FCPS Part-1 Guideline

Radiology & Imaging

FCPS part-1 Exam system:

- One Paper
- 150 questions (75 MCQ + 75 SBA)
- 300 marks
- 1-day long exam, 4 hours time
- Twice per year (December & June).

Subjects:

1. Anatomy
2. General & Systemic pathology
3. Radiological physics & radiobiology
4. Microbiology & Immunology
5. Biochemistry
6. Biostatistics

Book list:

Anatomy, Embryology & Histology	Radiological physics & radiobiology	Other Basics
• **Textbook- BD Chaurasia/ Vishram Singh** • **Netter/ Atlas** • Synapse lecture sheets	• **Selman (10th edition)** • **Christensen** • **K Thalyan** • **MRI made easy for beginners (2nd ed)** • **Synapse Lecture Sheet** for Radiological Physics (4th edition)	Synapse Lecture sheet Robbins Pathology (selected topics) Lange Microbiology

Radiology And Imaging FCPS Part 1 Curriculum

Paper I

ANATOMY CONTENT

This syllabus is intended as a guide and general indication to the breadth of the topics that my appear in the examination questions. It is not a teaching plan and the bullet points do not relate to equal amounts of study time.

1. Head & Neck

1.1 Brain

- Ventricles and CSF spaces
- Arteries and venous sinuses
- Basal nuclei and major white matter tracts
- Cerebrum and cerebellum
- Cranial nerves
- Pituitary and juxta sellar structures

1.2 Skull

- Calvaria and base of skull

1.3 Face and neck

- Arteries and veins
- Sinuses
- Orbit and contents
- Facial skeleton
- Tongue and oral cavity
- Lymph node groups
- Larynx and pharynx
- Thyroid and parathyroid
- Salivary glands

2. Thorax

2.1 Cardiovascular

- Mediastinum, pericardium and lymph node groups
- Cardiac chambers, valves, arteries and veins
- Great vessels and azygous / hemi-azygous system

2.2 Bronchopulmonary

- Trachea, lobar and segmental bronchi
- Pulmonary vasculature
- Pleura and fissures

2.3 Chest wall and diaphragm 2.4 Breast and axilla

3. Abdomen and Pelvis

3.1 Bowel

- Oesophagus and stomach
- Duodenum, small bowel and appendix
- Colon, rectum and anus

3.2 Upper Abdominal Viscera

- Liver segments and blood vessels
- Biliary tree and gall bladder
- Pancreas, adrenals and spleen

3.3 Abdominal wall

3.4 Spaces and planes

- Perirenal and pararenal spaces and fasciae

- Peritoneal reflections and spaces
- Mesentery and omentum

3.5 Genitourinary tract

- Kidneys and pelvicalyceal systems
- Ureters and bladder
- Prostate, seminal vesicles and urethra
- Testes and epididymis

3.6 Gynaecology

- Ovaries and fallopian tubes
- Uterus and cervix
- Vagina

3.7 Vascular supply

- Portal venous system
- Aorta and major branches
- NC and tributaries
- Azygous system

3.8 Lymph node groups

4. Musculoskeletal system

4.1 Spine

- Vertebrae, sacrum and joints
- Paraspinal muscles and ligaments
- Spinal cord, cauda equina and nerve roots

4.2 Upper Limb

- Bones and joints, including shoulder
- Muscles and nerves

- Blood vessels

4.3 Lower Limb

- Bones and joints, including pelvis
- Muscles and nerves
- Blood vessels

Guideline for setting questions for FCPS Part 1, Paper 1 (Anatomy)

MCQ-25, SBA-25

Serial	Chapter	No. of question
01	Embryology	03-05
02	Histology	03-05
03	Osteology & arthrology	06-08
04	Myology	03-05
05	Neurology	07-08
06	GIT	06-08
07	Hepatobiliary system	03-05
08	Genito-urinary system	05-08
09	Respiratory system	05-08
10	CVS	05-08
11	Endocrine	02-04
12	Breast	02-04

Paper-II

Radiological Physics (Radiology & Imaging):

