

**PAPER III: SUBJECT SPECIALIZATION PAPER for
RADIOLOGY & IMAGING SC. TECHNOLOGY (Technical)**

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2012
EXAMINATION CATEGORY: TECHNICAL**

**PAPER III: SUBJECT SPECIALIZATION PAPER for
RADIOLOGY & IMAGING SC. TECHNOLOGY**

Date	: 14 October 2012
Total Marks	: 100
Examination Time	: 150 minutes (2.5 hours)
Reading Time	: 15 Minutes (prior to examination time)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY:

1. Write your Roll Number clearly on the Answer Booklet in the space provided.
2. The first 15 minutes is being provided to check the number of pages, printing errors, clarify doubts and to read the instructions. You are NOT PERMITTED TO WRITE during this time.
3. Use either Blue or Black ink pen or ball point pen for the written part and Pencils for the sketches and drawings.
4. All answers should be written on the Answer Booklet provided. Candidates are not allowed to write anything on the question paper or any other materials.
5. It is divided into two sections-namely SECTION A and SECTION B.
6. SECTION A consists of two parts: Part I and Part II.

Part I consists of 30 Multiple-Choice Questions carrying one (1) mark each and is compulsory. The answer of your choice should be clearly written in whole along with the question and option number on your answer booklet. Eg. 31(c).

Part II consists of four (4) short answer questions of five (5) marks each and all questions are compulsory.

7. SECTION B consists of two Case Studies. Choose only ONE case study and answer the questions under your choice. Each case study carries fifty (50) marks in total.
8. This Paper consists of eight (8) pages including this Instruction page.

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SECTION A

PART I - Multiple Choice Questions

Choose the correct answer and write down the letter of the correct answer chosen in the Answer Sheet against the question number. E.g. 31 (c). Each question carries ONE mark.

1. The nucleus of the atom consists of :
 - a) electrons and protons
 - b) electrons, and positrons
 - c) protons and neutrons
 - d) positrons and neutrinos

2. Which of the following statements regarding electrons is correct?
 - a) They have a positive charge
 - b) They are equal to the number of protons in a non-ionized atom
 - c) They are equal to the number of neutrons in a non-ionized atom
 - d) They have no charge

3. In the diagnostic energy range , absorption of radiation using diagnostic machines is known as :
 - a) Compton absorption
 - b) photoelectric absorption
 - c) annihilation effect
 - d) pair production

4. Gonadal exposure should be minimized in order to prevent:
 - a) somatic effects
 - b) erythema
 - c) genetic damage
 - d) cataracts

5. Which of the following will help reduce exposure to the patient?
 1. High kV, low mAs
 2. Collimation
 3. Filtration
 - a) 1 and 2 only
 - b) 1 and 3 only
 - c) 2 and 3 only
 - d) 1,2 and 3

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6. Which of the following will provide radiation protection for the patient and also preserve radiographic contrast?
1. Close collimation
 2. Change par-to high –speed screen and decrease mAs
 3. High kV, low mAs techniques
- a) 1 and 2 only
b) 1 and 3 only
c) 2 and 3 only
d) 1,2 and 3
7. Which of the following is NOT considered part of inherent filtration?
- a) The glass envelope of the the tube
 - b) Housing material
 - c) The oil insulation
 - d) Aluminium
8. The unit of dose equivalent that is used to express radiation exposure to living tissue is:
- a) roentgen
 - b) rad
 - c) rem
 - d) erg
9. Which one of the following determines the radiation quality of any given x-ray beam?
- a) Heat of the filament
 - b) kVp
 - c) mAs
 - d) Size of the focal spot
10. The MPD for a male occupationally exposed worker is:
- a) 0.05 rem/year
 - b) 0.5 rem/year
 - c) 5.0 rem/year
 - d) 50.0 rem/year

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11. When lead aprons are employed during fluoroscopy , film badges should be worn:
- a) Outside the apron level of the waist
 - b) Inside of the apron level of the waist
 - c) inside the apron level of the neck
 - d) Outside of the apron level of the neck
12. If it is necessary for a patient to be held by another person during radiography, the best choice would be:
- a) An older adult relative
 - b) A young adult relative
 - c) A radiologic technologist
 - d) A radiologist
13. The stream of electrons in an x-ray tube is focused by:
- a) Line focus principle
 - b) Potential difference
 - c) Molybdenum collar around the filament
 - d) Tilted target
14. The size of the effective focal spot depends on the :
- a) Cathode connection
 - b) Angle of the anode
 - c) Rotor motor
 - d) Target material
15. Which of the following is NOT a property of x-rays?
- a) Highly penetrating invisible rays
 - b) Electrically neutral
 - c) Monoenergetic wavelengths
 - d) Travel in straight lines
16. The suture that separates the parietal bones is called:
- a) Lambdoid suture
 - b) Coronal suture
 - c) Metopic suture
 - d) Saggital suture

