

Candidate Signature

Roll No.

Time : 1 ½ Hours

(2.30 PM to 4.00 PM)

Total Score t 360

### **INSTRUCTIONS TO THE CANDIDATES**

Read the following carefully:

1. Answers are to **be** put in the OMR **Sheet and not on the question** paper.
2. Do not write anything on the question paper.
3. Read directions carefully.
4. Answer the questions as quickly and carefully as you can.
5. Do not spend too much time to answer the question which you find difficult.
6. Go through the entire test and then return to the question you have failed to answer.
7. Do not ask any question once the examination has started.
8. When you have finished answering, hand over the Booklet and Answer Sheet to the Invigilator.
9. For each incorrect answer one mark shall be deducted from the total score.
10. Candidate should sign on both OMR sheet and question booklet immediately.

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Resolution is best in

- A. Conventional film screen radiograph
- B. MRI
- C. CT scan**
- D. CR.

All are true regarding filtration except

- A. The inherent filtration is equivalent to 1 mm Al
- B. The total filtration is equivalent to 2.5 mmAl
- C. The added filtration is equivalent to 1.5 mm Al
- D. The inherent filtration is equivalent to 1.5 mmAl

3. Identify the correct equation for energy of the electromagnetic wave (h is the planck's constant), the unit is written in brackets

- A.  $E \text{ (eV)} = h / X \text{ (nm)}$
- B.  $E \text{ (eV)} = h f$
- C.  $E \text{ (KeV)} = 11/2 \text{ (mm)}$
- D.  $E \text{ (keV)} = h/X \text{ (nm)}$

4. All are correct wrt STIR except

- A. Is an inversion recovery sequence
- B. Enhances the contrast between the lesion and the fat
- C. Uses a long T1**
- D. Is a technique to suppress the fatty tissue

5. In plain radiography patient dose is maximally reduced with

- A. Reducing Kv
- B. Reducing mAs
- C. Use of Grid
- D. Collimation

6. False about posterior acoustic enhancement

- A. Is a useful ultrasound artifact
- B. Seen behind structures filled with fluid
- C. Seen as increased brightness behind the structure
- D. Is an artifact causing diagnostic problems

7. pH of Fixer is between

- A. 5to6
- B. 4to 5
- C. 6to7
- D. 5.5 to 6

8. Which radiograph of an adequate quality can be obtained without the use of a grid.

- A. X-ray skull
- B. X-Ray abdomen
- C. X-ray pelvis
- D. X-ray DL spine

9. Increasing icy

- A. Increases the contrast
- B. Does not affect the contrast
- C. Decreases the contrast
- D. Decreases the radiation dose

10. A patient presenting with a small non-obstructing ureteric calculus, is best investigated by
- A. Digital radiography- KUB region
  - B. IVU
  - C. NCCTAbdomen**
  - D. USG abdomen
11. False about directional power Doppler is
- A. Is more sensitive than color Doppler in picking flow
  - B. Gives information on the direction of blood flow
  - C. Can differentiate complete block from severe stenosis of the artery
  - D. Does not give any information on the direction of blood flow
12. Most radiosensitive organ is
- A. **Breast**
  - B. Bone marrow
  - C. **Eyes**
  - D. Gonads
13. Which application is not possible with a dual slice CT
- A. Renal angiography
  - B. Coronary angiography
  - C. Peripheral angiography
  - D. Virtual bronchoscopy
14. Thickness of the lead glass used in CT console room is
- A. **0.5mm**
  - B. 0.2mm
  - C. 2mm
  - D. 5mm
15. Investigation contraindicated in the first trimester of pregnancy is
- A. **TVS**
  - B. USG pelvis
  - C. Doppler examination of fetus
  - D. Chest X-ray
16. A 7.5 MHz transducer will give a
- A. Better depth than a 3.5 MHz probe
  - B. Better resolution than a 3.5 MHz probe
  - C. Similar depth but a better resolution than a 3.5 MHz probe
  - D. Less depth but a better resolution than a 3.5 MHz probe
17. All are investigations to evaluate the small bowel except
- A. **USG**
  - B. CT Enterography
  - C. CT Enteroclysis
  - D. MR enteroclysis
18. Best investigation for acute head trauma is
- A. Plain radiographs
  - B. NCCT brain
  - C. CECT brain
  - D. MRI brain
19. Large bowel preparation is done in
- A. CECTabdomen
  - B. Barium enema in acute ulcerative colitis
  - C. Virtual colonoscopy
  - D. **BMFT** with per-oral pneumocolon