Section I: Basic Concepts

1. Introduction to Medical Imaging

1.1 The modalities

1.2 Image properties

2. Radiation and the Atom

2.1 Radiation

2.2 Structure of the Atom

2.3 Electromagnetic spectrum, wave concept and particle concept of electromagnetic radiation.

3. Interaction of Radiation with Matter

3.1 Particle interactions

3.2 X-ray and Gamma-Ray Interaction

3.3 Attenuation of X-rays and gamma rays

3.4 Absorption of Energy from X-rays and gamma rays

3.5 Imparted energy, equivalent dose, and Effective dose

4. Image Quality:

4.1 Spatial resolution

4.2 Convolution

4.3 Physical Mechanisms of Blurring

4.4 The Frequency domain

4.5 Contract resolution

4.6 Noise texture: The noise power spectrum

4.7 Contrast

4.8 Contrast-to-Noise Ratio

4.9 Signal — to- Noise Ratio

4.10 Contrast-detail Diagrams

4.11 Detective Quantum Efficiency

4.12 Receiver operating characteristic curves

5. Medical Imaging Informatics

5.1 Analog and digital representation of Data

5.2 Digital Radiological Images

5.3 Digital Computers

5.4 Information storage devices

5.5 Display of digital images

5.6 Computer networks
5.7 PACS and teleradiology
5.8 Image processing
5.9 Security, including availability

Section-II: Diagnostic Radiology

6. X-ray

6.1 Production of X-ray
6.2 X-ray tubes
6.3 X-ray generator
6.4 Power ratings and Heat Loading & Cooling
6.5 Factors affecting X-ray emission
6.6 Filters, X- Ray Beam Restrictors, Grid

7. Radiography

7.1 Geometry of projection radiography
7.2 Screen —film Radiography, Luminescent Screens,
7.3 Physical characteristics of-Ray film and film processing, Photographic characteristics
7.4 Fluoroscopic Imaging
7.5 The Radiographic Image
7.6 Computed radiography, Digital Radiography, Digital Subtraction Imaging
7.7 Charge-X Coupled device and complementary metal-Oxide semiconductor
7.8 Flat panel thin-film-Transistor Array detectors
7.9 Technique Factors in Radiography
7.10 Scintillators and intensifying screens
7.11 Absorption efficiency and conversion efficiency
7.12 Radiographic detectors, patient dose, and exposure index
7.13 Dual-Energy Radiography
7.14 Scattered radiation in Projection Radiographic Imaging

8. Mammography

8.1 X-ray tube and beam filtration
8.2 X-ray generator and photo timer system
8.3 Compression, scattered radiation and Magnification
8.4 Screen-Film cassettes and film procession
8.5 Digital Mammography
8.6 Radiation Dosimetry
8.7 Regulatory Requirements

9. Fluoroscopy

9.1 Functionality
9.2 Fluoroscopic imaging chain components
9.3 Fluoroscopic detector systems
9.4 Automatic exposure rate control
9.5 Fluoroscopy modes of operation
9.6 Image quality in fluoroscopy
9.7 Fluoroscopy suites
9.8 Radiation dose

10. Computed tomography

10.1 Clinical Use
10.2 CT system designs
10.3 Modes of CT acquisition
10.4 CT reconstruction
10.5 Image quality in CT
10.6 CT image artifacts
10.7 CT Generators

11. X-ray dosimetry in protection imaging and computed tomography

11.1 Attenuation of x-rays in tissue
11.2 Dose-related metrics in radiography and fluoroscopy
11.3 Monte Carlo dose computation

11.4 Equivalent dose
11.5 Organ doses from X-ray procedures
11.6 Effective dose
11.7 Absorbed dose in radiography and fluoroscopy
11.8 CT dosimetry and organ doses
11.9 Computation of Radiation risk to the generic patient
11.10 Computation of patient specific radiation risk estimates
11.11 Diagnostic references levels
11.12 Increasing radiation burden from medical imaging
11 .13 Summary: Dose estimation in patients

12. Magnetic resonance basics: Magnetic fields, nuclear magnetic

12.1 Magnetism, magnetic fields, and magnets
12.2 The magnetic resonance signal
12.3 Magnetization properties of tissue
12.4 Basic acquisition properties of tissue
12.5 Basic pulse sequences
12.6 MR Signal localization
12.7 K-space and acquisition and image reconstruction
12.8 Summary.

13. Magnetic resonance imaging: Advanced image Acquisition Methods, Artifacts, spectroscopy, quality control. Siting

13.1 Image acquisition time
13.2 MR Image characteristics
13.3 Signal from flow
13.4 Magnetization transfer contrast
13.5 MR artifacts
13.6 Magnetic resonance Spectroscopy
13.7 Ancillary components
13.8 Magnet siting, quality control
13.9 MR bio effects and safety
13.10 Summary

14. Ultrasound

14.1 Characteristics of sound
14.2 Interaction of ultrasound with matter
14.3 Ultrasounds transducers
14.4 Ultrasound beam properties
14.5 Image data acquisitJ >
14.6 Two-Dimensional image display & storage
14.7 Doppler ultrasound
14.8 Miscellaneous
14.9 Ultrasound image quality & artifacts
14.10 Ultrasound system performance and quality assurance
14.11 Acoustic power and bio effects

