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## **Electronic Energy**

Each electronic state corresponds to one of the energy levels of the molecule. These energy levels will obviously depend on the molecular orbitals that are occupied, and their energies, but they also depend on the way in which the electrons within the various molecular orbitals interact with each other.

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and Double Groups

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## **Applications of Group Theory to the Physics of Solids**

Band theory, in solid-state physics, theoretical model describing the states of electrons, in solid materials, that can have values of energy only within certain specific ranges. The behaviour of an electron in a solid (and hence its energy) is related to the

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behaviour of all other  
particles around it. This  
is in direct contrast to  
the behaviour of an  
electron in free space  
where it may have ...

**Band theory |  
physics | Britannica**

In solid-state physics,  
the electronic band  
structure (or simply  
band structure) of a  
solid describes the  
range of energy levels  
that electrons may  
have within it, as well

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as the ranges of energy that they may not have (called band gaps or forbidden bands).. Band theory derives these bands and band gaps by examining the allowed quantum mechanical wave functions for an electron in a large ...

## **Electronic band structure - Wikipedia**

Electronic

Spectroscopy relies on

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the quantized nature of energy states. Given enough energy, an electron can be excited from its initial ground state or initial excited state (hot band) and briefly exist in a higher energy excited state. Electronic transitions involve exciting an electron from one principle quantum state to another.

## **Electronic Spectroscopy:**



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perturbation theory, we merely add a constant energy  $V(\sim r)$  to the free particle energy, and that constant term is exactly the mean potential energy seen by the electron, averaged over the unit cell. The terms of interest arise in second order perturbation theory and are

$$E^{(2)}(\sim k) = \sum_{k_0} \frac{V(\sim k - k_0) V(\sim k_0)}{E(\sim k) - E(\sim k_0)}$$

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$$j\hbar^{-k_0}jV(\sim r)j\sim kij^2$$

$$E(0)(\sim k) iE(0)(\sim k_0)$$

$$(1.6)$$

## Review of Energy Dispersion Relations in Solids

Theory of molecular spectra. Unlike atoms in which the quantization of energy results only from the interaction of the electrons with the nucleus and with other electrons, the quantization of

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molecular energy levels and the resulting absorption or emission of radiation involving these energy levels encompasses several mechanisms. In theory there is no clear separation of the different ...

## **Spectroscopy - Theory of molecular spectra | Britannica**

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This electronic effect is  
named after Hermann  
Arthur Jahn and  
Edward Teller, who

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proved, using group  
theory, that orbitally  
degenerate molecules

cannot be stable. The

Jahn-Teller theorem

essentially states that

any non-linear

molecule with a

spatially degenerate

electronic ground state

will undergo a

geometrical distortion

that removes that

degeneracy, because

the distortion lowers

the ...

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**Introduction to  
Inorganic Chemistry/  
Coordination  
Chemistry ...**

The basic concepts covered in these early chapters are then applied to a series of different examples including crystal field theory treatment of point defects in solids, molecular orbitals, two-photon processes, the optical properties of solids, the nonlinear optical properties of

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solids, lattice  
vibrations, the Jahn-  
Teller effect, and the  
effects of translational  
symmetry on electronic  
...

**Symmetry, Group  
Theory, and the  
Physical Properties  
of ...**

CHAPTER 5 -  
SYMMETRY AND  
VIBRATIONAL  
SPECTROSCOPY 5.1  
Potential Energy  
Diagrams The energy

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of a molecule can be approximated as  $E = E_{rot} + E_{vib} + E_{elec} + E_{tran} + E_{spin} + E_{nucl}$ . If we make the approximation that the wavefunction is separable, then the problem can be

## **CHAPTER 5 - SYMMETRY AND VIBRATIONAL SPECTROSCOPY 5.1**

...

The group focuses on the material sciences



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and technology

aspects of novel

electronic materials,

with a strong emphasis

on carbon materials,

such as graphene, as

well as other 2D

materials (MoS 2). The

group also works

towards the

development of

technological

applications based on

these materials in such

as electronics,

bioelectronics and

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good conductors (both  
electrical and thermal)

• Electronic heat  
capacity has an

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additional

(temperature  
dependent)

contribution from the  
electrons. ... Energy:

Group velocity:  $m \dots$

## **Free electron theory metals - NICHOLAS RESEARCH GROUP**

BAND THEORY OF

SOLIDS The energy

band structure of a

solid determines

whether it is a

conductor, an insulator

or a semiconductor. A

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solid contains an enormous number of atoms packed closely together.

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