Previous exam questions in ultrasound

Ultrasound Doppler can measure blood velocity. We are
interested in measuring the blood velocity at a certain depth. This is done by pulsed Doppler. How is the depth selectivity achieved?
a) By varying the frequency in the transmitted signal
b) By varying the total energy (power) in the transmitted signal
c) By selecting the reflected signal at a certain time after the pulse is sent out (time gating)
d) By selecting a certain frequency in the reflected signal (frequency gating)

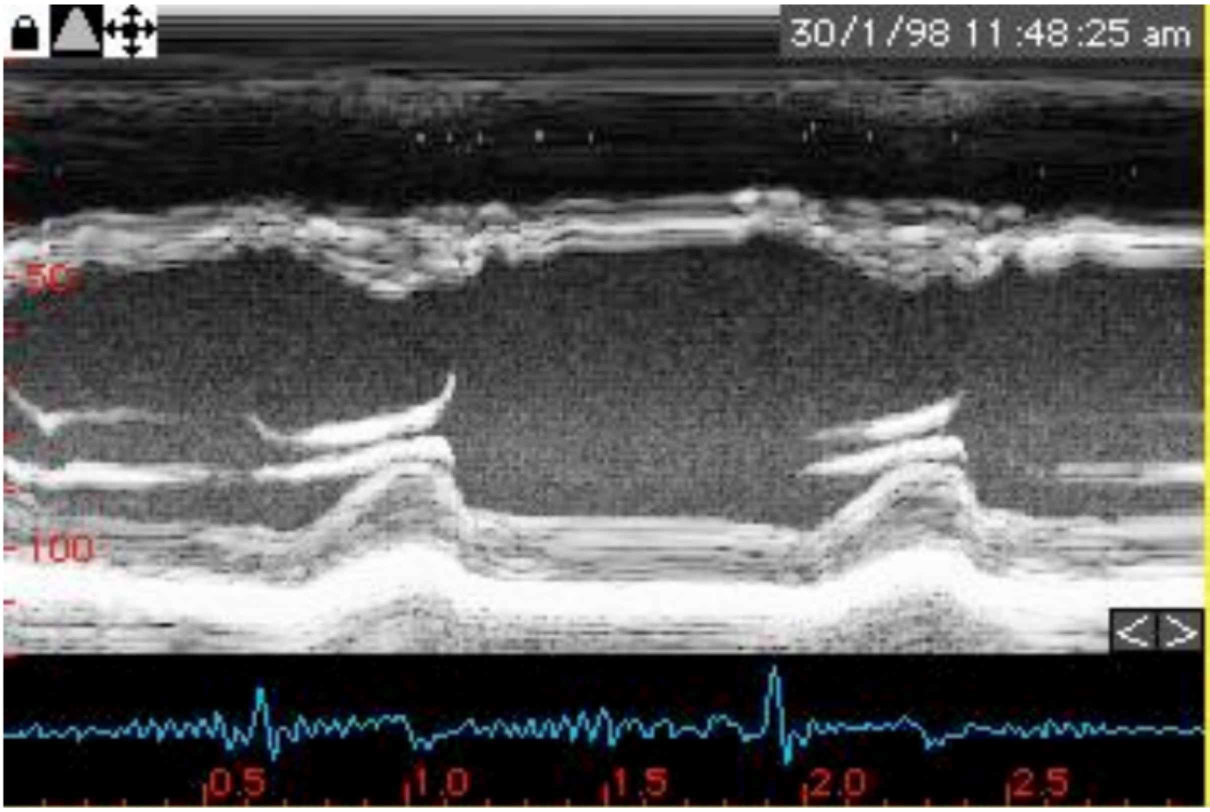
Which of these factors are important for the resolution in an ultrasound image?
A) Only the focal depth
B) Only the frequency
C) Only the probe aperture size
D) All of the above

Diagnostic ultrasound used in the heart has a frequency around 2 MHz. What approximate wavelength does this frequency correspond to?
A 0.17 mm
B 0.77 mm
C 7.7 mm
D 17 mm

What are the main biological effects of diagnostic ultrasound?
A Chemical, due to ionization
B Chemical, due to free radical formation
C Thermal (i.e. tissue heating)
D Cellular, due to mechanical cell disruption

A blood vessel has a narrowing (stenosis) in a short segment. In the normal part of the vessel, the cross sectional area is 1 cm_2, a blood velocity of 1 m/s and a systolic pressure of 120 mmHg. Through the stenosis, the blood velocity increases to 4 m/s. What is the cross sectional area of the stenosis?
A) 4 cm^2
B) 0.5 cm^2
C) 0.25 cm^2
D) 0.0625 cm^2

