutions Manual for Physical Chemistry: Quanta, Matter, and Change** Charles Trapp, Carmen Giunta, Marshall Cady, 2014-07-01

*Student's solutions manual to accompany Quanta, Matter & Change: A Molecular Approach to Physical Chemistry* Charles Trapp, Marshall Cady, Carmen Giunta, 2009-09-10 This Students solutions manual to accompany Quanta Matter Change provides full worked solutions to the a exercises and the odd numbered discussion questions and problems The manual is intended for students and instructors alike

**Solutions Manual for Students Vols 2 & 3 Chapters 22-41** Paul A. Tipler, Frank J. Blatt, 1998-12-15

**Change and Approximation** John Wiley & Sons Australia, Limited, Lynette Wilcock, Carole Johnson, Brian Hodgson, 1990

**Selected Solutions for Physics, Third Edition, by Robert Resnick and David Halliday** Edward Derrington, 1977-04-01

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### **Table of Contents Quantum Mechanics Zettili Solutions For Exercises**

1. Understanding the eBook Quantum Mechanics Zettili Solutions For Exercises
  - The Rise of Digital Reading Quantum Mechanics Zettili Solutions For Exercises
  - Advantages of eBooks Over Traditional Books
2. Identifying Quantum Mechanics Zettili Solutions For Exercises
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Quantum Mechanics Zettili Solutions For Exercises
  - User-Friendly Interface
4. Exploring eBook Recommendations from Quantum Mechanics Zettili Solutions For Exercises
  - Personalized Recommendations
  - Quantum Mechanics Zettili Solutions For Exercises User Reviews and Ratings

- Quantum Mechanics Zettili Solutions For Exercises and Bestseller Lists
- 5. Accessing Quantum Mechanics Zettili Solutions For Exercises Free and Paid eBooks
  - Quantum Mechanics Zettili Solutions For Exercises Public Domain eBooks
  - Quantum Mechanics Zettili Solutions For Exercises eBook Subscription Services
  - Quantum Mechanics Zettili Solutions For Exercises Budget-Friendly Options
- 6. Navigating Quantum Mechanics Zettili Solutions For Exercises eBook Formats
  - ePub, PDF, MOBI, and More
  - Quantum Mechanics Zettili Solutions For Exercises Compatibility with Devices
  - Quantum Mechanics Zettili Solutions For Exercises Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Quantum Mechanics Zettili Solutions For Exercises
  - Highlighting and Note-Taking Quantum Mechanics Zettili Solutions For Exercises
  - Interactive Elements Quantum Mechanics Zettili Solutions For Exercises
- 8. Staying Engaged with Quantum Mechanics Zettili Solutions For Exercises
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Quantum Mechanics Zettili Solutions For Exercises
- 9. Balancing eBooks and Physical Books Quantum Mechanics Zettili Solutions For Exercises
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Quantum Mechanics Zettili Solutions For Exercises
- 10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
- 11. Cultivating a Reading Routine Quantum Mechanics Zettili Solutions For Exercises
  - Setting Reading Goals Quantum Mechanics Zettili Solutions For Exercises
  - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Quantum Mechanics Zettili Solutions For Exercises
  - Fact-Checking eBook Content of Quantum Mechanics Zettili Solutions For Exercises
  - Distinguishing Credible Sources

13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
  - Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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