

## diagnostic questions

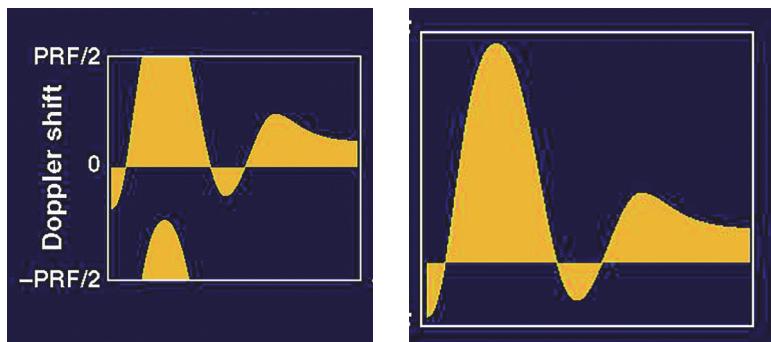
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**D69.** Physicians A and B are issued collar and waist radiation dosimeters. Both physicians receive an identical x-ray exposure during fluoroscopy. Physician A consistently and correctly wears his collar badge at the collar and outside of the lead apron and wears the waist badge under the lead apron. Physician B mixes up his collar and waist badge 50% of the time so that half the time the waist badge is worn outside the apron at the collar and the collar badge is worn under the lead apron. If the EDEX method is used to calculate exposure, which physician will have a *higher* reported exposure?

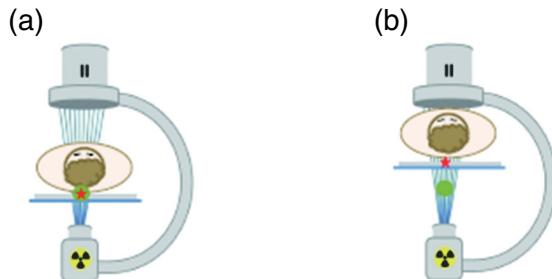
- A. Physician A
- B. Physician B

**D70.** The aliasing artifact shown below on the left during a pulsed Doppler study can be corrected as shown on the right by which of the following manipulations?

- A. switch to amplitude mode
- B. increase PRF
- C. decrease FOV
- D. increase matrix size
- E. decrease PRF



Use the figures below for questions D71 and D72.



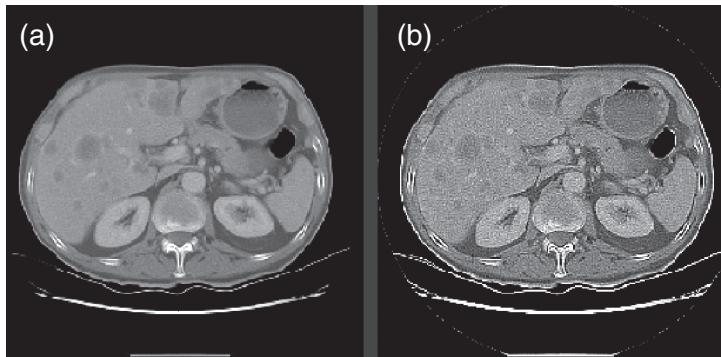
**D71.** For the two interventional fluoroscopy geometries shown above, which one will give lower entrance dose to the patient?

- A. (a)
- B. (b)
- C. The dose is the same.

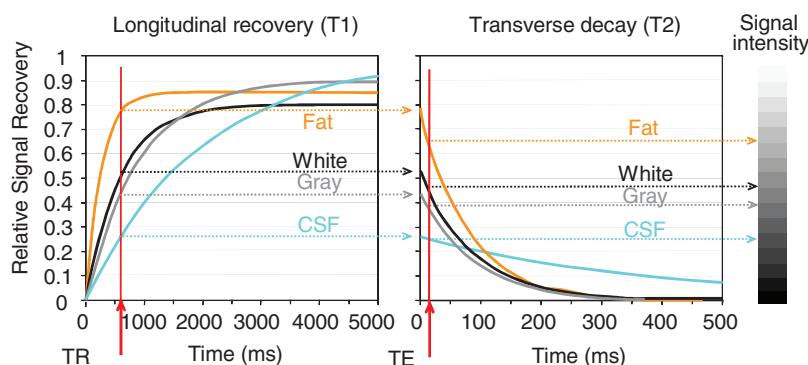
**D72.** For the two interventional fluoroscopy geometries shown above, which one will give the least scatter to the operator?

