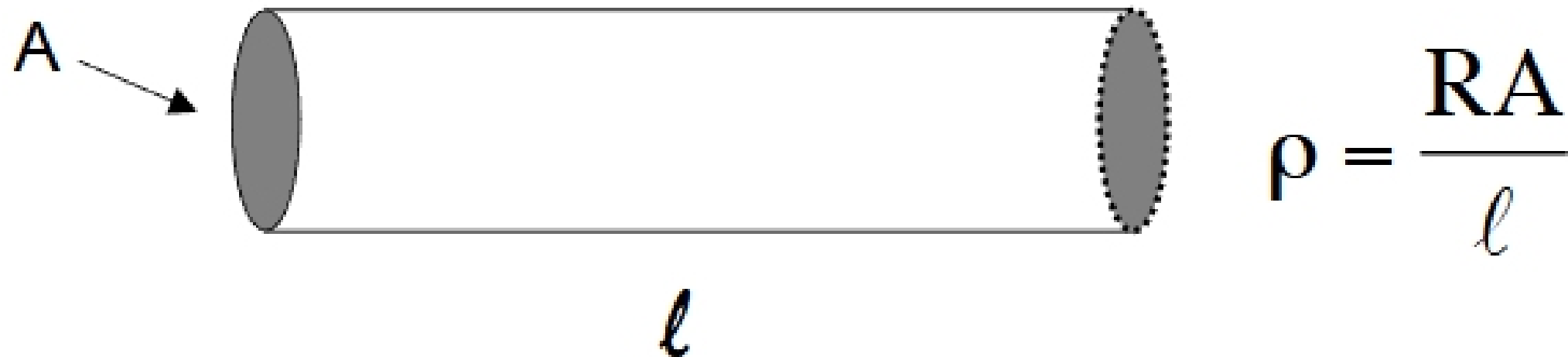
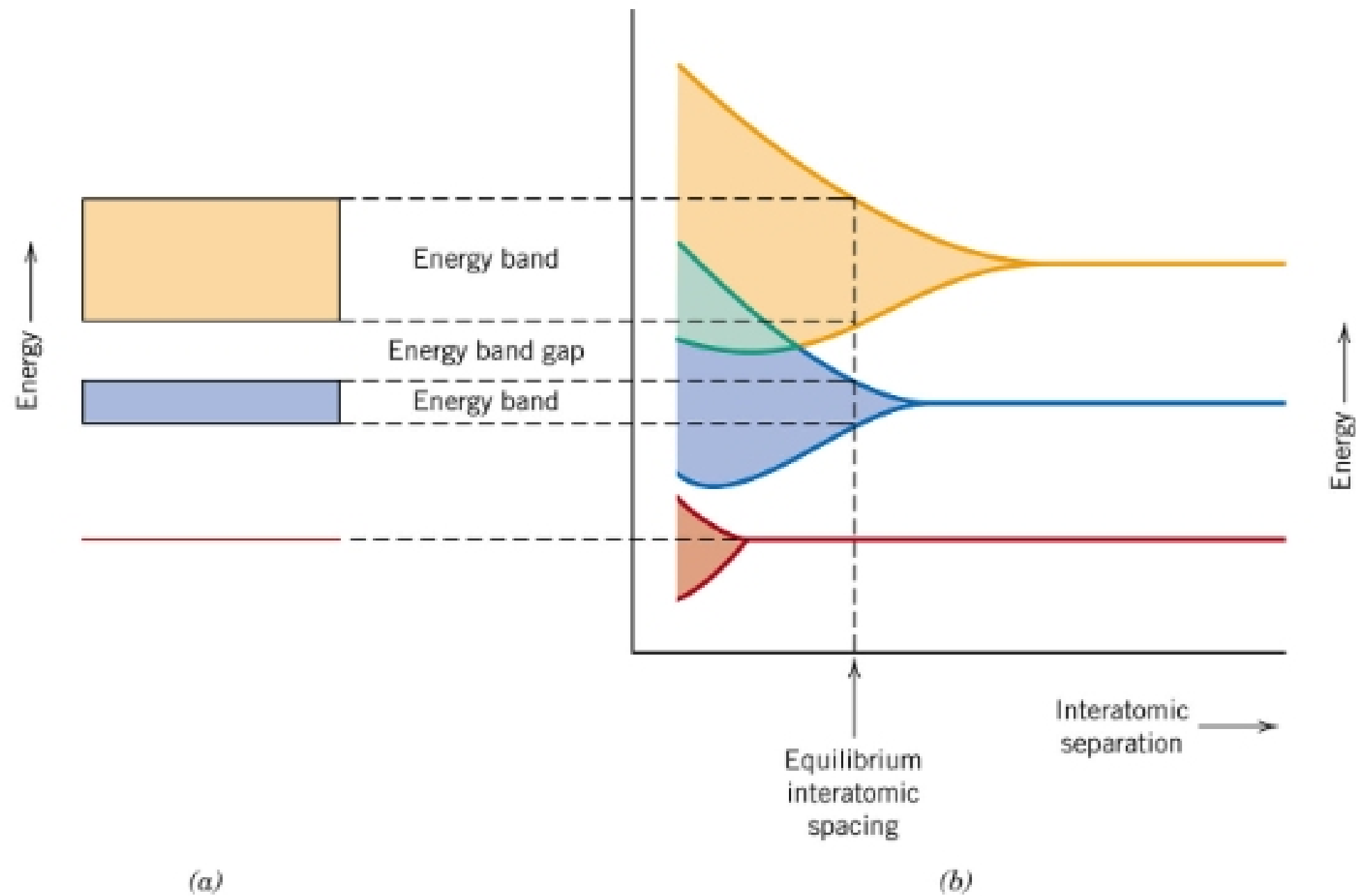


