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Band Theory and Electronic Properties of Solids (Oxford Master Series in Condensed Matter Physics) - Kindle edition by John Singleton. Download it once and read it on your Kindle device, PC, phones or tablets.

Written for students in physics and material science, the book takes a pedagogical approach to the subject through the extensive use of illustrations, examples and problem sets. The author draws on his extensive experience teaching band theory to provide the reader with a thorough understanding of the field. Considerable attention is paid to the vocabulary and quantum-mechanical training necessary to learn about the electronic, optical and structural properties of materials in science and technology. The text also offers several chapters on the newest experimental techniques used to study band structure. Concise yet rigorous, it fills a long overdue gap between student texts and current research activities. Hey guys, do you desires to finds a new book to study? The particular book was written by popular writer in this era. This book was inspired a number of people in the world. When you read this publication you will enter the new shape that you ever know just before. The author explained their strategy in the simple way, therefore all of people can easily to recognise the core of this publication. This book will give you a lots of information about this world now. So you can see the represented of the world within this book. Do you have something that you enjoy such as book? The publication lovers usually prefer to pick book like comic, small story and the biggest some may be novel. Reading addiction all over the world can be said as the method for people to know world far better then how they react in the direction of the world. So , for all you who want to start examining as your good habit, you can pick Band Theory and Electronic Properties of Solids Oxford Master Series in Condensed Matter Physics become your own personal starter. Only viewing or reviewing it may to be your solve problem if you get difficulties to your knowledge. Kinds of this e-book are various. Not only by written or printed but in addition can you enjoy this book simply by e-book. In the modern era like now, you just looking of your mobile phone and searching what your problem. Right now, choose your ways to get more information about your e-book. It is most important to arrange you to ultimately make your knowledge are still up-date.

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Chapter 2 : Band theory and electronic properties of solids / John Singleton. - Version details - Trove

This latest text in the new Oxford Master Series in Physics provides a much need introduction to band theory and the electronic properties of materials. Written for students in physics and material science, the book takes a pedagogical approach to the subject through the extensive use of illustrations, examples and problem sets.

Band Theory of Solids Chapter 2 - Solid-state Device Theory Quantum physics describes the states of electrons in an atom according to the four-fold scheme of quantum numbers. The quantum numbers describe the allowable states electrons may assume in an atom. To use the analogy of an amphitheater, quantum numbers describe how many rows and seats are available. Individual electrons may be described by the combination of quantum numbers, like a spectator in an amphitheater assigned to a particular row and seat. Like spectators in an amphitheater moving between seats and rows, electrons may change their statuses, given the presence of available spaces for them to fit, and available energy. If an electron is to move into a higher-order shell, it requires that additional energy be given to the electron from an external source. Using the amphitheater analogy, it takes an increase in energy for a person to move into a higher row of seats, because that person must climb to a greater height against the force of gravity. Leaps between different shells require a substantial exchange of energy, but leaps between subshells or between orbitals require lesser exchanges. When atoms combine to form substances, the outermost shells, subshells, and orbitals merge, providing a greater number of available energy levels for electrons to assume. When large numbers of atoms are close to each other, these available energy levels form a nearly continuous band wherein electrons may move as illustrated in Figure below Electron band overlap in metallic elements. It is the width of these bands and their proximity to existing electrons that determines how mobile those electrons will be when exposed to an electric field. In metallic substances, empty bands overlap with bands containing electrons, meaning that electrons of a single atom may move to what would normally be a higher-level state with little or no additional energy imparted. Band overlap will not occur in all substances, no matter how many atoms are close to each other. In some substances, a substantial gap remains between the highest band containing electrons the so-called valence band and the next band, which is empty the so-called conduction band. These substances are electrical insulators. Electron band separation in insulating substances. Materials that fall within the category of semiconductors have a narrow gap between the valence and conduction bands. Thus, the amount of energy required to motivate a valence electron into the conduction band where it becomes mobile is quite modest. Figure below Electron band separation in semiconducting substances, a multitudes of semiconducting close atoms still results in a significant band gap, b multitudes of close metal atoms for reference. At low temperatures, little thermal energy is available to push valence electrons across this gap, and the semiconducting material acts more as an insulator. At higher temperatures, though, the ambient thermal energy becomes enough to force electrons across the gap, and the material will increase conduction of electricity. It is difficult to predict the conductive properties of a substance by examining the electron configurations of its constituent atoms. Although the best metallic conductors of electricity silver, copper, and gold all have outer s subshells with a single electron, the relationship between conductivity and valence electron count is not necessarily consistent: The electron band configurations produced by compounds of different elements defies easy association with the electron configurations of its constituent elements. Energy is required to remove an electron from the valence band to a higher unoccupied band, a conduction band. More energy is required to move between shells, less between subshells. Since the valence and conduction bands overlap in metals, little energy removes an electron. Metals are excellent conductors. The large gap between the valence and conduction bands of an insulator requires high energy to remove an electron. Thus, insulators do not conduct. Semiconductors have a small non-overlapping gap between the valence and conduction bands. Pure semiconductors are neither good insulators nor conductors.

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