- A. (a)
- B. (b)
- C. The scatter is the same.

- D73.** For the identical CT images of the liver shown below, the image on the right appears noisier compared to the image on the left. What CT parameter was adjusted to produce the image on the right?



- A. more scatter photons were added
  - B. FOV was increased
  - C. mAs was increased
  - D. sharp filter was used
  - E. smooth filter was used
- D74.** The relative signal intensity for a spin echo image is shown with TR and TE as indicated in the graph below. The image contrast indicated by the arrow will be:

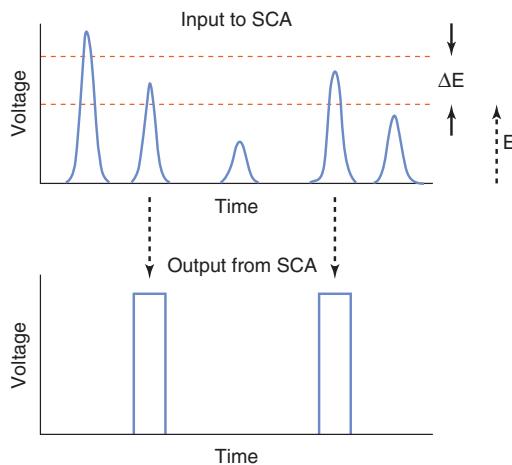


- A. T1 weighted
- B. T2 weighted
- C. proton density
- D. T2\* weighted

## diagnostic questions

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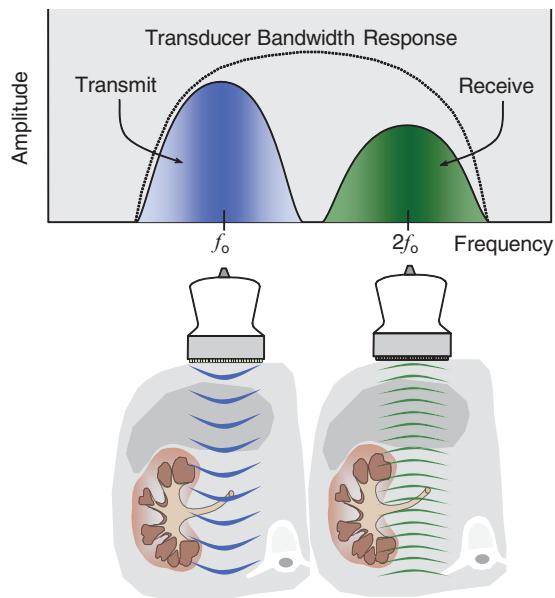
**D75.** The schematic shown below depicts the signal processing for which imaging modality?



- A. computed tomography
- B. MRI
- C. gamma camera
- D. ultrasound
- E. mammography

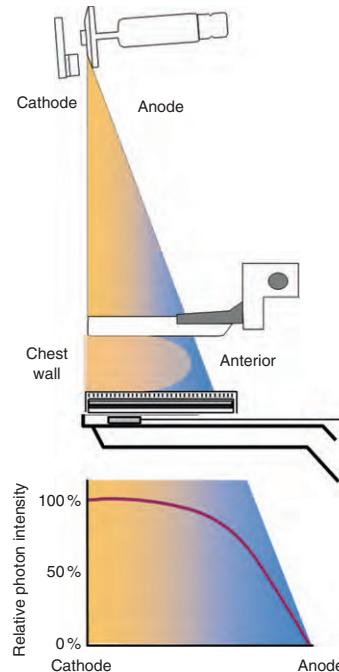
**D76.** The figure below is an illustration of what?

