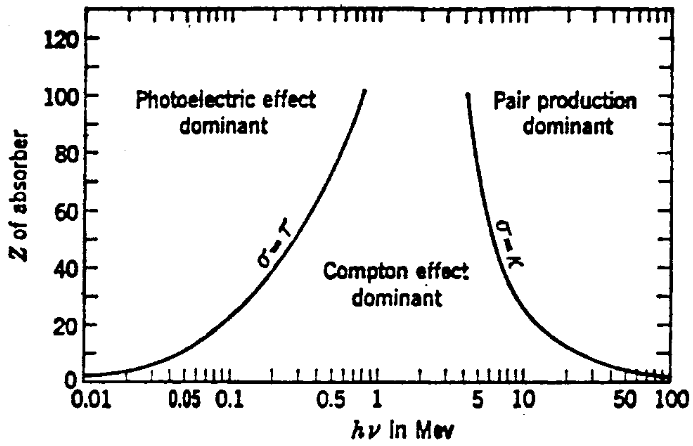

Figure 1.1: Relative importance of the three major types of γ-ray interaction. The lines show the values of Z and $h\nu$ for which the two neighboring effects are just equal.

photomultiplier attached to the crystal. Materials to be used as scintillators must of course be transparent to their own light so that it can be seen by the photomultiplier. A discussion of organic and inorganic materials suitable for scintillators is given in an appendix. In this experiment we use an inorganic crystal, NaI, as a scintillator.

If monoenergetic gammas interact in the NaI crystal the pulses produced by the photomultiplier will not all be if the same height but will show a certain distribution in height. A "pulse height spectrum" is obtained by plotting a graph of the number of pulses per unit time versus pulse height. The feature of these pulse height spectra can be understood in terms of the interaction the gamma undergoes in the crystal.

In the photoelectric effect and pair production all of the gamma ray energy in converted to electron (or positron) energy. Path lengths of charged particles are short so there is a good chance for all of the energy being absorbed in the crystal. In Compton scattering, however, part of the energy is converted to electron energy and part remains in the scattered photon. The scattered photon may interact again in the crystal by a second Compton scattering or by photoelectric absorption, but in some cases the scattered gamma ray escapes the crystal, carrying its energy with it.