20. The safest contrast which can be used in a patient with renal disease is  
 A. Hexabrix B. Iopamidol  
 C. Sodium meglumine diatrizoate D. Iodixanol
21. All are true regarding a mammography tube except  
 A. Aluminium filter is used B. Molybdenum filter is used  
 C. Beryllium exit window is present D. Rhodium filter is used
22. IV administration of iodinated contrast should be avoided in  
 A. A diabetic patient B. An infant  
 C. Acute renal failure D. Hypertension
23. Identify the correct statement  
 A. Standard silver halide films are blue sensitive films  
 B. Dental film is a single emulsion, non-screen film  
 C. Film used in mammography is a single emulsion double screen film  
 D. Duplicating film is a single emulsion film and exposed with ultraviolet light
24. Highest density of Barium suspension is used in  
 A. Double contrast barium swallow B. Barium meal  
 C. Double contrast barium meal D. BMFT
25. Non-radiating modalities are all except  
 A. Sonomammography B. Virtual bronchoscopy  
 C. Sonohysterosalpingography D. MR Enterography
26. Heparin is a drug used  
 A. To stop bleeding  
 B. To prevent clotting of blood  
 C. In severe contrast reaction  
 D. To treat contrast extravasation during IV injection
27. Scatter radiation can be reduced by all except  
 A. Compression B. Use of grid  
 C. Air gap technique D. increasing Kv
28. Identify the correct match
- |    |    | Atomic number | K shell energy ( KeV) |
|----|----|---------------|-----------------------|
| 1. | Al | 13            | 1.6                   |
| 2. | I  | 57            | 33                    |
| 3. | Ba | 56            | 37                    |
| 4. | Mo | 42            | 24                    |
- A. 1 and 2 are correct B. 1 and 3 are correct  
 C. 1, 2 and 3 are correct D. 2, 3 and 4 are correct

29. In a 3 phase, 6 pulse generator the ripple is  
A. 13% B. 6%  
C. 10% D. 9%
30. The window width is largest in viewing the  
A. Brain B. Abdomen  
C. Lungs D. Mediastinum
31. False about stochastic effects is  
A. Have no threshold dose  
B. Risk increases linearly with dose  
C. Severity of the effect does not increase with dose  
D. Risk does not increase linearly with dose
32. Weighting factor for breast is  
A. 0.2 B. 0.01  
C. 0.05 D. 0.12
33. The minimum radiation dose is received in  
A. Mammography  
B. Chest X Ray PView  
C. Chest X Ray lateral  
D. Sequential HRCT chest
34. At a constant mAs the relationship between ESD and kV  
A. ESD is roughly proportional to square of kV  
B. ESD is roughly proportional to kV  
C. ESD is roughly proportional to reciprocal of kV  
D. No relation exists
35. Which grid will be preferred with large field radiography and using high kV  
A. 8 : 1 B. 4 : 1  
C. 12 : 1 D. 10 : 1
36. Ring down artifact is seen in  
A. Ultrasound B. CT  
C. with Circular coil in MRI D. CR
37. Identify the incorrect statement wrt PET  
A. The two photons produced has an energy of 511 KeV each  
B. Most common positron emitter used is  $^{18}\text{F}$   
C. The positive particle travels approximately 2 mm before being annihilated by an electron  
D. The two photons produced has a combined energy of 511 KeV

