

Zettili Exercise 1.7

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

$M_{\odot} \equiv$ 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

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

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

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

$$\lambda_{\text{max}} = \frac{2898.9 \cdot 10^{-6} \text{ m K}}{T_{\odot}} = \frac{2898.9 \cdot 10^{-6} \text{ m K}}{5780 \text{ K}} = \boxed{5.07 \cdot 10^{-7} \text{ m} = 502 \text{ nm}}$$

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

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

Zettili Exercises Solution

R. Thomson



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Quantum Mechanics Nouredine Zettili, 2009-02-17 Quantum Mechanics Concepts and Applications provides a clear balanced and modern introduction to the subject. Written with the student's background and ability in mind, the book takes an innovative approach to quantum mechanics by combining the essential elements of the theory with the practical applications. It is therefore both a textbook and a problem solving book in one self-contained volume. Carefully structured, the book starts with the experimental basis of quantum mechanics and then discusses its mathematical tools. Subsequent chapters cover the formal foundations of the subject, the exact solutions of the Schrödinger equation for one and three dimensional potentials, time independent and time dependent approximation methods, and finally the theory of scattering. The text is richly illustrated throughout with many worked examples and numerous problems with step by step solutions designed to help the reader master the machinery of quantum mechanics. The new edition has been completely updated and a solutions manual is available on request. Suitable for senior undergraduate courses and graduate courses. *Problem Solving in Quantum Mechanics* Marc Cahay, Supriyo Bandyopadhyay, 2017-05-30 This topical and timely textbook is a collection of problems for students, researchers, and practitioners interested in state of the art material and device applications in quantum mechanics. Most problems are relevant either to a new device or a device concept or to current research topics which could spawn new technology. It deals with the practical aspects of the field, presenting a broad range of essential topics currently at the leading edge of technological innovation. Includes discussion on: Properties of Schrödinger Equation, Operators, Bound States in Nanostructures, Current and Energy Flux Densities in Nanostructures, Density of States, Transfer and Scattering Matrix Formalisms for Modelling Diffusive Quantum Transport, Perturbation Theory, Variational Approach, and their Applications to Device Problems, Electrons in a Magnetic or Electromagnetic Field and Associated Phenomena, Time dependent Perturbation Theory and its Applications, Optical Properties of Nanostructures. Problems in Quantum Mechanics For Material Scientists, Applied Physicists and Device Engineers is an ideal companion to engineering condensed matter physics or materials science curricula. It appeals to future and present engineers, physicists, and materials scientists, as well as professionals in these fields needing more in depth understanding of nanotechnology and nanoscience. *Introductory Nanoelectronics* Vinod Kumar Khanna, 2020-07-20 This introductory text develops the reader's fundamental understanding of core principles and experimental aspects underlying the operation of nanoelectronic devices. The author makes a thorough and systematic presentation of electron transport in quantum confined systems such as quantum dots, quantum wires, and quantum wells, together with Landauer-Büttiker formalism and non equilibrium Green's function approach. The coverage encompasses nanofabrication techniques and characterization tools, followed by a comprehensive exposition of nanoelectronic devices including resonant tunneling diodes, nanoscale MOSFETs, carbon nanotube FETs, high electron mobility transistors, single electron transistors, and heterostructure optoelectronic devices. The writing throughout is simple and straightforward with

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