# HKCRRT Mammography Certification Examination

## Objective

The objective of the Certification Examination of Mammography is to provide a platform for Radiographers to attain a recognised standard in performing Mammography and qualified as a HKCRRT Certified Mammographer, a Member of the Hong Kong College of Radiographers and Radiation Therapists (HKCRRT), (Mammography) known as MHKCRRT(Mammo).

## Entry Requirements

- Being a Radiographer registered with the Hong Kong Radiographers'Board.
- 5 years of post-registration working experience in medical imaging.
- A recognized Bachelor degree in medical imaging or related fields, or a Professional Diploma in Diagnostic Radiography (PDDR) of the Hong Kong Polytechnic University, or equivalent.

## Format of examination

150 Multiple Choice Questions covering the following areas of Mammography:

- Basic knowledge and concepts of Mammography
- Breast anatomy
- Mammogram pattern recognition
- Basic and additional Mammographic projections
- Protocol for breast imaginsg and Interventional procedures
- Trouble shooting in Mammography
- Breast Pathology
- Management of breast disease and treatment options
- Quality Management
- Nursing and patient cares
- Radiation protection

Candidates can be admitted as a Member of the Hong Kong College of Radiographers and Radiation Therapists (HKCRRT), (Mammography) known as MHKCRRT(Mammo) if they have attained a grade of 75% or above in the certification examination AND achieved the requirements of Mammography clinical experience as set by the HKCRRT.

## Duration of Examination

3 hours

## Examination Fee

HK$1200. 2nd attempt within 1 year is HK$600. The first-year membership fee ($600) will be waived if the candidate can be admitted as a member of HKCRRT.

## Syllabus of Examination

| |
|---|
| **A) Basic Mammographic knowledge and concept** |
| 1) Anatomy and physiology of the breasts |
| 2) Physics of mammography |
| 3) Criteria for Screening Mammography and Diagnostic Mammography |
| 4) Mammographic equipment |
| 5) Mammographic image quality |
| 6) Digital mammography and image receptor characteristics. |
| **B) Mammogram pattern recognition** |
| **C) Basic and additional Mammographic projections** |
| **D) Protocol for breast screening, diagnostic procedures** |
| **E) Trouble shootings in mammography** |
| 1) Proficiency in modified mammographic techniques |
| 2) Problem solving in operation and workflow |
| **F) Breast Conditions and Pathologies** |
| 1) Mammographic image interpretation |
| 2) Correlation to histology and cytology |
| **G) Managements of breast diseases and treatment options** |
| **H) Advanced Breast Imaging** |
| 1) Advanced technologies e.g. Contrast Enhance MMG |
| 2) Interventional procedures including preparation, procedures, and after care |
| 3) Breast ultrasound |
| 4) MRI breast imaging |
| 5) NM scintigram, sentinel node |
| **I) Patient cares, communication and education** |
| **J) Quality management** |
| 1) Quality assurance programme and QC tests |
| 2) Recognition of image critique, artifacts and trouble shootings |
| 3) Machine failure reporting system |
| 4) Quality assurance record system |
| **K) Radiation protection** |
| **L) Issues of research** |
| **M) Medico-legal aspect** |
| **N) Management and supervisory skills** |
| **O) Occupational Safety and Health (OSH)** |

## Suggested Reading Materials

These reading materials provide the candidates with a sound understanding necessary to complete the Certificate Examination of Mammography. The suggested texts and references are provided as alternative sources of information that will assist the candidates and are not considered to be mandatory reading.

- The Practice of Mammography – Daniel J Dronkers, Jan H.C.L. Hendriks, Roland Holland, Gerd Rosenbusch
- Clinical Breast Imaging – Cardenosa
- Mammography for Radiologic Technologist – Wentz
- Practical Mammography – Fischer
- Breast Imaging - Peters, Voegeli, Scanlan
- Breast Imaging – Kopans
- Practical Breast Pathology – Tot/Tabar/Dean
- Teaching Atlas of Mammography – Tabar/Dean
- Breast Imaging: The Requisites, Case Review Series, Clinical Breast Imaging, Diagnostic Imaging, Stavros.

