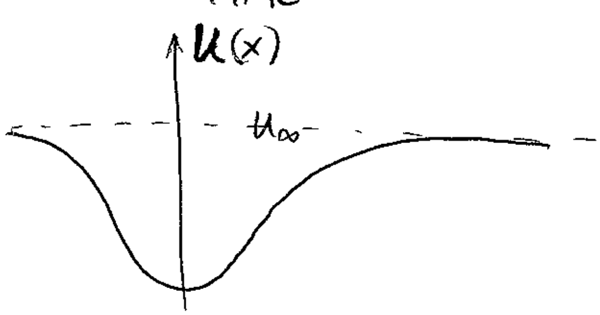
LAST TIME:

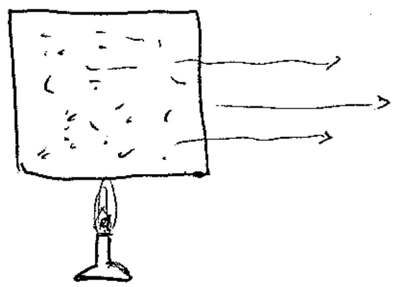


- states with $E < U_\infty$ exist only for specific energies

these energies determine most observable properties of the system.

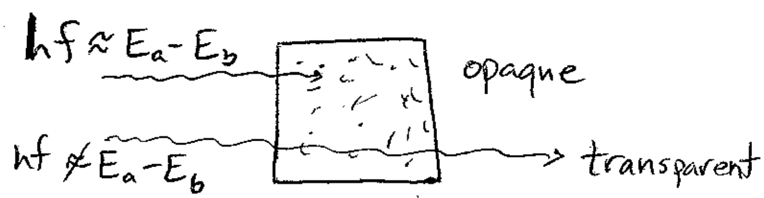
e.g.

emission spectrum



$hf = E_a - E_b$

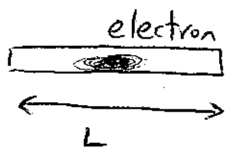
different for different atoms/molecules



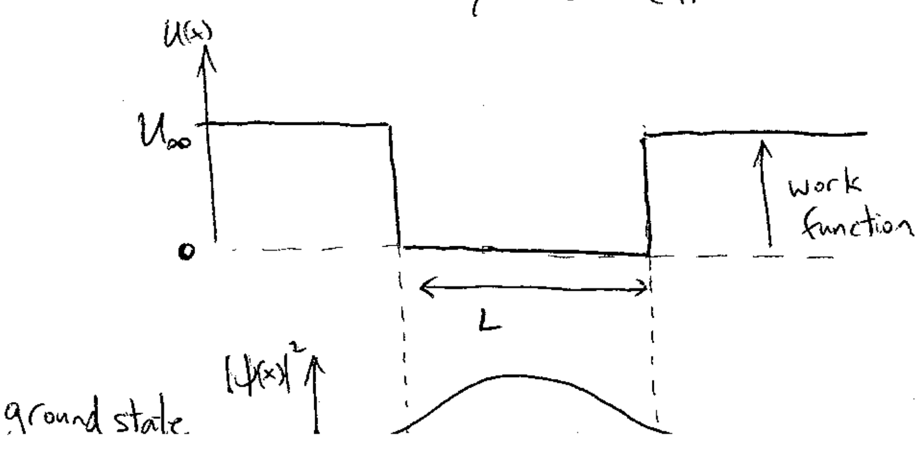
absorption spectrum

Conductor: free electrons
- all possible energies
- opaque for all wavelengths.

Another example: thin short wire



model by "finite square well"



- Number and energy of bound states determined by L, U_∞

- Ground state energy > 0

  ★ quantum electron always has some kinetic energy ★

  ZERO POINT ENERGY

- Wavefunction extends into region with $E < U(x)$

  → some probability of finding electron in region where it doesn't have enough energy to get classically.

dramatic consequence: TUNNELING

electron with $E < U_\infty$ can "jump" from one wire to other.

SIM

CLICKER

Energy eigenstates allow us to find time dependence of general wavefns:

$$\psi(x,t=0) = \sum c_n f_n(x) \Longrightarrow \psi(x,t) = \sum c_n f_n(x)\, e^{-\frac{iE_n t}{\hbar}}$$

energy eigenstate.

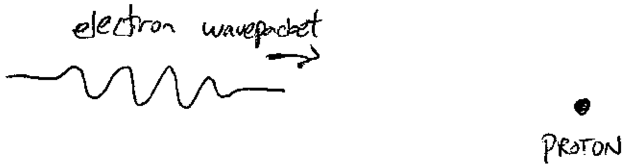
prob. dens. → const for energy eigenstate

→ not for sum of eigenstates.

What about states with $E > U_\infty$?

- all energies $E > U_\infty$ allowed
- BUT: not normalizible unless we form wavepackets.

e.g.



evolution of wavepacket describes SCATTERING from proton

$\boxed{\text{SIM}}$