**ROYAL CIVIL SERVICE COMMISSION**

**BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2014**

**EXAMINATION CATEGORY: TECHNICAL**

**PAPER III: SUBJECT SPECIALIZATION PAPER FOR**

**RADIOLOGY & IMAGING SCIENCE TECHNOLOGY**

**Date**  : 12 October

**Total Marks** : 100

**Examination Time**  : 2.5 hours

**Reading Time** : 15 minutes (Prior to examination Time)

**GENERAL INSTRUCTIONS:**

1. Write your Roll Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is being provided to check the number of pages of Question Paper, printing errors, clarify doubts and to read the instructions. You are NOT permitted to write during this time.
3. This paper consists of **TWO SECTIONS**, namely **SECTION A** and **SECTION B**
* **SECTION A** has two parts: Part I - 30 Multiple Choice Questions

 Part II - 4 Short Answer questions

All questions under SECTION A are COMPULSORY

* **SECTION B** consists of two case studies. Choose only ONE case study and answer the questions under your choice.
1. All answer should be written with correct numbering of Section, Part and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating any or correct Section, Part and Question Number will NOT be evaluated and no marks would be awarded.
2. Begin each Section and Part in a fresh page of the Answer Booklet.
3. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
4. Use of any other paper including paper for rough work is not permitted.
5. You are required to hand over the Answer Booklet to the invigilator before leaving the examination hall.
6. This paper has **08** printed pages in all, including this instruction pages.

**GOOD LUCK!**

**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 (b). Each question carries ONE mark**.

1. All of the following are properties of X-rays except:
2. X-rays are invisible
3. X-rays are negatively charged particles
4. X-rays travels at the speed of light in a vacuum
5. X-rays cannot be optically focused
6. The purpose of using AEC with film-Screen imaging is to control:
7. kVp
8. mA
9. Density
10. Contrast
11. \_\_\_\_\_\_\_\_\_ is the primary patient factor that determines the selection of exposure factors:
12. Age
13. Part measurement
14. Physical conditions
15. Weight
16. The fixing agent used to clean the undeveloped silver halide crystal is:
17. Hydroquinone
18. Aluminum chloride
19. Potassium bromide
20. Ammonium thiosulfate
21. Safelight filters are chosen based on the:
22. Amount of light intensity
23. Dimensions of the darkroom
24. Film sensitivity
25. Power rating
26. Staining or fading of the permanent image result when too much \_\_\_\_\_\_\_\_\_\_\_ remains on the film with improper washing
27. Phenidone
28. Acetic acid
29. Thiosulfate
30. Glutaraldehyde
31. The radiation- and light- sensitive layer of radiographic film is the \_\_\_\_\_\_\_\_\_\_layer:
32. Base
33. Emulsion
34. Super coat
35. Anticurl/antihalation
36. Poor film-screen contact result in a loss of:
37. Density
38. Contrast
39. Recorded detail
40. Speed
41. The purpose of intensifying screen is to :
42. Increase radiographic density
43. Increase recorded details
44. Decrease recorded details
45. Decrease patient dose
46. The purpose of the grid in radiography is to:
47. Increase density
48. Increase contrast
49. Decrease patient dose
50. Increase recorded details
51. The relationship between focal spot size and distance results in:
52. Receptor unsharpness
53. Motion blur
54. Geometric unsharpness
55. Shape distortion
56. A radiographic that has insufficient density would best be described as:
57. Over exposed
58. Over developed
59. Under exposed
60. Under developed
61. The X-ray beam used in diagnostic radiography can be described as:
62. Homogenous
63. Mono-energetic
64. Poly-energetic
65. Scattered
66. A recumbent position with the whole body tilted so that head is lower than the feet is called:
67. Sim’s position
68. Trendelenburg position
69. Decubitus position
70. Fowler’s position
71. If milliamperage (mA) is increased from 150mA to 300mA and all other factors remain the same, the X-ray beam will have:
72. Better quality
73. Twice the penetrating ability
74. Twice the no. of X-ray photons
75. Low contrast
76. Common bile duct is formed by:
77. Hepatic duct and pancreatic duct
78. CBD and pancreatic duct
79. Hepatic duct and cystic duct
80. Right and Left hepatic duct
81. A position used for rectal tube insertion for barium enema( on left side, right hip and thigh are flexed and left arm behind back) is called:
82. Sim’s position
83. Lithotomy position
84. Fowler’s position
85. Decubitus
86. Uniform appearance and texture in ultrasound is called:
87. Hypoechoic
88. Hyperechoic
89. Anechoic
90. Homogenous
91. The ability of an X-ray photon to remove an atom’s electron is a characteristic known as:
92. Attenuation
93. Scattering
94. Ionization
95. Absorption
96. Which of the following is not necessary in patient preparation for an ultrasound scan:
97. Fasting
98. Enema
99. Informed consent
100. Procedure explanation to patient
101. Cystogram is used to visualize:
102. Kidney
103. Ureter
104. Urethra
105. Urinary bladder
106. Time from the application of one RF pulse to the application of next RF pulse is called:
107. Repetition Time (TR)
108. Echo Time (TE)
109. STIR
110. Time of Inversion (TI)
111. With regard to T1 weighted image, which of the following is correct:
112. TR controls the amount of T1 weighting images
113. For T1 weighting images the TR should be long
114. TE controls the amount of T1 weighting images
115. For T1 weighting the TE should be long
116. Concerning the 1st generation of computed tomography, which statement is false:
117. Scan time > 2 second
118. Narrow pencil beam
119. Single detector per slice
120. Designed only for evaluation of brain
121. Which of the following is contraindication for Contrast Enhanced Computed Tomography (CECT) scan:
122. Cardiac pacemaker
123. Dentures
124. Diabetes patient with off medication
125. Raised RFT value
126. Cancer and genetic defects are examples of\_\_\_\_\_\_\_\_\_\_\_\_\_\_ effects
127. Stochastic
128. Nonstochastic
129. Birth
130. Deterministic
131. All of the following are true about the Fluid Attenuated Inversion Recovery (FLAIR) except:
132. Is used to suppress the high CSF signal in T2 weighted images
133. Is used in brain and spine imaging to see periventricular and cord lesions more clearly
134. A TI of 1700-2000 ms achieves CSF suppression
135. FLAIR is an extremely important sequence in musculoskeletal imaging
136. Which of the following is not a component of a modern CT imaging system:
137. Gantry
138. Slip ring
139. Image receptor
140. Image detector
141. The S.I unit of exposure is
142. RAD
143. Roentgen
144. Gray
145. Rem
146. Which of the following is the functional unit of the lung:
147. Bronchi
148. Alveoli
149. Cilia
150. Carina