  https://radiologyreviewarticles.com › Breast
- Diagnostic Breast Imaging: Mammography, Sonography, Magnetic Resonance Imaging, and Interventional Procedures. by Sylvia H. Heywang-Koebrunner, Ingrid

  https://www.mammoguide.com › imaging-books

## Requirements of Mammography Clinical Experience

1. Candidates are required to complete 500 sets of 4 views Single handed mammogram in a year preceding the application by members:

   For the latest 250 sets of mammogram:

   - Film rating > 75% should be in Perfect or Good Group
2. >97% should be in P, G, M groups. in the PGMI rating system – assessed and endorsed by mammography specialty supervisor
3. The clinical component requires the candidates' Mammography Specialty Supervisor to acknowledge completion of the required clinical examinations.

**The Hong Kong College of Radiographers and Radiation Therapists (HKCRRT)**
**Medical Dosimetry Certification Examination**

Objective:

To provide an examination for practicing Radiation Therapist to attain a recognized standard in medical dosimetry to be admitted as a member of the Hong Kong College of Radiographers and Radiation Therapists, Medical Dosimetry.

Entry Requirements:

1. Being a Radiation Therapist registered with the HK Radiographer's Board.
2. With a minimum of 2 years of post-registration working experience in medical dosimetry.
3. A recognized Bachelor degree in radiotherapy or related fields.

Format of online Examination:

150 Multiple Choice Questions covering the following areas of Medical Dosimetry:

| | |
|---|---|
| (A) Radiation Physicis | (15%) |
| (B) Dose calculation | (20%) |
| (C) Treatment Planning | (30%) |
| (D) Localisation | (15%) |
| (E) Brachytherapy | (5%) |
| (F) Radiation protection | (5%) |
| (G) Quality Assurance | (5%) |
| (H) Information technology | (5%) |

*(Please refer to the section of syllabus of examination for details)*

Candidates can be admitted as a member of the HKCRRT (Medical Dosimetry) if they have passed the examination AND achieved the requirements of clinical training and experience as set by HKCRRT. A Certificate will be issued by HKCRRT for those candidates who passed the certification examination.

Duration of Examination:

3 hours

Schedule of Examination:

Please refer to the poster in HKCRRT official website for details.

Examination fee:

HK$1200

The first-year membership fee (HK$600) will be waived if the candidate can be admitted as a member of HKCRRT.

Syllabus of Examination:

(A) Radiation Physicis

- Radioactivity
- X-ray production and characteristics of radiations
- Radiation measurement and related equipment

(B) Dose calculation

- External beam of photon and electron calculations
- Beam modification devices effect
- Tissue inhomogeneities

(C) Treatment Planning

- Dose distribution of photon and electron
- Clinical Oncology and treatment schemes
- Radiobiology and calculations
- Interpretation of Dose Volume Histogram
- IMRT

(D) Localisation

- Patient data acquisition
- Patient positioning and immobilization
- Special set up devices
- Treatment simulations
- Medical imaging for oncology
- Image registration

(E) Brachytherapy

- Radioactive sources characteristics
- Dose distributions
- Application of radioactive sources

(F) Radiation protection

- Radiation monitoring for personnel and patients
- Principles of radiation protection

(G) Quality Assurance

- Equipment safety and accuracy
- Plan and treatment accuracy

(H) Information technology

- Data importing and exporting

- Computer system management
- Planning computer algorithms

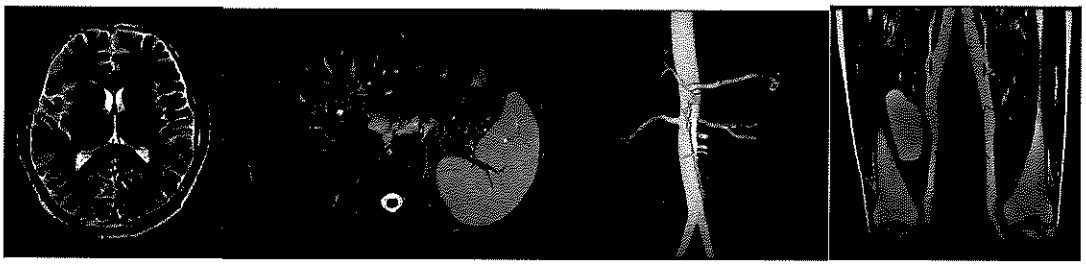
***Suggested*** Reading Materials:

The Candidates will find the following reading materials helpful for the Medical Dosimetry Certification Examination. The materials should not be considered mandatory and **other sources of related information** are not exclusive.