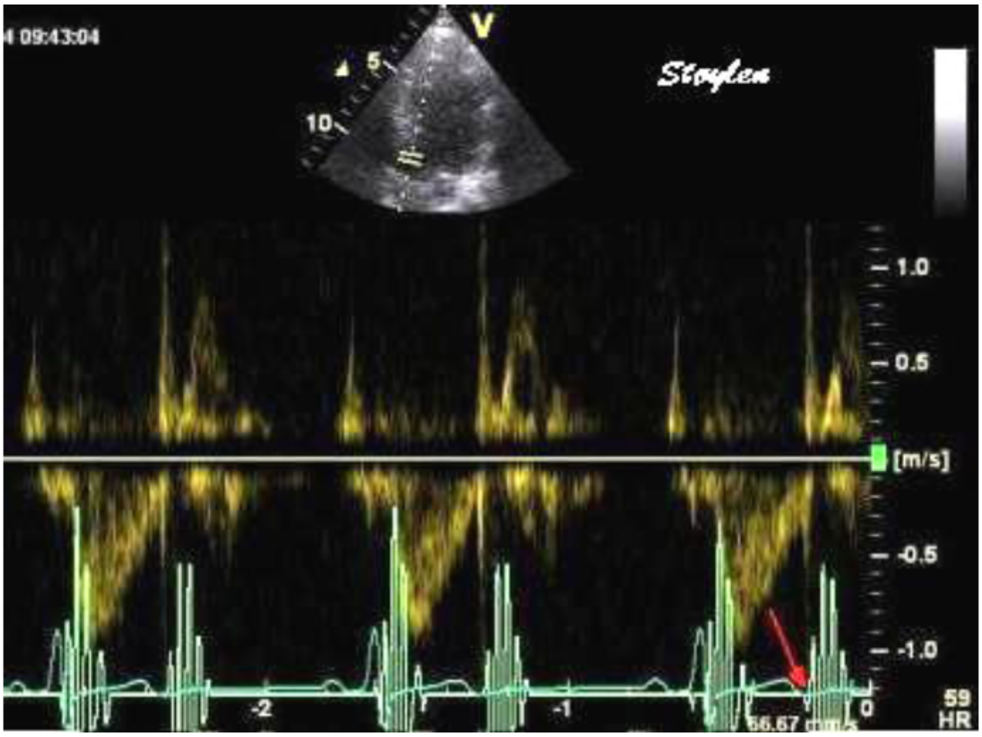
And what is the systolic pressure drop over the stenosis?
A) 4 mmHg
B) 16 mmHg
C) 32 mmHg
D) 64 mmHg



The picture shows an ultrasound picture of a heart where a single ultrasound beam is used to record an
echo that is printed along a time axis, giving a diagram of the motion of structures in the heart. What is
this ultrasound modality called?
A A-mode
B B-mode
C M-mode
D Doppler mode

What happens to ultrasound images when frequency increases?
A) Depth penetration increases, resolution increases
B) Depth penetration increases, resolution decreases
C) Depth penetration decreases, resolution increases
D) Depth penetration decreases, resolution decreases

What happens to the frame rate (in 3D called volume rate), when going from 2D imaging to 3D imaging, provided we retain the same line density (resolution)?
A Frame rate increases to the double
B Frame rate remains unchanged
C Frame rate is halved
D Frame rate decreases by an inverse square factor



The picture shows an ultrasound picture of a heart where an ultrasound beam is used to record the velocity spectrum that is printed along a time axis, giving a diagram of blood velocities in a specific place of the heart. What is this ultrasound modality called?

A A-mode

B B-mode

C M-mode

D Doppler mode

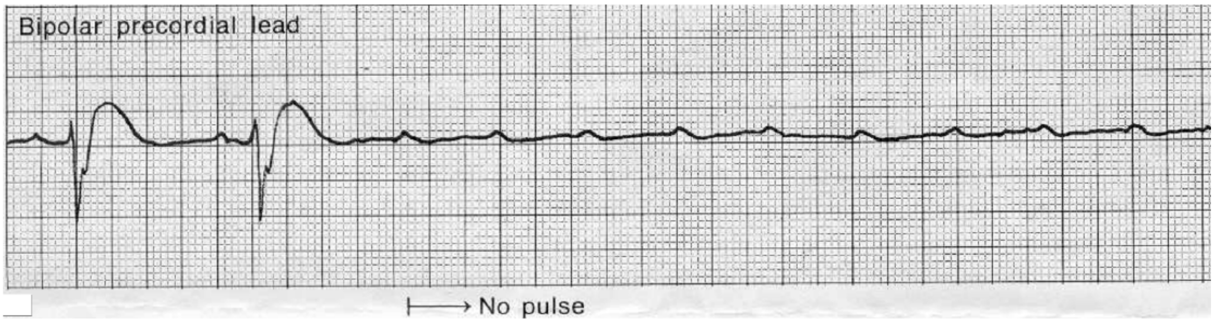
In the image above, velocity traces are sampled from a specific depth along the ultrasound beam. How is the depth selectivity achieved?

A) By varying the frequency in the transmitted signal

B) By varying the total energy in the transmitted signal

C) By selecting the reflected signal at a certain time after the pulse is sent out (time gating)

D) By selecting a certain frequency in the reflected signal (frequency gating)



A patient in the coronary care unit suddenly displays a change in the heart rhythm and pulse as shown in the figure. What is the mechanism?

A The atria suddenly starts to beat in an uncoordinated manner
B The AV-node suddenly stops conducting the impulses from the atria to the ventricles
C The ventricles suddenly starts to beat in an uncoordinated manner
D Nothing happens electrically, but the mechanic pumping stops abruptly

And how would you treat it?
A Electrical shock
B Pacemaker
C Balloon angioplasty (PCI)
D Coronary bypass surgery