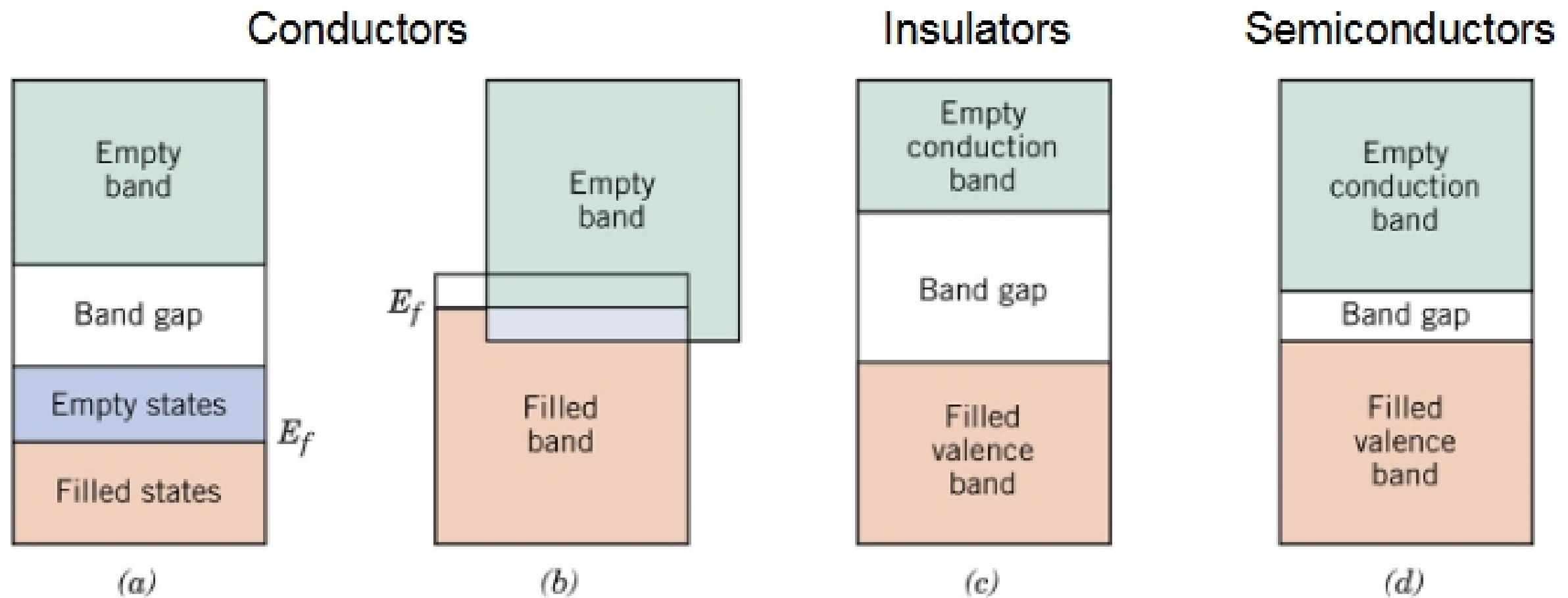
Resistance and Resistivity



- $V=IR$, but resistance is not a material property because it depends on the sample geometry.
- Resistivity, ρ (units $\Omega \cdot \text{m}$), is the material property that describes a material's resistance to the passage of electric current independent of size and geometry.
- Conductivity, σ , and ρ are inversely related. $\sigma = \frac{1}{\rho}$



Materials consist of many atoms in close proximity. The Pauli exclusion principle dictates that only two electrons may reside at a given energy level. Therefore, rather than reside at specific discrete energy levels the electrons inhabit energy “bands”.



Charge carriers in conductors (e.g., most metals) do not need to overcome an energy barrier to participate in electrical conduction as do semiconductors and insulators.

For semiconductors and insulators, electrons in the valence band are associated with a particular atom while electrons in the conduction band may move from atom to atom conducting electricity.