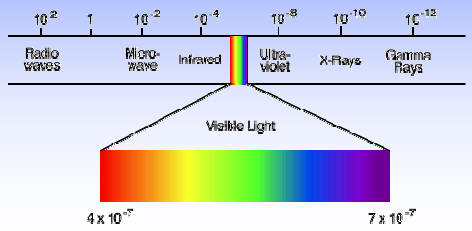
Quantization of Energy

1

Max Planck (1858-1947)
Solved the "ultraviolet catastrophe"



Quantization of Energy

2

An object can gain or lose energy by absorbing or emitting a specific amount of energy called a **QUANTA**.

Energy of radiation is proportional to frequency

$$E = h \cdot f$$

h = Planck's constant = 6.6262×10^{-34} J•s

Quantization of Energy

3

$$E = h \cdot f$$

Light with large λ (small f) has a small E.

Light with a short λ (large f) has a large E.

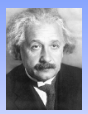
http://colossus.chem.umass.edu/bvining/downloads/chemland2/ElectroMagneticSpectrum.htm

4

Photoelectric Effect

Classical theory said that E of ejected electron should increase with increase in light intensity—not observed!

- No e^- observed until light of a certain minimum E is used.
- Number of e^- ejected depends on light intensity.



A. Einstein
(1879-1955)

5

How is the photoelectric effect *used*?

- ***Calculators*** use photoelectric cells to convert light energy into electrical energy.

6

Photoelectric Effect:

- Albert Einstein proposed that EM radiation has BOTH particle and wave properties!
- Think of a beam of light as being made up of a stream of tiny particles called PHOTONS.
- A PHOTON is particle of EM radiation with NO MASS and has a QUANTUM of energy.