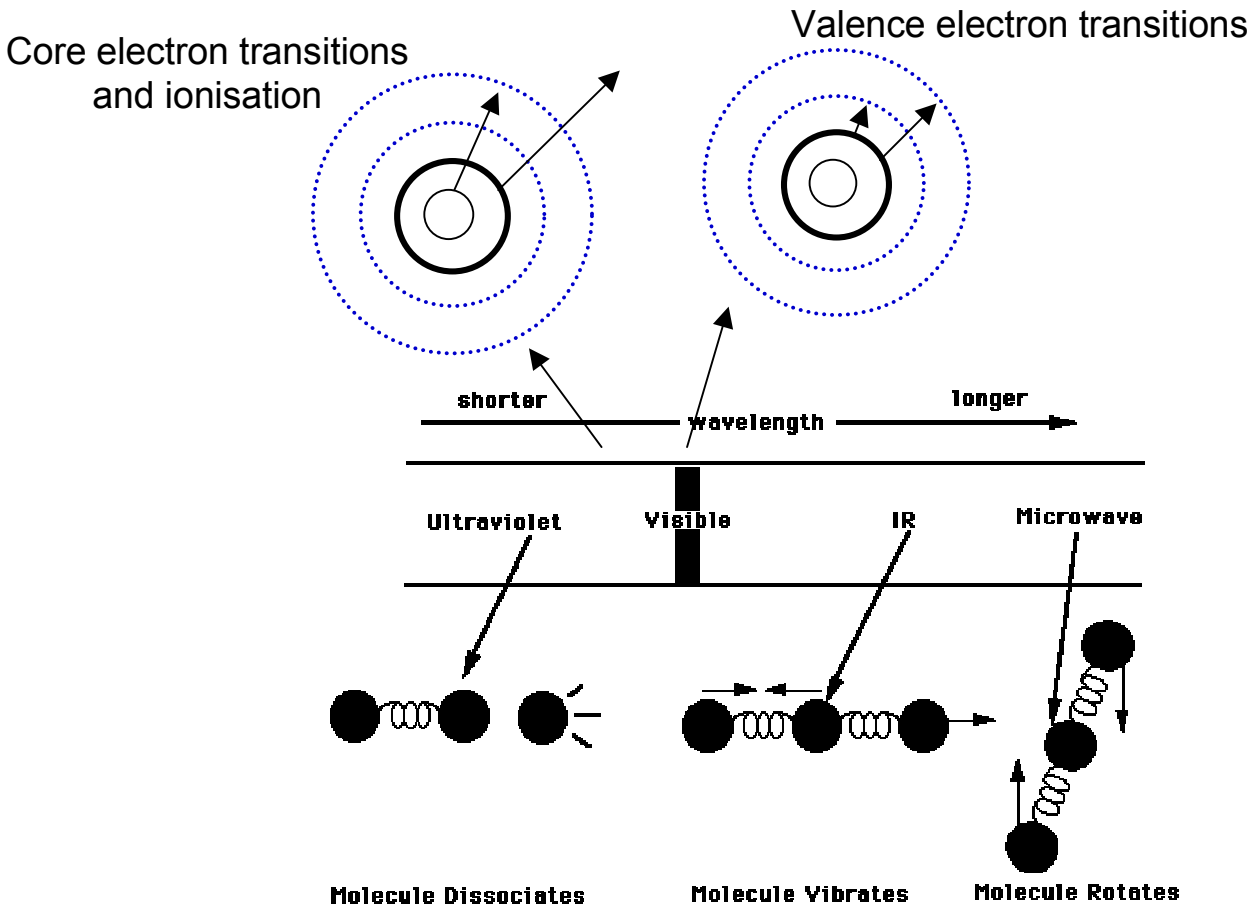
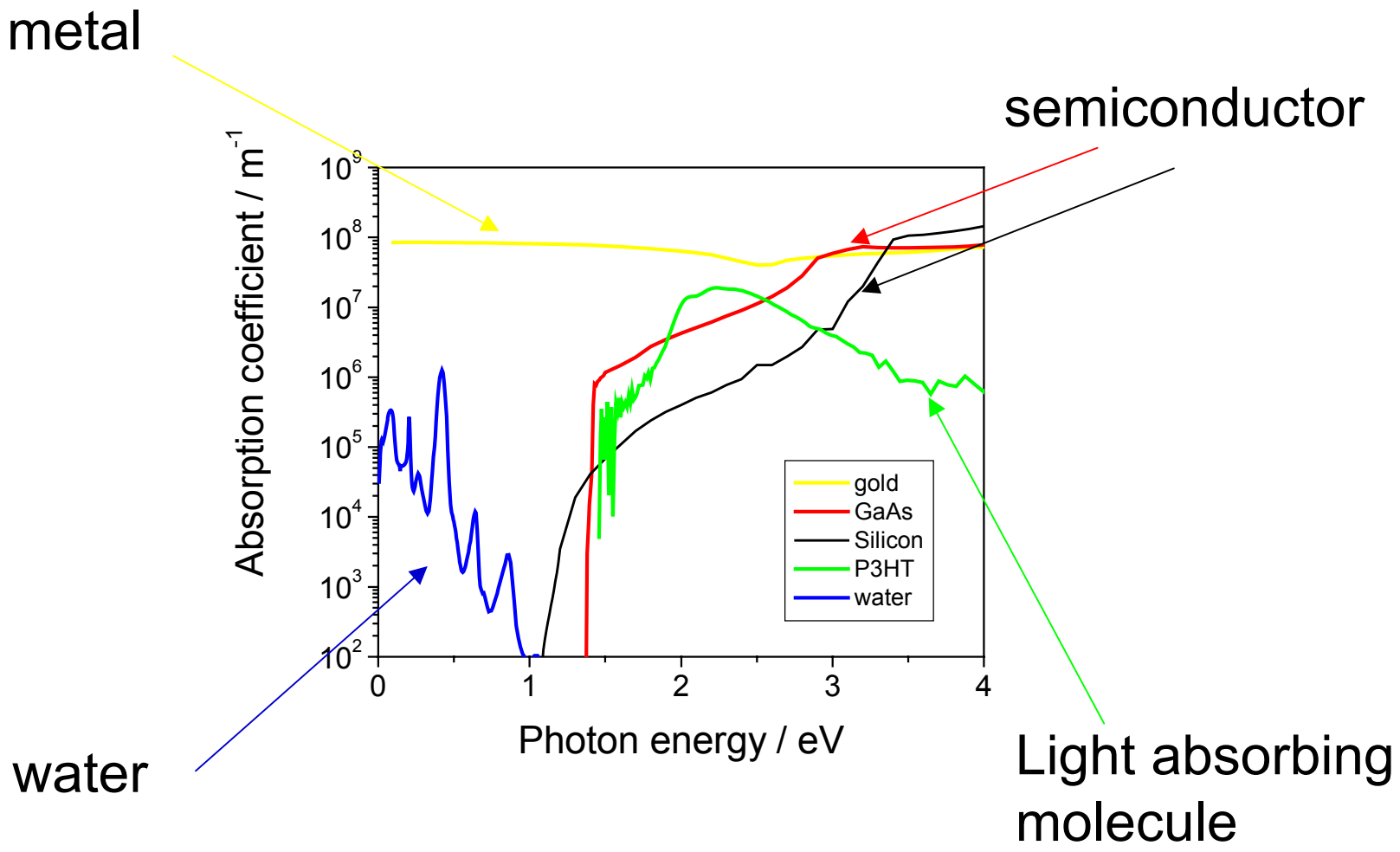
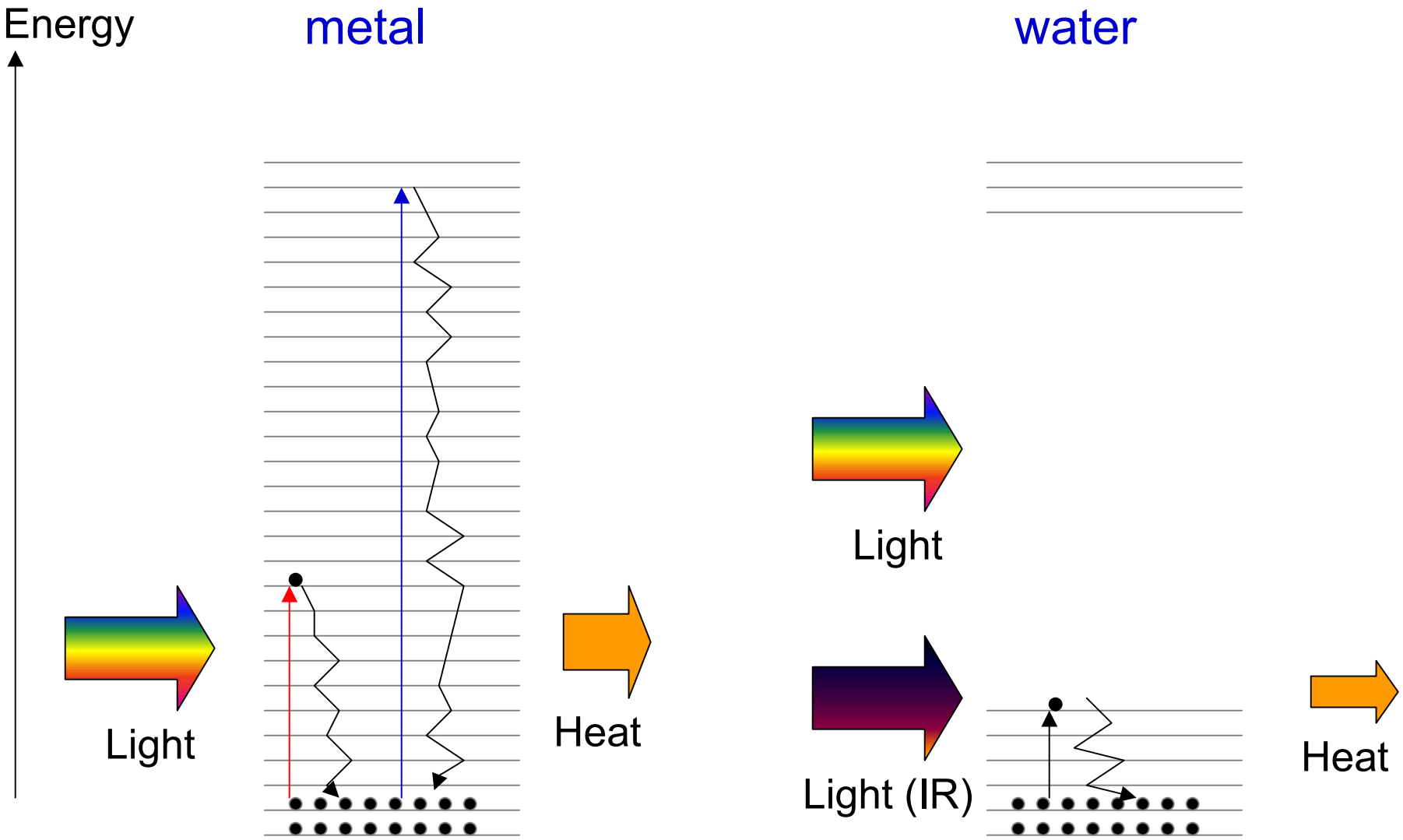
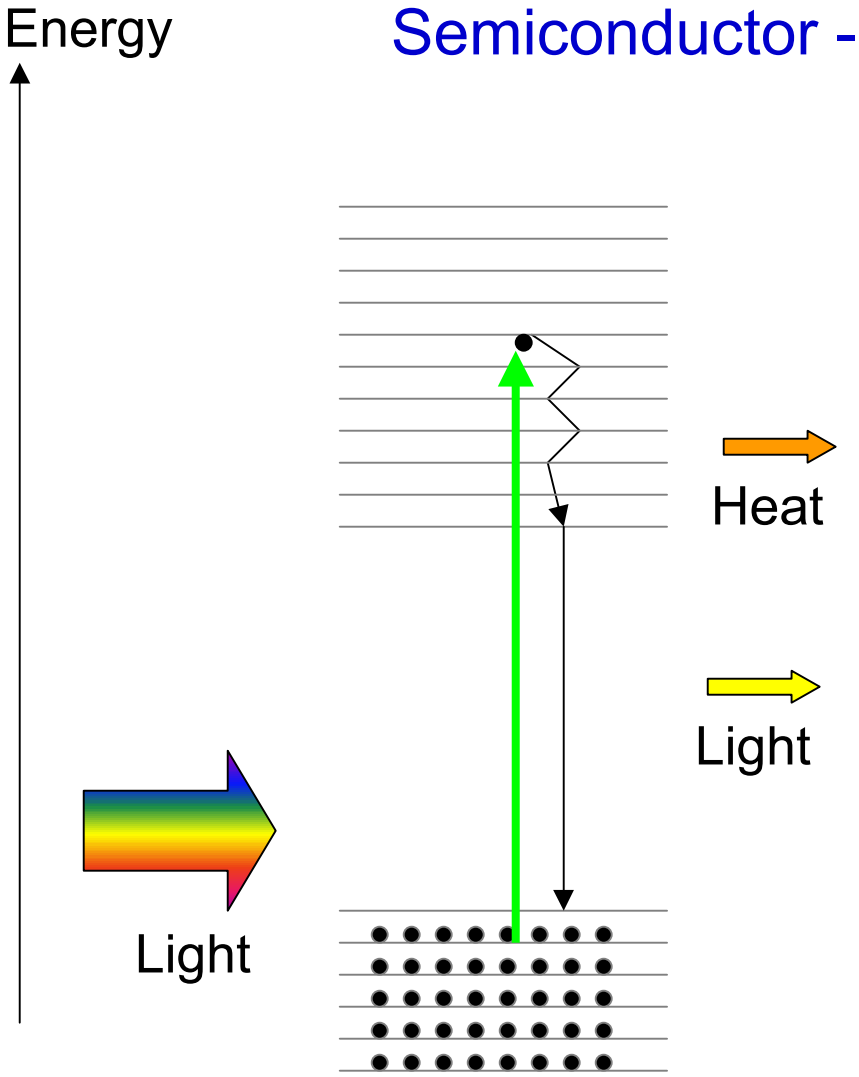

Core electron transitions