1. The Physics of Radiation Threapy. ***Faiz M. Khan***. Lippincott Williams & Wilkins 5th edition or above
2. Treatment Planning in Radiation Oncology. ***Faiz M. Khan. Bruce J. GerbiLippincott*** Williams & Wilkins
3 Practical Radiotherapy Planning. ***Ann Barrett***. Arnold
4 Radiation Therapy Physics. ***William R. Hendee. Geoffrey S. Ibbott***. Wiley
5 Radiation Therapy Planning. ***Bentel G.C*** McGraw Hill. 2nd edition or above

## The Hong Kong College of Radiographers and Radiation Therapists

# Certification Examination of Magnetic Resonance Imaging (MRI)



## Objective

The objective of the Certification Examination of MRI is to provide an alternative channel for Radiographers who can attain the recognised standards in MR imaging to be admitted as a Member of the Hong Kong College of Radiographers and Radiation Therapists (HKCRRT) (Magnetic Resonance Imaging) MHKCRRT(MRI).

## Format of Certification Examination

150 Multiple Choice Questions covering basic principles and clinical applications of MRI such as:

- MRI Physics (55%)
- MRI Clinical Applications (10%)
- MRI Safety (10%)
- MRI Contrast Medium (10%)
- MRI Pathology (10%)
- MRI Anatomy (5%)

*{Please refer to the section of syllabus of examination for details.}*

## Duration of Examination

3 hours

## Syllabus of Examination

### (A) MRI Physics

- Nuclear Physics
- Relaxation mechanism
- Spatial encoding of MRI signals
- K-space sampling techniques
- Fourier transformation
- Image contrast mechanisms
- Image quality optimization
- Image compensation techniques – flow compensation, spatial saturation, spectral saturation, respiratory and cardiac gating / triggering, navigator echo, magnetization transfer pulse etc.
- MRI pulse sequence structure, design and imaging characteristics
- Concept of pulse sequence diagram
- Implications of changing pulse sequence parameters such as TR, TE, flip angle etc.
- Spin echo and fast spin echo imaging
- Gradient echo imaging
- Inversion recovery sequences
- Echo Planar Imaging (EPI)
- Diffusion-weighted imaging (DWI)
- Diffusion tensor imaging (DTI)
- Perfusion imaging
- Single- and multi-voxel MR spectroscopy
- Flow dependent MR angiography / venography
- Contrast-enhanced MR angiography / venography
- Time-resolved imaging of contrast kinetics
- Parallel imaging techniques
- Design of various magnet systems used in MRI
- Spatial encoding gradient coils
- Radiofrequency system including phase array coils
- Basic quality assurance of MRI system
- Recognition of imaging artifacts induced by the system hardware, pulse sequences, poor operator choices, physiological and patient motion etc.
- Basic principles of MRI artifacts and corresponding compensation techniques
- Motion artifacts
- Aliasing or wrap-around artifacts
- Magnetic susceptibility artifacts
- Gibbs or truncation artifacts
- Chemical shift artifacts
- RF leakage or Zipper artifacts

- Moire fringes
- Magic angle artifacts
- Other imaging artifacts due to hardware failure

**(B) MRI Clinical Applications**

- Clinical applications of various MRI pulse sequences and imaging applications in clinical settings for diagnosis of different disease entities

**(C) MRI Safety**

- Effect of static magnetic field
- Effect of time-varying gradient magnetic field
- Effect of radiofrequency field
- Magnetic and radiofrequency shielding
- Cryogen-related issues
- Safety concerns of MRI site planning
- Patient screening
- Basic emergency procedures

**(D) MRI Contrast Media**

- Extra-cellular contrast agents
- Tissue-specific contrast agents
- Intravascular or blood pool contrast agents
- Positive & negative contrast agents
- Safety of MRI contrast agents

