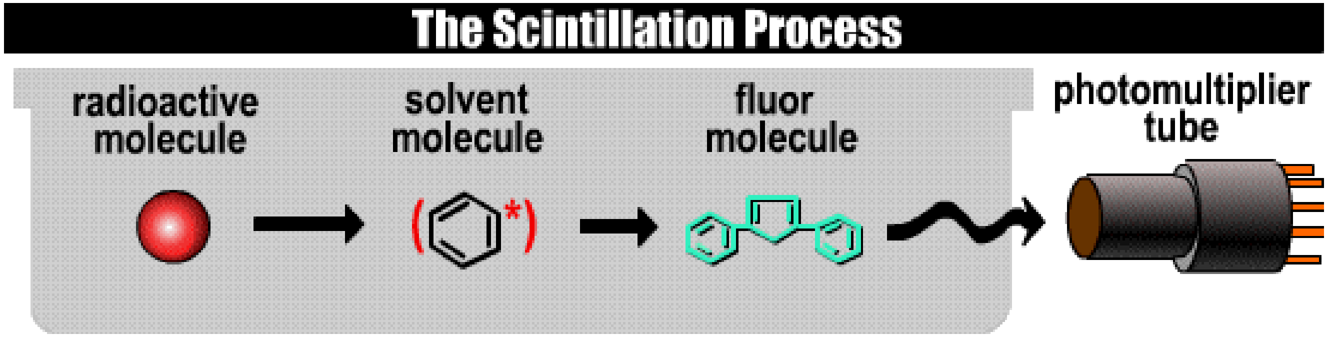
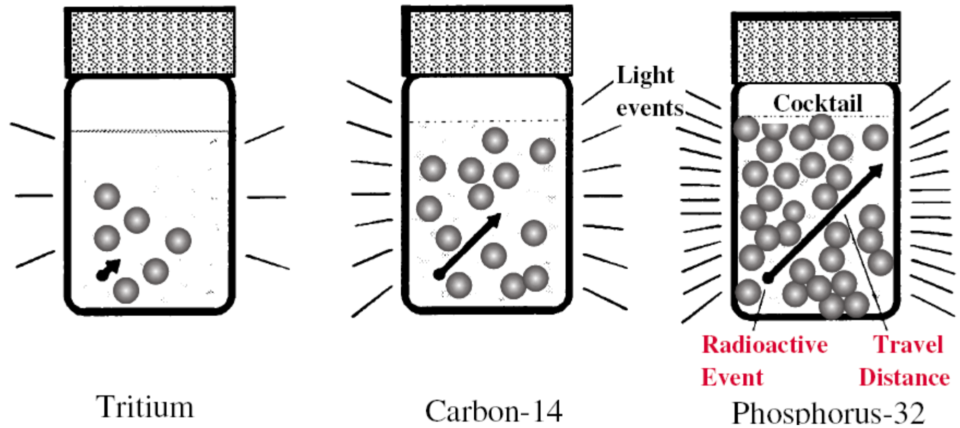
Scintillation Counter