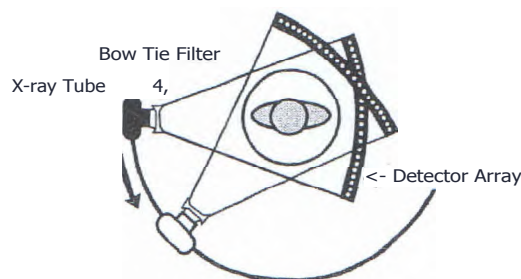
38. The leakage radiation from the X-ray tube should be less than
- A. 1.5 m Gy in 1 hour at a distance of 1 m from the focus
  - B. 1 m Gy in 1 hour at a distance of 1 m from the focus
  - C. 2 m Gy in 1 hour at a distance of 1 m from the focus
  - D. 0.1 m Gy in 1 Sec at a distance of 1 m from the focus
39. Which scientist was not awarded a nobel prize for his contribution in the field of Radiology
- A. Godfrey Hounsfield
  - B. Felix Bloch
  - C. Mansfield
  - D. Paul Christian lauterburg
40. If the ultrasound frequency probe operates at 2 MHz its third harmonics is at
- A. 4 MHz
  - B. 8 MHz
  - C. 6 MHz
  - D. 10 MHz
41. Higher Doppler frequency is obtained if
- A. The velocity is increased
  - B. Higher probe frequency is used
  - C. The beam is aligned more in the direction of the flow direction
  - D. All are correct
42. The percentage of rejects due to a specific cause is
- A. Rejects due to a specific cause /the total number of rejects X 100
  - B. Rejects due to a specific cause /the total number of radiographs taken X 100
  - C. Total number of rejected radiographs /the rejects due to a specific cause X 100
  - D. None of the above
43. Calculate the geometric un-sharpness for a radiographic procedure with focal spot 2mm, the focus- receptor distance of 100cm and the object- receptor distance of 25cm
- A. 0.33mm
  - B. 0.5mm
  - C. 0.67 mm
  - D. 0.25mm
44. Choose the correct statement wrt ultrasound and Doppler
- A. The maximum Doppler shift is obtained when  $\theta$  is 90 and in USG imaging the strongest echoes occur when  $\theta$  is zero
  - B. The maximum Doppler shift is obtained when  $\theta$  is 90 and in USG imaging the strongest echoes occur when  $\theta$  is 90
  - C. The maximum Doppler shift is obtained when  $\theta$  is zero and in USG imaging the strongest echoes occur when  $\theta$  is 90
  - D. None is correct
45. The most important drug given in anapylaxis is
- A. Prednisolone
  - B. Adrenaline
  - C. Avil
  - D. Salbutamol





56. Select the incorrect option
- A. There are 7 tarsal bones
  - B. Patella is a sesamoid bone
  - C. Tibia is not the longest bone in the human body
  - D. There are 7 carpal bones
57. All are important landmarks except
- A. Suprasternal notch
  - B. Inferior scapular angle
  - C. Head of femur
  - D. Xiphi-sternal joint
58. Which view of the chest is the best to see the relation of the esophagus with the left atrium is
- A. Lateral
  - B. Right oblique
  - C. Left oblique
  - D. Antero-posterior
59. All are true except
- A. Impulse in the heart is generated in the SA node
  - B. QRS complex in ECG represents the ventricular contraction
  - C. P wave represents the atrial relaxation
  - D. Cardiac output is the product of stroke volume and heart rate
60. Circle of Willis is present in the
- A. Posterior fossa
  - B. supra-cisternal region at the base of the brain
  - C. Anterior cerebral fossa
  - D. Junction of the spinal cord and the medulla
61. Identify the incorrect statement with respect to X rays
- A. Are electromagnetic waves and behave as waves as well as particles
  - B. Are electromagnetic waves having more frequency than infrared waves
  - C. Are electromagnetic waves having more energy than the microwaves
  - D. Are electromagnetic waves having more wavelength than the microwaves
62. Identify the incorrect statement with respect to MRI
- A. As TR increases SNR increases
  - B. As TR increases SNR decreases
  - C. As TR decreases scan time decreases
  - D. As TR decreases T1 contrast increases
63. SNR in MRI increases with all except
- A. Decrease in TE
  - B. Increase in slice thickness
  - C. Increase in matrix size
  - D. Use of local coil

64. Bones and air do not produce artefacts in  
 A. MRI  
 B. VICCT head  
 C. USG  
 D. CECT abdomen
65. Zipper artifact is encountered in  
 A. USG of lower abdomen  
 B. Volume CT MRI  
 C. Pelvic CT
66. Identify the correct option wrt CTDI  
 A. CT dose index takes into account length of the scanning  
 B. Is a measure of radiation dose from a single rotation of the gantry  
 C. Is a measure of radiation dose received by the patient in 1 sec of scanning  
 D. CTDI is dependent upon the size of the patient
67. All are prerequisites of MR spectroscopy except  
 A. Magnetic field strength of more than 1 Tesla  
 B. Uniform magnetic field ( better than 1ppm)  
 C. Magnetic field strength of 2 Tesla or more  
 D. Use of phase encoding gradients only
68. Correctly match the two columns
- | Artefact                   | Solution         |
|----------------------------|------------------|
| 1. Alising                 | a. Use gating    |
| 2. Chemical shift          | b. Use spin echo |
| 3. Magnetic susceptibility | c. Enlarge FOV   |
| 4. Phase mismatching       | d. Reduce FOV    |
- A. 1-c, 2-b, 3-d,4-a  
 B. 1-a, 2-c, 3-b, 4-d  
 C. 1- c, 2-a, 3-d, 4-b  
 D. 1-c, 2-d, 3-b, 4-a
69. Identify the generation of CT in the diagram



