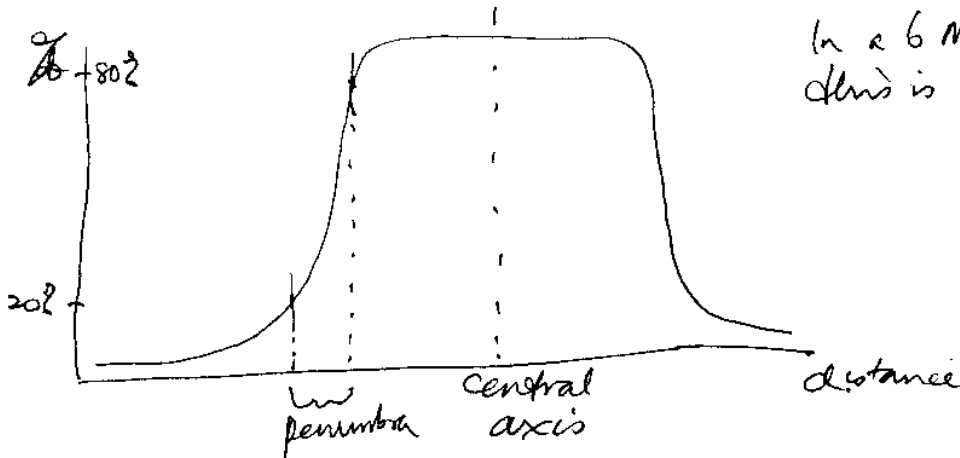


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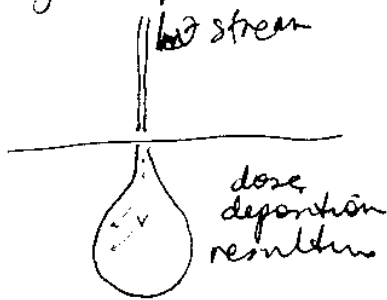
- a) Penumbra is the lateral fall off in the radiation beam. It does not have a sharp edge, so the smear of dose (usually between 20% - 80% is called "penumbra").



- b) Penumbra results from 3 physical mechanisms which give them names to subtypes

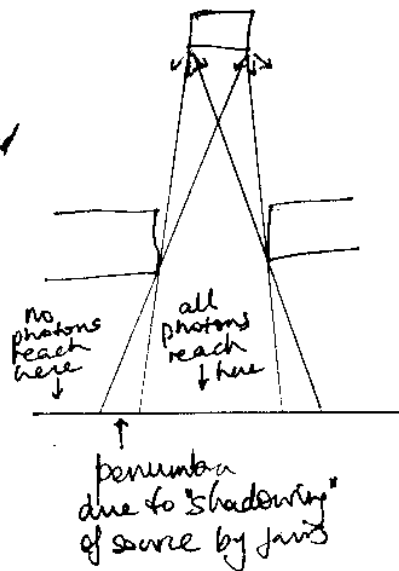
a) PHYSICAL PENUMBRA

results from the lateral scatter of ionised electrons released by the photon-matter interactions. Although most are forward scattered, interactions spread the dose, as represented by this pencil beam



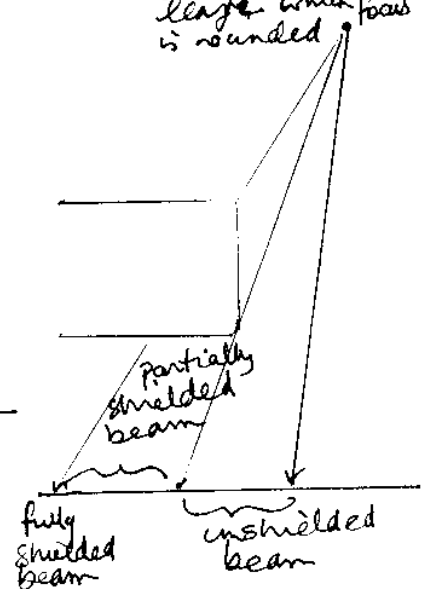
b) GEOMETRIC PENUMBRA

results from a focal spot with a width. This is small for linear beams but more significant for the 2cm wide Co source



c) TRANSMISSION PENUMBRA

results from engineering decisions that use a NON-FOCUSED jaw or shield e.g. VARIAN MLC leaves which focus is rounded



- c) Large penumbras are good for junction because overlaps are less affected by slight changes in position, \therefore hot + cold spots are minor. Large penumbras are bad for non-junctioning because the dose fall off in areas not needing treatment is wider, so irradiating normal tissues + \uparrow likelihood of acute + late side effects unnecessary. Small penumbras are the reverse, when junctioning a small penumbra makes inaccurate setup more likely to be a no dose or double dose situation, and for non-junctioning it gives sharp dose fall off to minimise side effects.