**(E) MRI Pathology**

- Common MRI pathologies and their MRI appearances

**(F) MRI Anatomy**

- Neuro-anatomy including grey/while matter differentiation, ventricular system and vascular structures
- Spinal anatomy
- Musculoskeletal anatomy
- Body anatomy including heart, thorax, abdomen and pelvis

The Hong Kong College of Radiographers and Radiation Therapists
香港放射師學院

## Objectives

The objective of the Certification Examination of Nuclear Medicine (NM) Technology is to provide a channel for Radiographers to attain the recognized standard in Nuclear Medicine for admission as a Member of the Hong Kong College of Radiographers and Radiation Therapists (HKCRRT) (Nuclear Medicine) MHKCRRT (NM).

## Entry Requirements

- ✧ Being a Radiographer registered with the Hong Kong Radiographer's Board AND
- ✧ 5 years of post-registration working experience in medical imaging AND
- ✧ A recognized Bachelor degree in medical imaging or related fields, or Professional Diploma in Diagnostic Radiography (PDDR) of the Hong Kong Polytechnic University or equivalent

## Format of Certification Examination

150 Multiple Choice Questions covering basic principles and clinical applications on Nuclear Medicine and Positron Emission Tomography (PET), such as:

1. Basic radiation physics
2. Instrumentation, quality control and imaging principles
3. Radiopharmaceuticals, radiopharmacy and cyclotron
4. Radiation safety
5. Clinical procedures and applications

*(Please refer to the section of "Syllabus of Examination" for details)*

Passing mark is 75%. To admit as Member of the College in NM Faculty, successful candidates also need to satisfy the requirements of clinical experience in the specialty as set by HKCRRT.

## Duration of Examination

3 hours

## Schedule of Examination

The Certification Examination for Nuclear Medicine will be held once per year, subject to the arrangement of the Council and the Faculty Subcommittee.

## Examination Fee

Please refer to the latest information in announcement.

## Syllabus of Examination

### 1 Basic radiation physics

- ✧ Type of radiation
- ✧ Half-life and radioactive decay
- ✧ Interactions of radiation with matters
- ✧ Detection instruments
- ✧ Statistics of radiation counting

Sample question

Which of the following statement(s) about Compton scattering is/are correct?

1. The incoming photon gains energy from a recoil or Compton electron.
2. The incoming photon gives up energy to a recoil or Compton electron.
3. The "scattered" photon has correspondingly higher energy.
4. The angle of scattering is independent to the energy changes.
5. Compton scattering increases the count rate and contrast, and hence improves the image quality of gamma cameras.

A. 1,3,4
B. 2,5
C. 2,3,4,5
D. 2,4
E. 2 only

## 2 Instrumentation, quality control and imaging principles

- ✧ Physics and principles of imaging equipment (e.g. gamma camera, solid state camera, hybrid scanners and PET scanner)
- ✧ Physics and principles of non-imaging equipment (e.g. dose calibrator and GM counter)
- ✧ Concepts of spatial resolution, energy resolution, sensitivity, linearity, and uniformity
- ✧ Measurement of scanner performance
- ✧ Common quality control and calibration procedures
- ✧ Analyzing and evaluating quality control results
- ✧ Image generation and reconstruction
- ✧ Recognizing related artifacts

Sample question

What is the function of the collimator?

A. Defines the geometric field of view of the gamma camera crystal
B. Primary photons are absorbed in the septa of the collimator
C. Reduce radiation dose to the patient
D. Increase the sensitivity of the scintillation crystal
E. All of the above

## 3 Radiopharmaceuticals, radiopharmacy and cyclotron

- ✧ Basic radiochemistry
- ✧ Measuring and calculating radioactivity
- ✧ Operating principles of cyclotron
- ✧ Working principles and use of equipment (e.g. dose calibrator and generators)
- ✧ Common radiopharmaceuticals: preparation and quality control procedures
- ✧ Dispensing and transport of radioactive goods

Sample question

Which of the following statement(s) about the Mo-99/Tc-99m generator system is/are correct?