**PART – II: Short Answer Questions (20 marks)**

**Answer ALL the questions. Each question carries 5 marks**

1. What are the sources of medical radiation? Write briefly about the radiation protection to the patients.
2. Draw a neat diagram of the ultrasound transducer and labels its part. Add a note on backing block and piezoelectric crystals.
3. Describe the key stages of manual film processing. What is the function of replenishment and fixation?
4. What is the principle used in Computed Tomography and Magnetic Resonance Imaging? What are the advantages and disadvantages of Computed Tomography and Magnetic Resonance Imaging?

**SECTION B: Case Study**

**Chose either case 1 or case 2 from this section. Each case carries 50 marks.**

**CASE 1**

A 25 years old woman met with an accident at Taba and was brought to JDWNRH casualty by ambulance. Imagine you are on duty in X-ray and emergency Doctor has ordered the following X-ray trauma series.

 Explain how you would assess the patient during the part positioning, where you would centre the central ray, what exposure factors would you give and what part should be included in the X-ray.

1. C-Spine AP and Lateral (10 marks)
2. AP Chest (5 marks)
3. AP Pelvis (5 marks)
4. Knee AP, Lateral and Sunrise View (15 marks)
5. Ankle AP, Lateral and Mortise View (15 marks)

**CASE 2**

A 32 years old man, known case of hypertension and diabetes, presented to the emergency department with epigastric pain associated with distended abdomen and generalized weakness. The physician on duty had advised urgent bedside abdominal ultrasound, urgent abdominal X-ray, CT abdomen and MRI brain.

1. What are the probable radiological diagnoses for the above case? (5 marks)
2. What are the organs you should assess while doing abdominal ultrasound. What details should be included in the report. Do you advice for any patient’s preparation? (10 marks)
3. What type of positioning would you do for the abdominal X-ray with distended abdomen? What is the difference between portable and normal abdominal X-ray. (10 marks)
4. Explain the patient preparation and scanning protocol for CT abdomen. What are the contraindications for contrast enhanced computed tomography? (10 marks)
5. Mention the sequences for MRI brain? What are the differences between each sequences. What are the advantages and disadvantages of MRI? (15 marks)