and ionisation
Valence electron transitions
shorter
wavelength
longer
Ultraviolet
Visible
IR
Microwave
Molecule Dissociates
Molecule Vibrates
Molecule Rotates

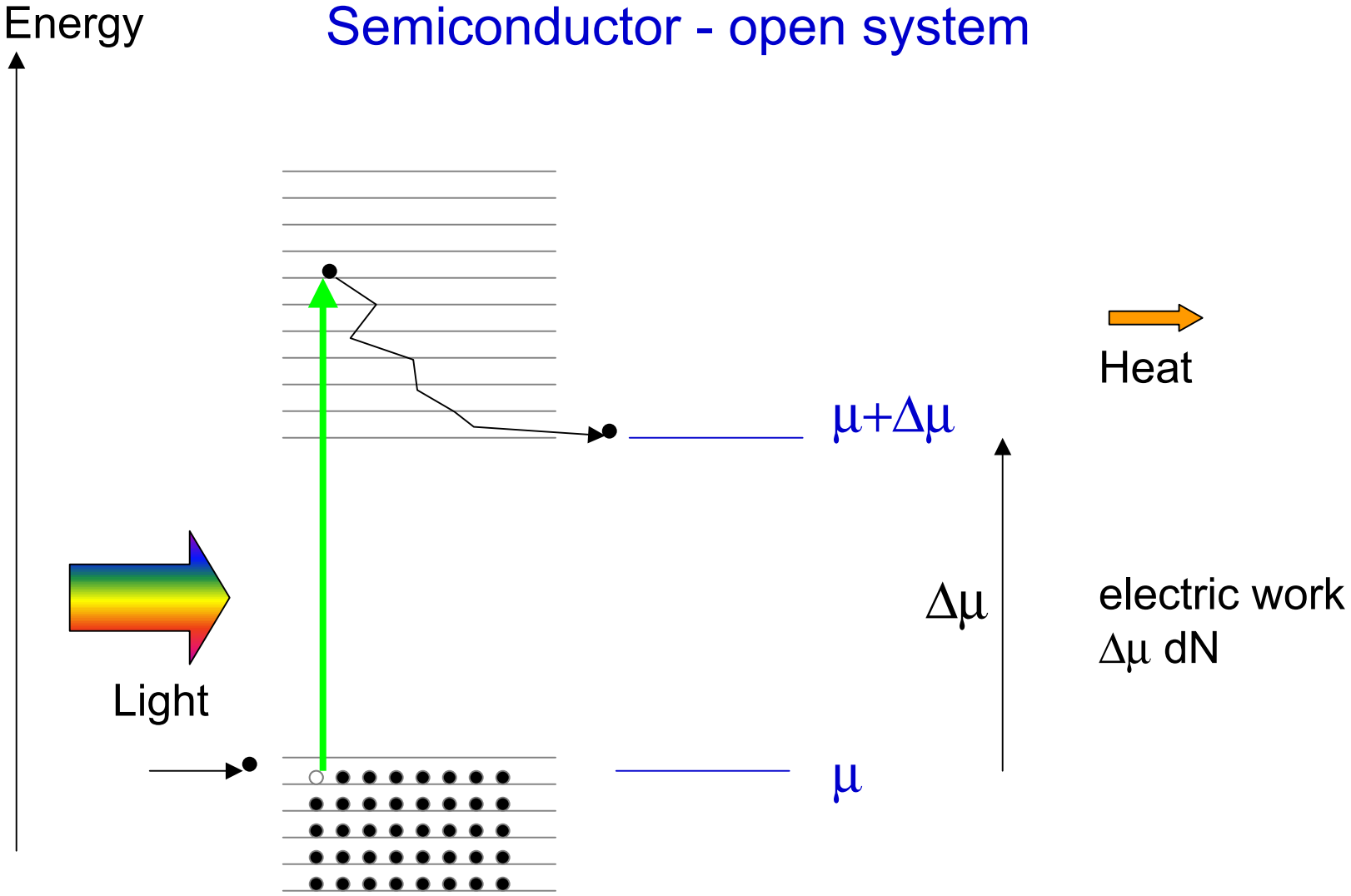

