

# 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, 4hours 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
<ul style="list-style-type: none"><li>• <b>Textbook- BD Chaurasia/ Vishram Singh</b></li><li>• <b>Netter/ Atlas</b></li><li>• Synapse lecture sheets</li></ul>	<ul style="list-style-type: none"><li>• <b>Selman ( 10th edition)</b></li><li>• <b>Christensen</b></li><li>• <b>K Thalyan</b></li><li>• <b>MRI made easy for beginners (2<sup>nd</sup> ed)</b></li><li>• <b>Synapse Lecture Sheet for Radiological Physics (4<sup>th</sup> edition)</b></li></ul>	<ul style="list-style-type: none"><li>• Synapse Lecture sheet</li><li>• Robbins Pathology (selected topics)</li><li>• Lange Microbiology</li></ul>

# 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 may 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 Contrast 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 acquisition >
- 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 statistics

### **18. Nuclear Imaging —The scintillation camera**

18.1 Planar nuclear imaging: The Anger scintillation Camera

18.2 Computers 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 Ionizing 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/>