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Solved Problems and Worked Examples (By Subject)

Note: All PDF files are print optimized and provide excellent laser printed copies. Simply print from the PDF file. The displayed PDF file quality is lower than the actual print quality.

Numerous Worked Examples in Materials Science, Electronic Materials, Electronic Devices and Physics. See two typical samples:

[pn Junction: The Shockley Model \(PDF\)](#)

[pn Junction: The Shockley Model \(PDF\)](#)

Password from the book is needed to access these topics:

Password: 3rd Edition, page 223, the first word in the name of Equation 3.33. (Case sensitive).

Elementary Materials Science Concepts

- [Units in Materials Science \(PDF\)](#)

Atomic mass, Avogadro's number, molecular mass, molar quantities, electron volts, calories.

- [Conversions in Materials Science \(PDF\)](#)

Conversions from atomic to weight percentage and vice versa

- [Atomic concentration and mean separation \(PDF\)](#)

Relationship between interatomic separation and the number of atoms per unit volume.

- [Solids: Elementary Concepts \(PDF\)](#)

- [Ionic Bonding: An Example on CsCl \(PDF\)](#)

- [Ionic Bonding: Madelung Constant \(PDF\)](#)

- [Van Der Waals Bonding \(PDF\)](#)

- [Surface and Bulk Atomic Concentrations: Separation between atoms and separation between impurities \(PDF\)](#)

- [FCC Crystal Characteristics \(PDF\)](#)

Relationships between the lattice parameter, atomic radius, density and APF.

- [FCC Crystal Characteristics \(PDF\)](#)

- [BCC Crystal Characteristics \(PDF\)](#)

- [Diamond and Zinc Blende Crystal Structure Characteristics \(PDF\)](#)

The diamond and the zinc blende crystal structures have several similarities.

- [NaCl Crystal Characteristics \(PDF\)](#)
- [Planar Concentration of Atoms in the FCC Crystal \(PDF\)](#)
- [Planar Concentration of Atoms in the Diamond Crystal Structure \(PDF\)](#)
- [Heat Capacity of Metals and Non-Metals: Dulong-Petit Rule and the Debye Heat Capacity \(PDF\)](#)
- [Covalent Bond \(PDF\)](#)
- [Electron Affinity \(PDF\)](#)
- [Ionic Crystals \(PDF\)](#)
- [Linear Atomic Concentration \(PDF\)](#)
- [Potential Energy Curve, Bonding and Bulk Modulus \(PDF\)](#)
- [The Planetary Model of the Atom \(PDF\)](#)
- [Virial Theorem and the Hydrogen Atom \(PDF\)](#)
- [Elementary Crystals \(PDF\)](#)
- [Elementary Crystals \(The Diamond Crystal Structure\) \(PDF\)](#)

Electrical and Thermal Conduction in Solids

- [Mean free path of conduction electrons in a conductor \(PDF\)](#)
- [Temperature of the filament of a light bulb \(PDF\)](#)
- [Electrical Conduction in Metals I: Principles \(PDF\)](#)
- [Electrical Conduction in Metals II: Temperature Coefficient of Resistivity \(TCR\) \(PDF\)](#)
- [Interconnects in ICs and Matthiessen's Rule \(PDF\)](#)
- [Isomorphous Alloys \(PDF\)](#)
- [Conduction electron concentration from the Hall effect \(PDF\)](#)
- [Thermal and Electrical Conductivity of Metals \(PDF\)](#)
- [Radiation Theory of the Electrical Fuse \(PDF\)](#)

Elementary Quantum Physics

- [The Compton effect \(PDF\)](#)
- [The ground energy of a macroscopic object \(PDF\)](#)
- [The uncertainty principle and spectral width of light emission \(PDF\)](#)
- [X-Ray diffraction \(PDF\)](#) 25 Nov 13 Revised
- [Modern Physics I: Four Solved Problems \(PDF\)](#)

Bonding, the Band Theory of Solids and Statistics

- [The water molecule \(H₂O\) \(PDF\)](#)
- [X-ray emission and the density of states in a metal \(PDF\)](#)

Semiconductors

- [Energy band diagram of an *n*-type semiconductor \(PDF\)](#)
- [Piezoresistance: Pressure Sensor/Strain Gauge \(PDF\)](#)
- [Electron-Hole Recombination in Semiconductors and Photoconductivity \(PDF\)](#)
- [Hall effect \(PDF\)](#)
- [Ionization region in doped semiconductors \(PDF\)](#)
- [Compensation doping of semiconductors \(PDF\)](#)
- [Seebeck coefficient of semiconductors and thermal drift in semiconductor devices \(PDF\)](#)
- [Diffusion \(PDF\)](#)

Semiconductor Devices

- [pn Diffusion and drift in a pn junction \(PDF\)](#)
- [pn Junction: The Shockley Model \(PDF\)](#)
- [pn Forward current in a GaAs pn junction diode \(PDF\)](#)

Forward current in a direct bandgap semiconductor pn junction.

- [BJT: Calculation of the characteristics of an \$nnp\$ BJT \(PDF\)](#)
- [BJT: Emitter bandgap narrowing effect \(PDF\)](#)
- [BJT: Nonuniform base doping effect \(PDF\)](#)
- [BJT: Low frequency small signal equivalent circuit \(PDF\)](#)
- [Bipolar Junction Transistors at Low Frequencies: Principles and Solved Problems \(PDF\)](#)
- [JFET pinch-off voltage \(PDF\)](#)
- [Enhancement MOSFET and NMOST Common Source Amplifier \(PDF\)](#)
- [Speed of a JFET \(PDF\)](#)
- [LED Emmission Wavelength and Temperature \(PDF\)](#)

Dielectric Materials and Insulation

- [Static electronic polarizability \(PDF\)](#)
- [Relative permittivity of an ionic crystal at optical and at low frequencies \(PDF\)](#).

Calculate the relative permittivity of CsCl at low and optical frequencies.

- [Time response of a dipolar dielectric \(PDF\)](#)
- [Piezoelectric coefficients \(PDF\)](#)

Piezoelectric coefficients d and g .

- [Piezoelectric spark generator \(PDF\)](#)

A better (more advanced) design of a spark generator.

- [Piezoresistance \(PDF\)](#)
- [Electric Field in Coaxial Cables \(PDF\)](#)

Magnetic Materials and Superconductivity

- [Hysteresis and eddy current losses in a transformer \(PDF\)](#)
- [The ferrite antenna of an AM radio receiver \(PDF\)](#)
- [Ferrimagnetic Materials and Ferromagnetic Crystals \(PDF\)](#)
- [Diamagnetism \(PDF\)](#)

Mechanical Properties

- [Cold Work \(PDF\)](#)
- [Elastic Deformation of a Metal Component \(PDF\)](#)

Optical Properties

- [Complex Refractive Index and Light Absorption \(PDF\)](#)
- [Dispersion: Refractive Index vs. Wavelength Behaviour \(PDF\)](#)
- [Fresnel's Equations \(PDF\)](#)
- [Polarization \(PDF\)](#)

A McGraw-Hill Book with Web Resources

[Web-Materials, Third Edition Website](#)

Web-Materials

*Materials and Devices Website for
Scientists and Engineers*

Serving scientists and engineers since
1996. Dedicated to continuing education.