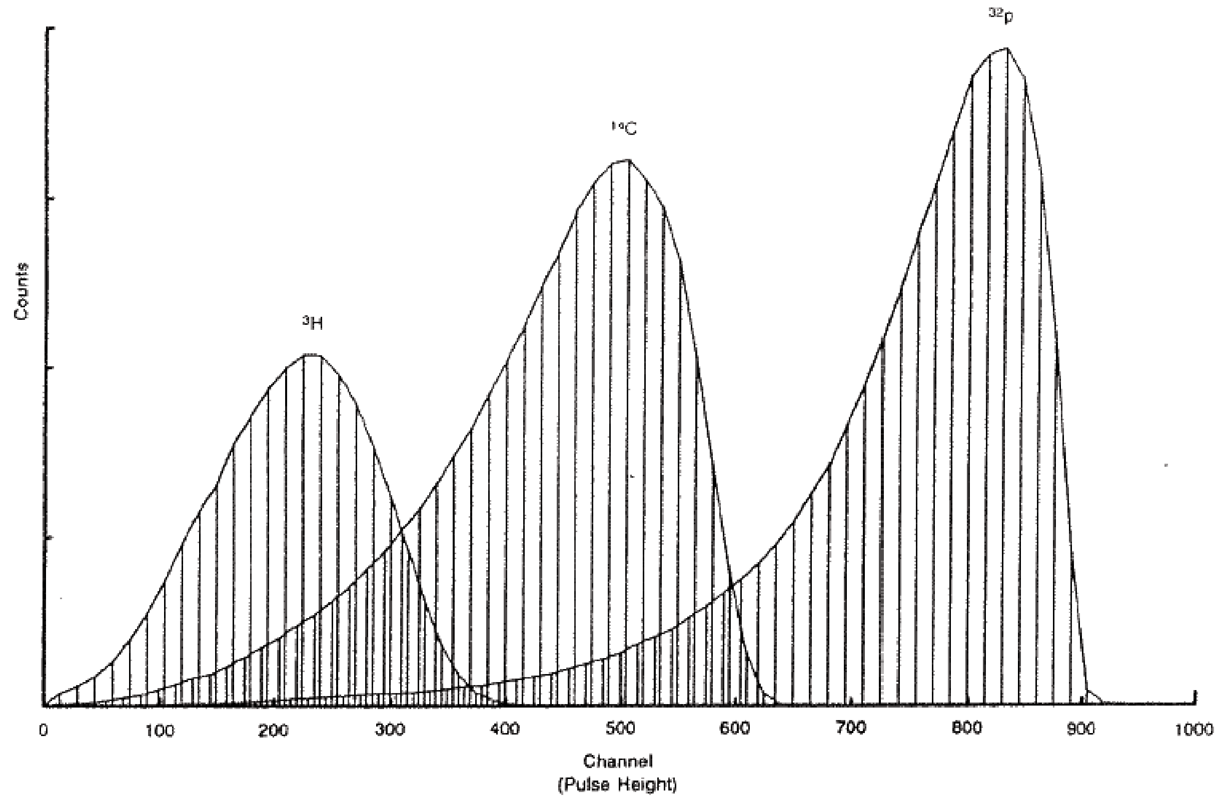


- Scintillation Cocktail contains solvent and fluor (or solute) molecules.
- Solvent is good at capturing energy of β-particle (electron), but does not produce light.
- A fluor molecule enters an excited state following interaction with excited solvent.
- The excited fluor molecule decays to ground state by emitting light (usually in blue wavelength)
- Blue light is detected by photomultiplier tube (usually two PMT are used to minimize PMT errors.

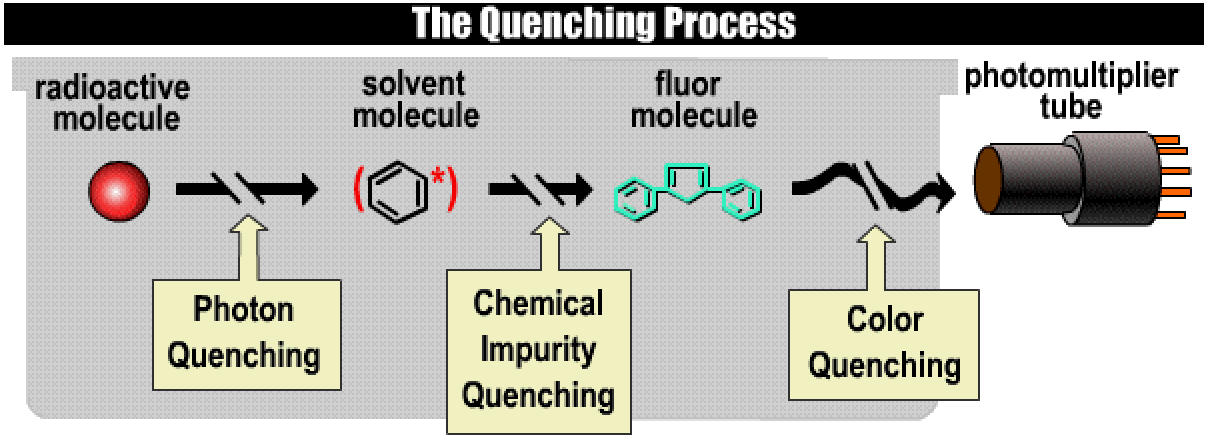
β-Energy and Light Intensity

Stronger β emitters generate stronger pulses of light, so that ^{3}H , ^{14}C, and ^{32}P can all be distinguished and counted at the same time.

