

First FRCR in Clinical Radiology

Physics Module: Specimen Questions

- 1 Concerning the Compton effect:
 - (a) There is interaction between a photon and a free electron.
 - (b) The larger the angle through which the photon is scattered, the more energy it loses.
 - (c) The wavelength change produced depends upon the scattering material.
 - (d) High energy radiation is scattered more than lower energy radiation.
 - (e) The amount of scattering that occurs depends on the electron density of the scattering material.

- 2 Concerning digital radiography (DR):
 - (a) Phosphors may be used in the detector.
 - (b) The receptor signal is used to determine exposure cut-off time.
 - (c) The image can be viewed within five seconds of the exposure.
 - (d) Pixel dropout is a recognised artefact.
 - (e) The receptor dose indicator gives a record of patient dose.

- 3 Radiological image unsharpness increases
 - (a) if shorter exposure times are used.
 - (b) as the object to receptor distance increases.
 - (c) as the target angle decreases.
 - (d) if a grid is used.
 - (e) as the focal spot size increases.

- 4 In automatic mode fluoroscopy, the patient entrance surface dose rate
 - (a) usually increases with image intensifier field size.
 - (b) depends on the added filtration.
 - (c) is independent of the kV-mA characteristic used.
 - (d) doubles if the patient-intensifier face distance is halved.
 - (e) should be less than 50 mGy min^{-1} .

- 5 Concerning *The Ionising Radiations Regulations 1999*:
 - (a) Local Rules are required for a controlled area.
 - (b) Only classified workers can enter a controlled area.
 - (c) The annual effective dose limit is 30 mSv for employees aged over 18 years.
 - (d) Personal dosimeters should be issued for periods no greater than one month.
 - (e) A radiation protection adviser is responsible for managing staff radiation safety in a radiology department.

- 6 Concerning *The Ionising Radiation (Medical Exposure) Regulations 2000*:
- (a) Overall responsibility for keeping dose to the patient as low as reasonably practicable rests with the practitioner.
 - (b) The practitioner is the only person entitled to authorise an x-ray exposure.
 - (c) Only doctors and dentists are permitted to request an x-ray.
 - (d) The person performing quality control tests on an isotope calibrator must have training.
 - (e) The enforcing authority is the Health and Safety Executive.
- 7 Radionuclides
- (a) are those nuclides having more neutrons than protons.
 - (b) may emit x-rays.
 - (c) decay exponentially.
 - (d) do not occur naturally.
 - (e) may be produced in a cyclotron.
- 8 Concerning computed tomography:
- (a) A CT number of 0 is assigned to water.
 - (b) Image quality is limited by electronic noise.
 - (c) Axial image resolution is improved with reduction in slice width.
 - (d) An unfiltered x-ray beam is used.
 - (e) The typical effective dose for a CT head scan is 10 mSv.
- 9 Signal to noise in MRI is increased with
- (a) a decreased matrix size.
 - (b) a longer TE.
 - (c) a thicker slice.
 - (d) a smaller field of view.
 - (e) the use of a higher main magnetic field.
- 10 Concerning diagnostic ultrasound:
- (a) The higher the transmitted frequency, the greater the depth that can be scanned.
 - (b) In abdominal scanning it typically has a wavelength in soft tissue of about 0.5 mm.
 - (c) It is reflected from a surface between two media that have different acoustic impedances.
 - (d) The ultrasound beam can be focussed.
 - (e) Ionisation of cell water may occur at frequencies greater than 5 MHz.

Answers									
1a	T	1b	T	1c	F	1d	F	1e	T
2a	T	2b	T	2c	T	2d	T	2e	T
3a	F	3b	T	3c	F	3d	F	3e	T
4a	F	4b	T	4c	F	4d	F	4e	T
5a	T	5b	F	5c	F	5d	F	5e	F
6a	F	6b	F	6c	F	6d	T	6e	F
7a	F	7b	T	7c	T	7d	F	7e	T
8a	T	8b	F	8c	T	8d	F	8e	F
9a	T	9b	F	9c	T	9d	F	9e	T
10a	F	10b	T	10c	T	10d	T	10e	F