A. It is an example of transient equilibrium
B. Maximum buildup of Tc-99m activity occurs at 23 hours after elution
C. Labeling efficiency can be impaired if there is excessive Tc-99 in the eluate
D. The expected valence of Tc-99m is +7, in the chemical form of pertechnetate
E. All of the above

## 4 Radiation safety

- ✧ Radiation hazards and dosimetry
- ✧ Basic principles in radiation protection: Time, distance and shielding
- ✧ Personnel monitoring
- ✧ Handling and disposal of radioactive materials
- ✧ Radiation surveillance
- ✧ Use of survey meters
- ✧ Decontamination procedures
- ✧ Precautions for patients

Sample question

Which of the following contribute(s) to a misadministration of radiopharmaceutical?

A. Given to the wrong patient
B. A patient receiving the wrong radiopharmaceutical
C. Wrong route of administration
D. Administered dose differing from the prescribed dose by greater than an allowable standard
E. All of the above

## 5 Clinical procedures and applications

- ✧ Scanner operation
  - ➢ Modes of acquisition in radionuclide imaging: static, dynamic, gated and SPECT
  - ➢ Collimators and their applications
  - ➢ Acquisition parameters
  - ➢ Hybrid imaging

- ✧ Patient preparation and care
  - ➢ Indications and precautions
  - ➢ Preparation for clinical procedures
  - ➢ Premedication and drug intervention
  - ➢ Before and after care

- ✧ Radionuclide imaging
  - ➢ Bone scan
  - ➢ Renal scan
  - ➢ Cardiac scan
  - ➢ Thyroid scan
  - ➢ Others

- ✧ Non-imaging procedures
  - ➢ Blood cell labelling
  - ➢ Radioactive gas generation
  - ➢ Radioactivity quantification

- ✧ PET imaging
  - ➢ F-18 FDG scan
  - ➢ Non-FDG scan

- ✧ Radionuclide therapy
  - ➢ Common therapeutic radioisotopes and agents
  - ➢ Concept of theranostics and organ dosimetry
  - ➢ Indications

- ✧ Radiopharmaceutical administration
  - ➢ Uptake mechanism
  - ➢ Pharmacokinetics

- ✧ Image evaluation, processing and data analysis
  - ➢ Physiological uptake and biodistribution
  - ➢ Image artifacts
  - ➢ Dynamic data and concept of kinetic modeling

Sample question

Which the following about bone scan is correct?

A. Bone scan has high specificity for detection of bone metastasis
B. The "flare" phenomenon indicates poor prognosis of the metastatic disease
C. The three-phase bone scan is used to diagnose osteomyelitis
D. Faint or absent visualization of the kidneys is one of the findings on superscan, which point to the only diagnosis of metastatic disease.
E. Bone scan is useful for detection of bone metastasis in multiple myeloma and thyroid cancer.

## Suggested Reading Materials

These reading materials would provide the candidates with a sound understanding necessary to complete the Certification Examination of Computed Tomography. The suggested texts and references are provided as alternative sources of information that will assist the candidates and are not considered to be mandatory reading.

- Ell & Gambhir. **Nuclear Medicine in Clinical Diagnosis and Treatment**. Churchill Livingston, 2004
- Harvey A. Ziessman, Janis P O'Malley, James H. Thrall. **Nuclear Medicine: The Requisites**. Third Edition. Mosby, 2006.
- Mettler & Guiberteau. **Essentials of Nuclear Medicine Imaging** – Sixth edition. Saunders, 2012.
- Simon R. Cherry, James Sorenson, Michael Phelps. **Physics in Nuclear Medicine** – Third edition. Saunders, 2003.
- **Principles and Practices of PET and PET/CT**, Wahl. R Lippincott, Williams and Wilkins, second edition 2009
- **Nuclear Medicine and PET/CT Technology and Techniques**, Christian. P , Mosby 2008
- **Clinical Positron Emission Tomography**, Schulthess. G Lippincott, 2004
- **Principles and Practice of PET/CT : A Technologist's Guide**, EANM, 2009

Web sites:

- European Association of Nuclear Medicine (EANM)
  www.eanm.org
- Society of Nuclear Medicine and Molecular Imaging (SNMMI)
  www.snmmi.org
- International Commission on Radiological Protection (ICRP)
  www.icrp.org