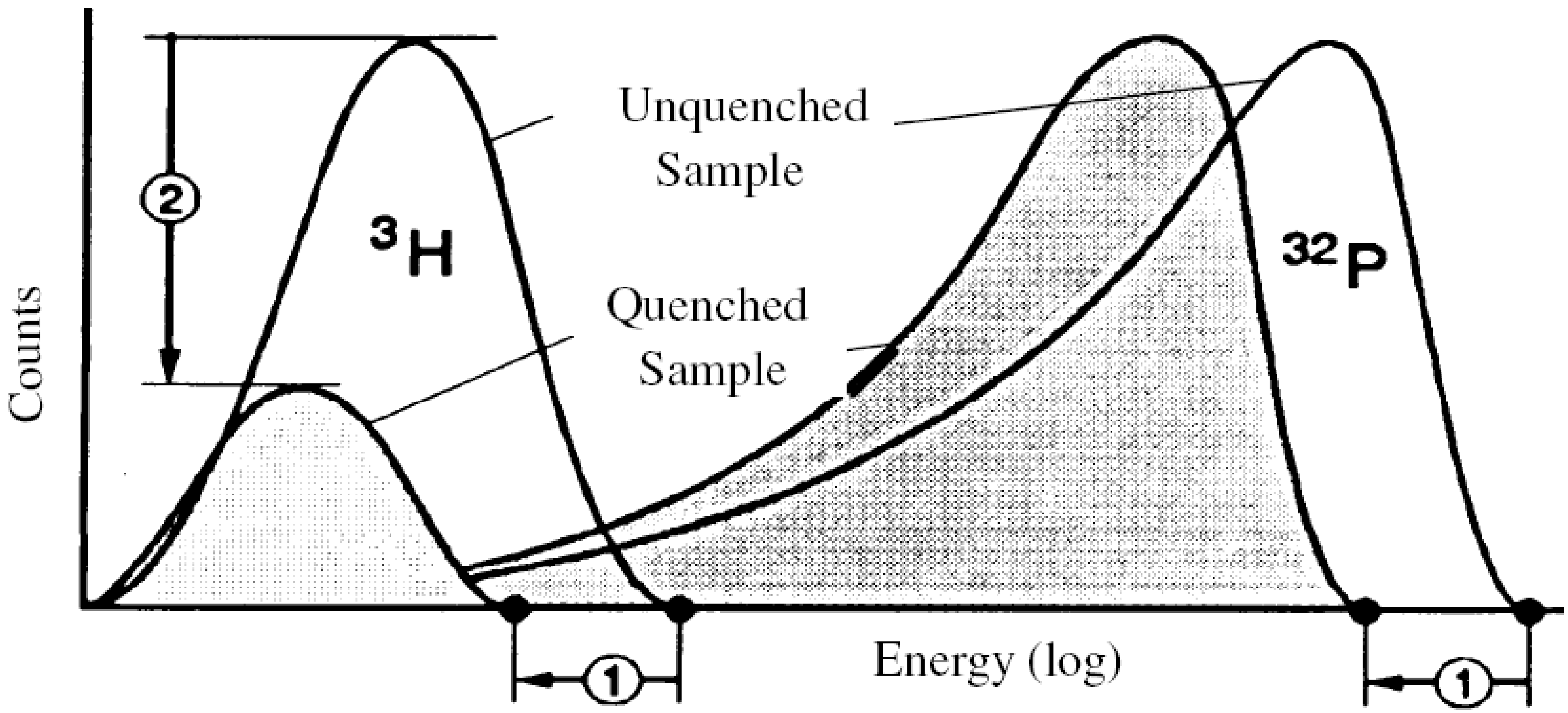




Quenching

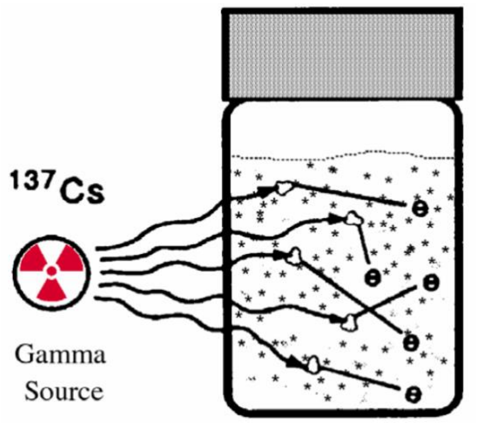


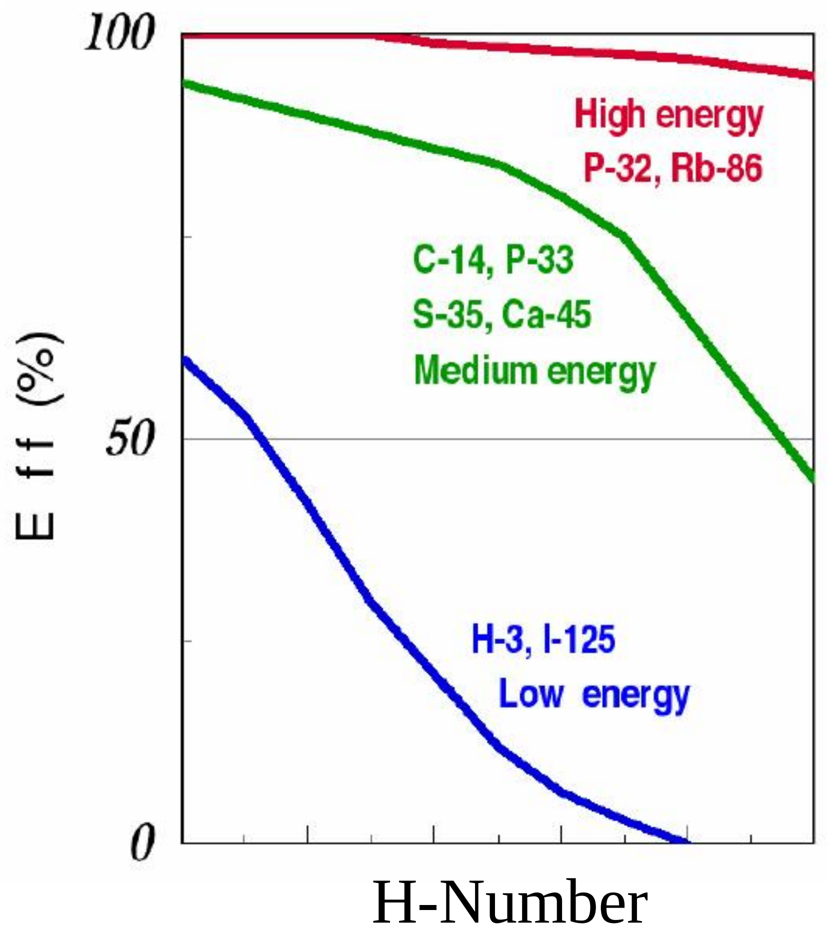
Effects of Quenching

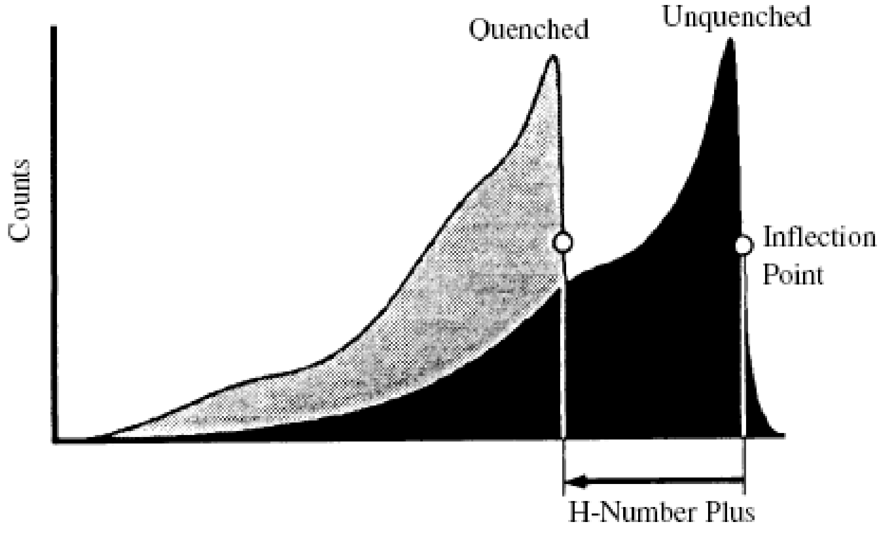


Beckman's H#

Compton electrons