metal
semiconductor
water
Light absorbing molecule
Absorption coefficient / m-1
Photon energy / eV
gold
GaAs
Silicon
P3HT
water

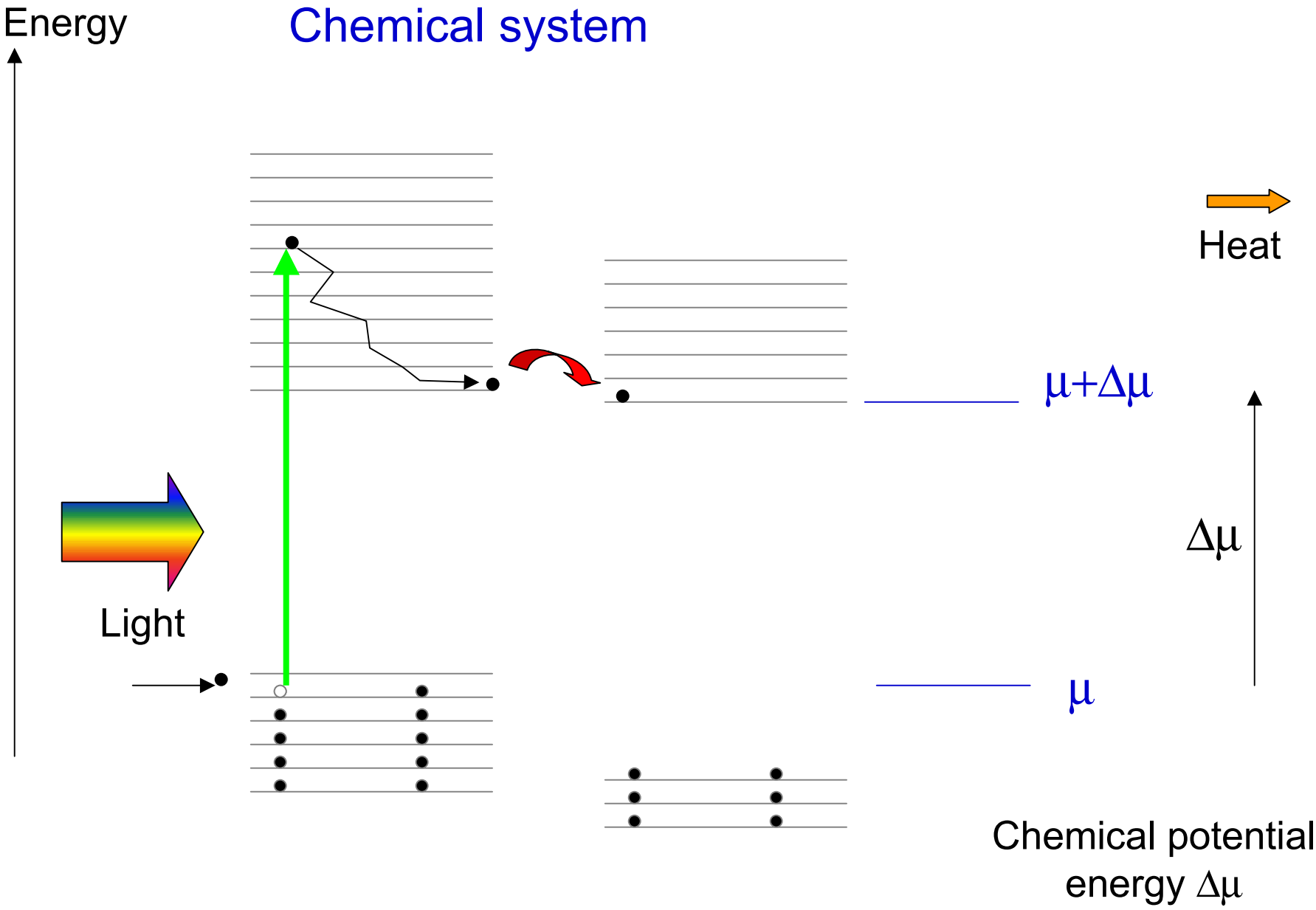

Energy
metal
water
Light
Heat