- A. high-resolution chest CT
- B. ventilation scan
- C. US harmonic imaging
- D. MRI lung screening
- E. MTF of lung radiograph

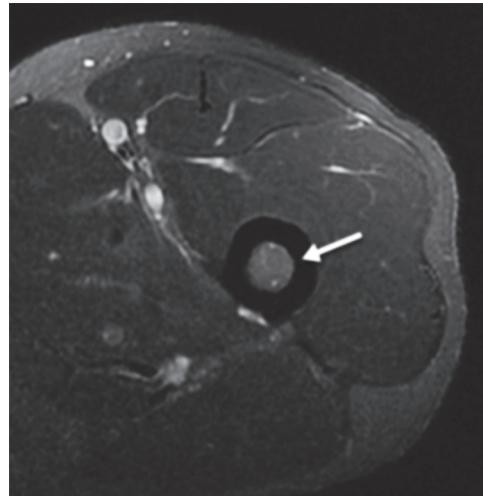


**D77.** In mammography, the chest wall is positioned facing the cathode of the x-ray tube due to:

- A. tube loading
- B. anode heel effect
- C. focal spot blur
- D. image receptor orientation



**D78.** In the image shown below, cortical bone (white arrow) looks dark because it has:



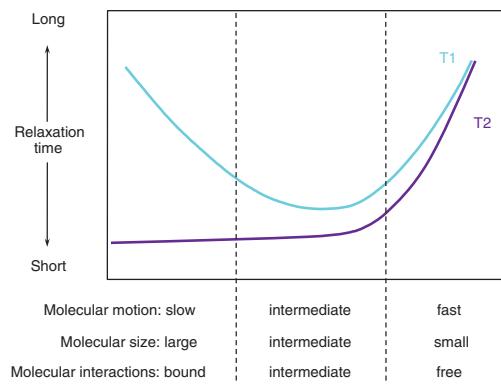
Axial T2 fat saturated MRI of femur

- A. extremely mobile protons and long T2
- B. very low mobility of protons and short T2
- C. turbulent flow, which causes signal loss from cortical bone
- D. diffusion phenomenon, which reduces signal from cortical bone

## diagnostic answers

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- D70.** B. Aliasing occurs if the Pulse Repetition Frequency (PRF) is less than twice the Doppler frequency shift being measured (Nyquist criterion).
- D71.** B. Geometry B delivers the lowest entrance skin as it is further away from the source.
- D72.** B. Bringing the image intensifier close to the patient's body will significantly reduce the scattered radiation in the direction of the operator, because the patient entrance dose is lower.
- D73.** D. Sharp filters improve the spatial resolution but make the image noisier.
- D74.** A. Short TR emphasizes T1 differences, while short TE de-emphasizes T2 differences.
- D75.** C. Schematic shows pulse height analysis using a Single Channel Analyzer (SCA). Notice the energy windows.
- D76.** C. Harmonic imaging uses a lower central frequency and receives echo from higher harmonic frequencies, thus enabling imaging from deeper anatomy.
- D77.** B. Due to anode heel effect, the thicker part of the breast is positioned facing the cathode so an equalized intensity of radiation reaches the image receptor.
- D78.** B. In the T2-weighted image, tissues with short T2 values will have low signal. Cortical bone has short T2 values because the protons have low mobility. This enhances local magnetic field interactions (dipole-dipole interaction) between adjacent protons and makes T2 relaxation more rapid. There is no turbulent flow in cortical bone. The spin-echo image is not diffusion-weighted and, therefore, diffusion should not reduce signal.



- D79.** C. The spatial resolution in MRI is related to the FOV and sampling matrix. Hence, spatial resolution =  $240/256$  or  $\sim 0.94$  mm. The spatial resolution is independent of the sampling time of the ADC.