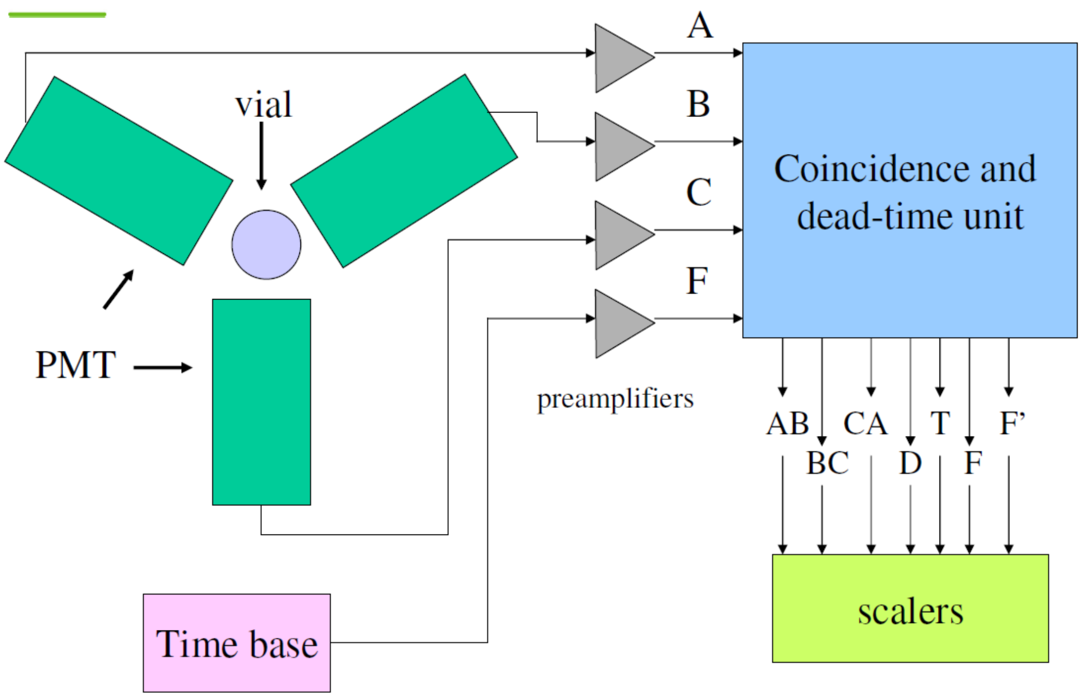


The larger the H number the greater the quenching

Hidex 300 SL

Triple to Double Coincidence Ratio (TDCR) method

$$\frac{\varepsilon_T}{\varepsilon_D} = \frac{\int_0^{E_{max}} S(E)\left(1-e^{-\frac{\nu m}{3}}\right)^3 dE}{\int_0^{E_{max}} S(E)\left(3\left(1-e^{-\frac{\nu m}{3}}\right)^2 - 2\left(1-e^{-\frac{\nu m}{3}}\right)^3\right) dE}$$



$$m = \alpha \int_0^E \frac{dE}{1 + kB\frac{dE}{dx}}$$

$$\frac{T}{D} = \frac{\varepsilon_T(\nu\alpha)}{\varepsilon_D(\nu\alpha)} = TDCR$$

Measured