Section III: Nuclear Medicine 15.1

Radionuclide production
15.2 Nuclear transformation

16. Radionuclide production, Radiopharmaceuticals, and internal dosimetry

16.1 Radionuclide production
16.2 Radiopharmaceuticals
16.3 Internal dosimetry
16.4 Regulatory issue

17. Radiation detection and measurement

17.1 Types of detectors and basic principles
17.2 Gas-Filled detectors
17.3 Scintillation detectors
17.4 Semiconductor detectors
17.5 Pulse height spectroscopy
17.6 Nominating detectors applications
17.7 Counting statics

18. Nuclear Imaging —The scintillation camera

18.1 Planar nuclear imaging: The anger scintillation Camera

18.2 Computes in nuclear imaging

19. Nuclear imaging —Emission tomography

19.1 Focal plane Tomography in nuclear medicine

19.2 Single photon emission computed tomography

19.3 Positron emission tomography

19.4 Dual modality imaging-SPECT/CT, and PET/MRI

19.5 Clinical aspects, comparison of PET and SPECT and dose

Section IV: Radiation biology and protection

20. Radiation biology

20.1 Overview.

20.2 Interaction of radiation with tissue.

20.3 Molecular and Cellular Response to Radiation.

20.4 Organ System Response to Radiation.

20.5 Whole Body Response to Radiation the Acute Radiation Syndrome.

20.6 Radiation-Induced Carcinogenesis.

20.7 Hereditary Effects of Radiation Exposure.

20.8 Radiation Effects in Utero.

21. Radiation Protection

21.1 Sources of Exposure to ionizing radiation.

21.2 Personnel Dosimetry.

21.3 Radiation Detection Equipment in Radiation Safety.

21.4 Fundamental Principles and Methods of Exposure Control.

21.5 Structural Shielding of Imaging Facilities.

21.6 Radiation Protection in Diagnostic and Interventional X-ray Imaging.

21.7 Radiation Protection in Nuclear Medicine.

21.8 Regulatory Agencies and Radiation Exposure Limits.

21.9 Prevention of Errors.

21.10 Management of Radiation Safety Programs.

21.11 Imaging of Pregnant and Potentially Pregnant Patients. 21.12 Medical Emergencies involving lonizing Radiation.

Guideline for setting question for FCPS Part 1, Paper-II **50**

Questions of Radiological physics

Serial no.	Chapter	No. of questions
01	Matter, current, magnetism and electromagnetism	08-10
02	Radiation, X-Rays, Interaction Of radiation with matter, absorption of radiation	10-12
03	Radioactivity, isotope, absorbed dose, radiation hazards and protection	08-10
04	X-ray film, screen, film processing, (Both manual & automatic)	06-08
05	Radiographic image & devices for improving radiographic quality.	08-10
06	Special equipment	05-07
07	Special techniques	05-07

Paper-III A.

General Pathology:

- Normal Cell
- Cause of disease, cell-response to injury. Connective tissue
- Normal structure and effects of disease
- Inflammation
- Inflammatory Reaction, wound healing, chronic inflammation, acute pyogenic infection, Disorders of growth
- Tumours
- Effects of ionizing radiation
- Disorders of metabolism

- disorders of nutrition
- Disorders of endocrine function
- Calcium metabolism and heterotrophic calcification
- Thrombosis, embolism
- Ischemia and infarction
- Congestive heart failure
- Renal failure
- Respiratory failure
- Calculi • disorders of bloods.

B. Immunology

- Immune response (humoral and cellular) Immunodeficiency
- Immunosuppression
- Organ trans-plantation and pathophysiology of rejection

C. Genetics

As applied to radiological and imaging practice.

D. Systemic pathology

- Those related to the common radiological conditions
- Like musculoskeletal system, gastrointestinal system, cardiovascular system, respiratory system, genitourinary system, nervous system, endocrine system and breast, skin and subcutaneous tissue etc.

E. Biostatistics

- Basic concepts of biostatistics, definitions, importance, use and limitations. Definitions and concepts, important terms and rates used in medical statistics. Methods of data collection.
- Concepts of sampling.
- Basic concepts of probability.
- Frequency and probability distribution concepts and application in medicine. Methods of displaying and projecting data.

- Correlation and relation. Measures of variability.
- Basic concepts of experimental designs relevant to medical science, clinical trial.
- Test of significance.
- Methods and principles of recording and maintenance of information (Requirement of health information system)

Guideline for setting question in FCPS Part-1 Questions

Serial no	Chapter	No. of Questions
01.	General pathology	10-12
02.	Haematological & reticuloendothelial disorders	04-06
03.	Immunology & genetics	04-06
04.	Microbiology	04-06
05.	Parasitology	03-05
06.	Systemic pathology related to radiological interest	15-16
07.	Biostatistics	03-05
08.	Biochemistry	04-06

For details: https://bcps.edu.bd/