CMSA

FC Rad Onc(SA) Part I, Paper 1 - Physics

Questions 1 & 2 (50%)

Topic	Sub-topic (covering all radiation therapy modalities)	Khan reference	Podgorsak reference	Knowledge units		
Basic Radiation Physics	Classification of radiation		1.1.5-7	Classification of fundamental particles	Direct / indirect ionization	Classification of
	Wave and quantum models of radiation	Chapter 1,3,5	Add. notes	Energy and wavelength	Energy spectrum	
	Atomic and nuclear structure		1.2	Nucleus, orbital shells, energy levels, binding energy	Particles - proton, electron, neutron, positron	Atomic number,
	Radioactivity and decay	Chapter 2	1.2.6 1.2.7 1.2.9	Decay processes, half life	Parent-daughter relationships, equilibrium	Nuclear reactions,
	Interactions with matter / processes, attenuation, scatter,	Chapter 5	1.3 1.4 Add. notes 1.2.6 4.4	Absorption, scatter; LET; elastic and inelastic	Photoelectric, Compton effect, Pair Production.	Interactions of
	Radiation quantities and units	Chapter 7,8	1.1.9 and Ch 2 6.2 6.3	Fluence, KERMA, dose, Exposure	Absobed dose	Doserate
				Mono- and hetero-energetic photon beams	Calculation of absorbed dose from exposure	Relationship between
Treatment Units	Design/construction/field size definition / beam production	Chapter 3,4,15,16, Notes	Ch 5 13.1-2	Physical concepts of beam production; characteristics	Equipment design, selection, specification and	Linear accelerators;
	Physical aspects of beams: Quantities, %DD, PSF, TMR, OARs.	Chapter 9,10,14,26	Ch 6	Photon, electron and particle beams	ISL, BSF, Electron build up, PDD, EqSq, TAR	
Quality Assurance	Measurement - Dosimeters	Chapter 6 & 8	Ch 3	Ion chambers	Other methods	
	Calibration - principles	Chapter 8 + TRS 398	Ch 9	Instruments, phantoms	Protocols, corrections	Beam quality
	Acceptance tests and commissioning	Chapter 17, RSA Legislation, License Conditions	Ch 10 13.7-8	DoH Radiation Control Legislation	SASQART	
	Routine QA		12..1 -2 12.4 13.9	Goals	Roles and duties, staffing	Linac QA
Radiation Protection	Radiation monitoring instruments		Ch 4	Area survey meters	Individual monitoring	
	Radiation effects	Chapter 16; DoH Radiation Control Legislation, Notes	16.2	Deterministic	Stoachastic	- on embryo and
	Quantities and units.		16.5	Physical quantities	Equivalent (RBE) dose	Effective dose
	Basic framework and standards		16.6	ALARA	ICRP dose limits	Regulations and
	Dose estimation - MIRD	Notes	Add. notes 16.5.2.4	Committed dose		
	Shielding		16.10 16.17-19	Principles	Room design	Neutron shielding
	Safety of operation	Chapter 16; DoH Radiation Control Legislation	16.11 16.11.2	Teletherapy equipment	Source storage	Incident reporting
	Types of exposure		16.4 16.13-15	Medical exposure, prevention of accidental exposure	Occupational exposure	Public exposure
	Dose minimization practices and procedures. Time, Distance,		Add. notes	Radiation protection issues with imaging		

Questions 3 & 4 (50%)

Topic	Sub-topic (covering all radiation therapy modalities)		Podgorsak reference	Knowledge units		
Imaging	Diagnostic imaging		Add. notes	Priniciples of image production	Routine imaging principles	Processors
	Modalities available for treatment planning	Chapter 12.1 - 3; Add notes	Add. notes, 15.11	CT, US	MRI.	SPECT, PET, PET-
	Simulation equipment		5.9	Simulators	CT-Sims	DRR, EPID, CBCT
	Image fusion / registration	Chapter 19.2	Add. notes, 15.11	Merging systems	Evaluation tools	
Patient Positioning	Immobilization / positioning	Chapter 12.7 + Notes	7.4	Immobilisation devices / methods	Positioning devices / methods	Simulation
	In-room imaging and dose measurements	Chaper 12.3		CBCT, Portal imaging	Position verification	
Treatment Planning	Target volume & OAR delineation.	Chapter 11.8,14	7.2	ICRU 50 & 62	GTV / CTV / PTV / ITV	Margins
	Dose specification and reporting (ICRU)		7.3, 8.3.1	Photons	Electrons	
	Patient data acquisition	Chapter 19.2	7.4.1 & 2	Need for patient data	Nature of patient data	Other
	Beam modifiers	Chapter 11.4, 12.5, 13.1-3,14	7.5.2 7.5.3 7.5.4	Wedges, blocks	Bolus	Compensators
	Beam corrections	Chapter 12.4-5,14	7.5.5 7.5.6	Surface, obliquity	Heterogeneities	
	Beam combinations	Chapter 11 & 13.4	7.5.7	Matching	Adjoining fields	Co-planar beams
	3D Conformal RT, Dynamic MLC, IMRT, VMAT, QA	Chapter 11,13,19 & 20	15.7	Defs. and goals vs traditional RT	Prescription, Dose constraints	Inverse planning and
	Plan evaluation		7.6	Isodoses	DVH	Special dosimetry
	Electron beams	Chapter 14	8.3	PDD, interactions, obliquaty, selection of energy	Dose statistics	Clinical
	Manual dose calculation	Chapter 10	7.7	SSD setup	SAD setup	Output factor, F/S
	Computerized treatment planning systems	Chapter 19.3	Ch 11.	Hardware	Algorithms	Data acquisition
				Commisioning and QA		
Treatment delivery QA		Chapter 12 + Notes	12.4 7.6.5	Patient charts	Portal imaging	In-vivo dosimetry
			R&V systems 11.3.6	CBCT		
Special topics	Techniques and equipment. Anthropomorphic	Chapters 9.1; 14, 15; 18; 21-26	Ch 15.	Stereotactic radiosurgery (intra-and extra-cranial SRS	Total Body Irradiation (TBI), Total skin electron	Intraoperative
				Conformal radiotherapy, IMRT, VMAT	HDR / LDR brachytherapy	IGRT, ART, Gated
	Informatics	Notes	Add. notes	DICOM 11.4.3	Networking	PACS

Core knowledge: 80-85%

Extra: 15-20%