Radiation Oncology Physics *(20hrs)*

	Recommended minimum physics detail to pass assignment
• Give a brief account of nuclear transformation and its resultant particles	Atomic Structure, Nuclear structure; Radioactivation; Nuclear transformations; emitted particles (α, β and γ particles; positrons; neutrino & antineutrino)
• Describe the atomic transformations that generate these particles	Alpha decay Beta (β -, β +, electron capture) decay Gamma (pure, Internal Conversion) decay Metastable states
• Describe the components in your linear accelerator that modify the output of the wave guide	These components are all AFTER the wave guide, i.e., beam collimation and monitoring system (exit window, bending magnet, scattering foil, target, flattening filter, ion chambers, light field/range finder, collimators (primary/secondary/MLC -please note difference between the three manufacturers), accessory tray, interlocks
• Describe the rationale and use of the Geiger-Muller tube in the use of radionuclides	Principles of Radiation Protection Acceptable Dose Levels at Discharge
• Obtain an EPI and Xray image of the pelvis. Describe in detail the importance and involvement of photon matter interactions (PEE, Compton, PP) that produce the differences between the images	Detailed description of the interaction of photons with matter, matter of different density, matter of different composition; f-factor.
• Describe the attenuation of photon beams in detail	Detailed description of photon attenuation Half Value Layer Mass Attenuation Coefficient (Energy Transfer) Linear Attenuation Coefficient (Energy Transfer/Energy Absorption) MAC for Pb/H_2O at increasing energy
• [Planning exercise] You are attempting to treat an immobile pelvic object (a cylinder with a 8.0cm radius and 10.0cm length in the central pelvis centred on the prostate). After generating the object, define the PTV and then describe the exact field size needed to provide adequate dose to the target. Explain in detail the disparity between target size and field size in all dimensions. Produce one plan that represents a SAD technique and another for a SSD technique. Explain which is more useful.	Detailed and accurate description of physical penumbra. Must use the Planning System to demonstrate the size of the penumbra (TPS image required), distance between 95% isodose and target is to be minimized understands the use of 95% isodose covering target area describes the different penumbral width at the sup/inf margins defines the PTV by auto-expansion (i.e., object vol = PTV vol) Definition of SAD & SSD technique, appreciation of use implications for delivering treatment.
• Describe the changes in dose deposition profile occurring for photon beams of different energies (6MV vs. >9MV), different field sizes (5cm vs. 10 cm), central blocking, wedging and changing normalisation point	