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17. The common bile duct opens into the :
- a) Medial wall of the first part of the duodenum
 - b) Medial wall of the second part of the duodenum
 - c) Lateral wall of the second part of the duodenum
 - d) Medial wall of the third part of the duodenum
18. The stomach is located primarily within the :
- a) Right lower quadrant (RLQ)
 - b) Right upper quadrant (RUQ)
 - c) Left upper quadrant (LUQ)
 - d) Left lower quadrant (LLQ)
19. Normally a patient is asked to inhale deeply when having the lungs x-rayed. Which of the following is the BEST reason for that?
- a) More uniform density
 - b) Increased contrast
 - c) Greater magnification
 - d) Greater area of lung structures shown
20. To demonstrate a pleural effusion in the chest of a patient who is unable to be put in an erect position, which of the following might you use?
- a) Transthoracic
 - b) Supine
 - c) Lateral decubitus
 - d) Trendelenburg
21. The abdominal aorta bifurcates into the Left and Right:
- a) Common iliac arteries
 - b) Popliteal arteries
 - c) Femoral arteries
 - d) Tibial arteries
22. If the patient asks the radiographer about the results of his examination, he should be:
- a) Told to ask the radiologist
 - b) Informed of the findings
 - c) Assured that the referring physician will be informed
 - d) Referred to the chief technologist

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23. What form of energy is used in MRI?
- a) Radiowaves
 - b) Sound waves
 - c) X rays
 - d) Ultraviolet
24. What effect does an MRI contrast have on the tissue?
- a) The cells within the tissue produce extra hydrogen molecules
 - b) All tissues within the slice become darker
 - c) The rate of relaxation of the protons within the tissue is altered
 - d) The rate of precession of each proton is sped up
25. Thorough patient preparation and education prior to a CT scan will do which of the following:
- a) Reduce repeat radiation dose
 - b) Reduce patient anxiety
 - c) Ensure best possible images
 - d) All of the above
26. Which of the following is FALSE in CT imaging:
- a) Reducing slice thickness reduces patient dose
 - b) Noise reduction often leads to an increased patient dose
 - c) An obese patient requires increased dose to produce an image with an acceptable noise level
 - d) a high resolution CT chest will deliver greater dose per slice than a routine Chest CT
27. All of the following are true about Ultrasound EXCEPT:
- a) The frequencies of Ultrasound used in medical imaging are in the range of 1-20 MHz
 - b) Ultrasound examinations are non-invasive
 - c) The amount of attenuation of an ultrasound beam is directly proportional to its frequency
 - d) Lateral resolution cannot be improved by using focused transducers
28. The frequencies of Ultrasound used in medical imaging are in the range of :
- a) 1 – 20 Hz
 - b) 1 – 20 MHz
 - c) 10 – 20 MHz
 - d) 10 – 20 KHz

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29. Which of the following is a radiographic study of the urinary bladder that involves the direct injection of a contrast media through a catheter?
- a) Intravenous pyelogram
 - b) Intravenous urogram
 - c) Retrograde pyelogram
 - d) Cystogram
30. Compression is used during excretory urography in order to accomplish which of the following?
- a) Aiding in the excretion process
 - b) Immobilizing the patient
 - c) Preventing the patient from breathing during the exposure
 - d) Retaining the contrast medium in the collecting system

PART – II : Short Answer Questions (20 marks)

Answer ALL the questions. Each question carries 5 marks.

1. Write briefly about the hazards of radiation.
2. What are the interactions that take place between the electrons from the filament and the atoms in the target of an X-ray tube? Describe any 2 interactions.
3. Compare and contrast between Ultrasonography, Computed Tomography and Magnetic Resonance Imaging?
4. Draw a neat diagram of the Rotating Anode X-ray tube and label its parts. What are the functions of the X-ray tube shield?

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SECTION B : Case Study

Choose either Case 1 or Case 2 from this section. Each Case carries 50 marks.

CASE 1

You as the senior radio- technologist are in charge of teaching the radiographer trainees from the RIHS about radiographic positioning.

What exposure factors would you use, where would you center the central ray, and how would you ensure that you got the best images for the following X-rays.

- i) X-ray Chest PA view
- ii) X-ray Abdomen AP view
- iii) X-ray Cervical spine Lateral view
- iv) X-ray Right Ankle Mortise view
- v) X-ray Skull AP view
- vi) X- ray PNS AP view
- vii) X-ray Left shoulder Y-view
- viii) X-ray Right wrist AP
- ix) X-ray Left elbow Lateral view
- x) X-ray KUB AP view

CASE 2

You are the Chief Radio-technologist, and in this capacity you have been given the task of planning out the design and layout of the infra-structure of the X-ray unit in the upcoming Central Regional Referral Hospital. Describe in detail how you would go about it.