

**Very Very long Title of the  
Presentation that is so long**  
**Subtitle of the Presentation that is also  
very long**

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Sample University

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# Outline

**more** topics that are not listed here but will be discussed in the presentation.

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## Band Theory

- **Band theory :**  
electrons in solids are not bound to individual atoms, but are shared by many atoms
  - **Fermi energy :**  
highest energy level occupied at absolute zero temperature
  - **Valence band :** band of energy levels occupied by electrons
  - Metals have lot of electrons near Fermi energy
  - Resistivity increases with temperature due to **defects, lattice vibration**
- **Defects :**  
impurities, vacancies, dislocations

# Resistivity of Metals

- **Drude theory** : metals are good electrical conductors because electrons can move nearly freely between the atoms in solids

- conductivity:  $\sigma \propto \tau \Rightarrow \rho \propto \tau^{-1}$

$\tau$  : average lifetime of the electron between collision with other **electrons, impurities, lattice**

$$\tau^{-1} = \tau_{\text{imp}}^{-1} + \tau_{\text{el-el}}^{-1} + \tau_{\text{el-ph}}^{-1}$$

$$\rho = \rho_0 + aT^2 + bT^5$$

Resistivity increases with Temperature

## Future Plan

- Strong coupling between lead and impurity
- Non-equilibrium effects
- Ferromagnetic RKKY (?)
- Generalize to multi-impurity

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**Thank  
You .**