Light
Light (IR)
Heat

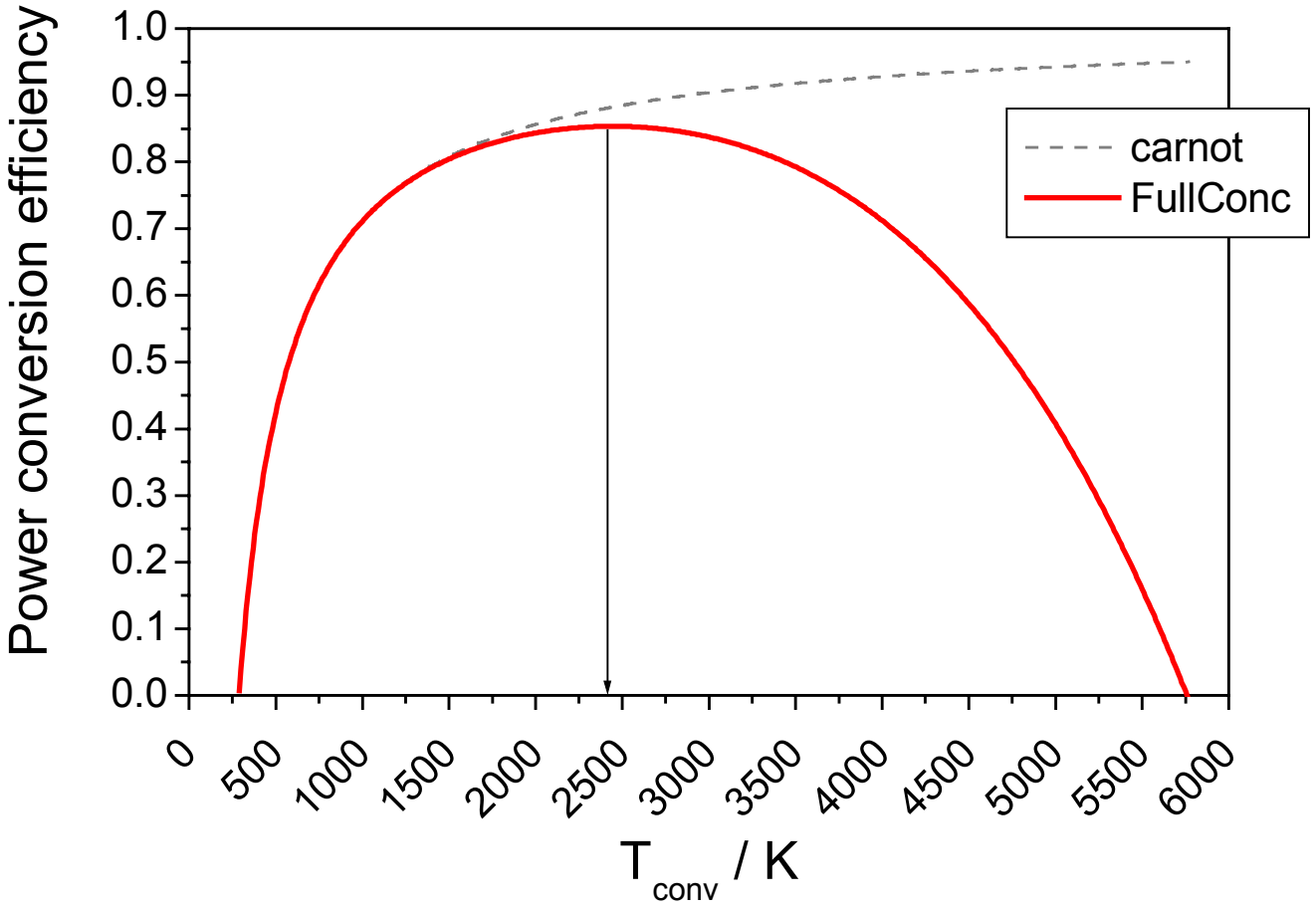
Semiconductor - closed system



Semiconductor - open system




Energy
Chemical system
Heat
μ+Δμ
Δμ
Light
μ
Chemical potential
energy Δμ


Power conversion efficiency
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
T conv / K
carnot
FullConc

Summary of Lecture 17

- Visible photon absorption causes electronic transitions
- Black solids: thermalisation and radiation $\Rightarrow$ HEAT
- Semiconductor, open system: electron motion with excess chemical potential energy $\Delta\mu \Rightarrow$ ELECTRIC WORK
- Chemical open system: electron transfer with $\Delta\mu \Rightarrow$ CHEMICAL POTENTIAL ENERGY
- The simplest solar energy converter comprises a hot body exchanging radiation with Sun, coupled to a heat engine