A PRACTICAL GUIDE TO PHYSICS AND ECHOCARDIOGRAPHY

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BOREDOM

No really, I love listening to you.
What best describes you?

1. Doctor – acute medicine / A&E / ITU
2. Doctor – cardiology trainee
3. Clinical physiologist
4. Other
5. In the wrong room!
Are you planning to sit the BSE examination?

1. Yes – within the next six months
2. Yes – at some point
3. No – considering other accreditation (eg emergency medicine level 2)
4. No plans for accreditation
Which of the following is true?

1. High frequency ultrasound penetrates bone better than low frequency ultrasound
2. Low frequency ultrasound should be used in children where possible
3. The range of usable frequencies in echocardiography is 2 to 10 Mhz
4. MHz is cycles per millisecond
5. Help!
Correct answer is option 3

- Usable frequency range is 2 to 10 Mhz
High frequency in children
Watch out for units

- Hz is cycles per second
- kHz is 1000 cycles per second, or 1 cycle per milisecond
- MHz is 1,000,000 cycles per second
Ultrasound travels

1. Faster through air than fat
2. Faster through bone than fat
3. Faster when the power is turned up
4. Slower when using low frequency probes
5. In a mysterious way
The correct answer is 2

- Ultrasound travels faster through bone (3500 m/sec) than fat (1450 m/sec)
Ultrasound and air
Can the operator change the speed of ultrasound?
Image resolution

1. The higher the frequency, the better the resolution
2. Axial resolution is the dot width perpendicular to the beam
3. Resolution is improved with ultrasound contrast
4. Temporal resolution cannot be adjusted by the operator
The correct answer is 1

- The higher the frequency, the better the resolution
How to adjust temporal resolution..
Reduce the sector width
Reduce the depth
Concentrate on region of interest
Watch out for colour Doppler
Reducing colour sector width
Which of the following is true?

1. The Nyquist limit is responsible for aliasing when using pulse wave Doppler
2. Frame rate is independent of image depth
3. Frame rate is reduced by making the sector narrower
4. Colour Doppler estimates peak flow velocity
5. Ultrasound has no known effects on human tissue
The correct answer is 1

- The Nyquist limit is responsible for aliasing when using pulse wave Doppler
Pulse vs continuous wave
Harry Nyquist
What is the most powerful ultrasound machine in use in clinical practice?
High vs low MI
Colour flow Doppler

1. Venous flow is blue, arterial is red
2. The sector width should be kept to a minimum
3. Utilises CW Doppler measurement
4. Is not affected by reverberation artefact
5. Cannot be combined with M-mode measurement
The correct answer is 2

- The sector width should be kept to a minimum
BART convention
Reverberation & acoustic shadowing
What is M-mode?