- A. Second  
 B. Third  
 C. Fourth  
 D. None

70. True regarding ESD are all except
- A. Is the absorbed dose in the skin in a given location and includes the back scatter radiation
  - B. The SI unit of ESD is Sieverts
  - C. It can be measured directly with a dosimeter on the patient
  - D. It can be calculated by multiplying the incident dose with the back scatter factor
71. If all the above factors are the same the same level of radiation energy reaches the film in all except
- A. 20 mA for 1 sec
  - B. 40 mA for 0.5 sec
  - C. 80 mA for 0.2 sec
  - D. 200 mA for 0.1 sec
72. All are the causes of distortion of the image except
- A. Foreshortening
  - B. Image contrast
  - C. Elongation
  - D. Differentiation magnification
73. The act which deals with the sex determination during antenatal USG scan is
- A. Pre Conception Pre Natal Diagnostic Test
  - B. Pre Natal Diagnostic Test
  - C. Pre Natal Sex Determination Test
  - D. Pre Natal Diagnostic Technique
74. Calculate the average gradient of the film if the log relative exposure of 1 to 1.5 produces the densities within the useful range i.e. 0.25 to 2.0
- A. 3.5
  - B. 3
  - C. 2.5
  - D. 2
75. Emergency equipments in the radiology department includes
- A. Suction equipment
  - B. Laryngoscope
  - C. Oxygen cylinder
  - D. All of the above
76. All views are taken with the patient prone except
- A. Cadwells view
  - B. PNS
  - C. Townes
  - D. Optic canal
77. Estimate the length of the tissue covered if imaged for 4 seconds with a collimation of 2mm, gantry rotation time is 0.5 sec and pitch of 1.5
- A. 24 mm
  - B. 30mm
  - C. 12mm
  - D. 18mm
78. What is the rating of an X Ray unit in kW with the following parameters mA 500, peak kV=90 kV and using a constant potential generator
- A. 50
  - B. 45
  - C. 90
  - D. 55

79. Photoelectric effect is the predominant tissue interaction in all except  
A. Radiography of extremity                      B. Mammography  
C. Barium swallow                                      D. Abdominal radiograph
80. Perfluorooctylbromide is a  
A. USG contrast agent                                      B. CT contrast agent  
C. **Both**    D. **None**
81. The line from the lower point on the inferior orbital margin to the upper border of external auditory meatus is called the  
A. Anatomical base line                                      B. Reids base line  
C. Frankfurt line    D. All of the above
82. Bilateral SI joints are better visualized with  
A. Pelvis with B/L SI joints -AP view  
B. Pelvis with B/L SI joints-PA view  
C. **Both of the above**  
D. None of the above
83. Disadvantage of Power Doppler over colour Doppler is  
A. Dependant on insonation angle  
B. Does not indicate the velocity  
C. Decreased sensitivity for flow  
D. Aliasing occurs
84. According to the USG safety guidelines the total sound energy should not exceed  
A. 20 J/cm<sup>2</sup>    B. 100 J/cm<sup>2</sup>  
C. 50 J/cm<sup>2</sup>    D. 40 J/cm<sup>2</sup>
85. All are artifacts seen with MRI except  
A. Zipper artifact    B. Ghost image  
C. Aliasing    D. **Ring** down artifact
86. Find the incorrect statement  
A. Noise is the fundamental limit to the quality of the CT image  
B. It reduces the contrast resolution of the smaller objects and reduces the spatial resolution of the low contrast objects  
C. It reduces the spatial resolution of the low contrast objects but not the contrast resolution of the smaller objects  
D. The sources are quantum noise, electronic noise and structural noise
87. Tissue harmonic imaging should be used in the following to obtain a good quality image on USG  
A. Obese patient  
B. Thin patient  
C. **Interference due to bowel gases**  
D. Abdominal trauma

88. The advantages of MRCP are all except
- A. Non radiating
  - B. Non invasive
  - C. No IV contrast required
  - D. Short scanning time
89. Heavily T2 weighted sequences are acquired in all except
- A.** MR urography
  - B.** MRCP
  - C. MRI of brain for hydrocephalus
  - D. MR myelography
90. In coronary CT using prospective gating the cardiac scan is acquired during the
- A. R-R interval
  - B. P-O interval
  - C. S-T interval
  - D. P-R interval

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