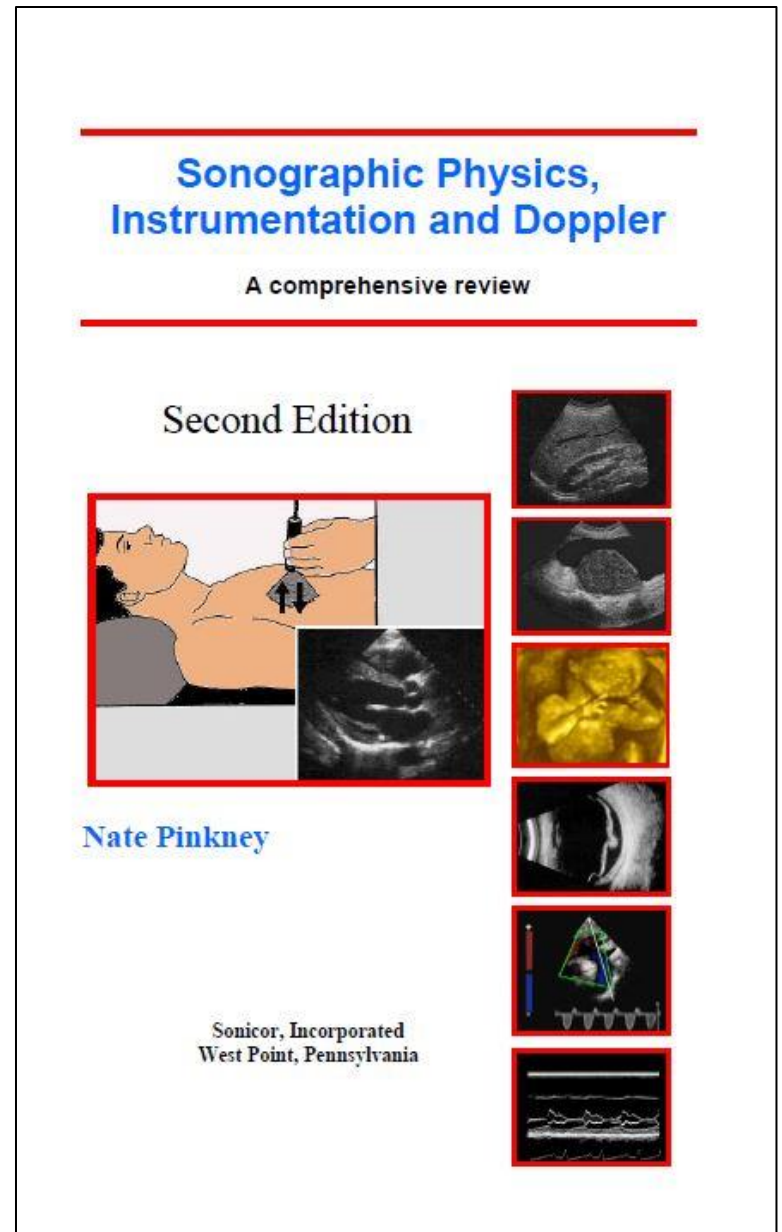


Lesson 01:

Physical Concepts

This lesson contains 15 slides plus 9 multiple-choice questions.

Accompanying text for the slides in this lesson can be found on pages 53, 59, 63, 64, 65, 75, 87, 88, 89, and 90 in the textbook:



8 BIT BINARY NUMBERS

Binary

Decimal

128 64 32 16 8 4 2 1
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1
0 0 0 0 1 0 1 0
0 0 0 0 1 1 1 1
0 0 1 0 0 0 0 0
0 1 0 0 0 0 0 0
1 0 0 0 0 0 0 0
1 1 1 1 1 1 1 1

100 10 1
= 0
= 1
= 10
= 15
= 32
= 64
= 128
= 255

ENGINEERING & SCIENTIFIC NOTATION

<u>Prefix</u>	<u>Factor</u>		<u>Decimal</u>	<u>Symbol</u>
pico	(trillionth)	10^{-12}	0.000000000001	p
nano	(billionth)	10^{-9}	0.000000001	n
micro	(millionth)	10^{-6}	0.000001	μ
milli	(thousandth)	10^{-3}	0.001	m
centi	(hundredth)	10^{-2}	0.01	c
deci	(tenth)	10^{-1}	0.1	d
deca	(ten)	10^1	10	D
hecta	(hundred)	10^2	100	h
kilo	(thousand)	10^3	1000	k
mega	(million)	10^6	1000000	M
giga	(billion)	10^9	1000000000	G
tera	(trillion)	10^{12}	1000000000000	T

DECIBELS

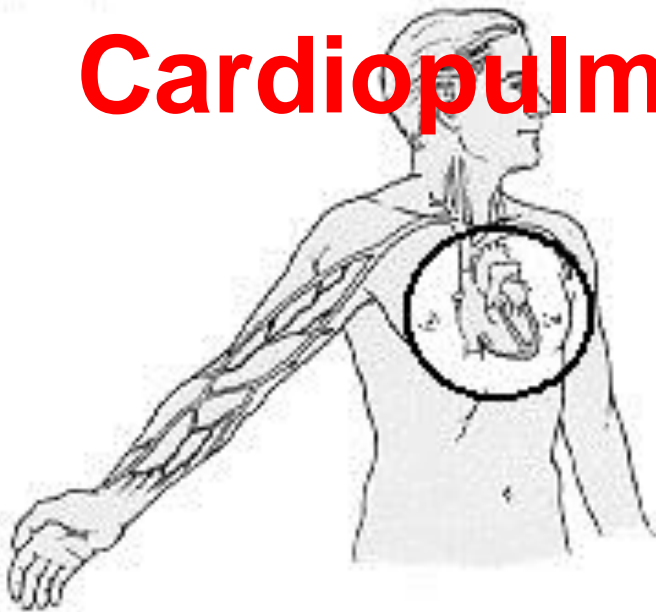
dB	Power or Intensity ratio (Amplitude ratio)²	Amplitude ratio (Power or Intensity ratio)^{1/2}
-9	0.125	0.354
-6	0.25	0.5
-3	0.5	0.707
0	1	1
+3	2	1.414
+6	4	2
+9	8	2.83
+10	10	3.16
+20	100	10
+30	1000	31.6
+40	10000	100
+50	100000	316
+60	1000000	1000

RELATIVE POWER LEVELS

Ultrasound transducer output	30 dB
Normal conversation	60 dB
Shouting	80 dB
Busy restaurant	90 dB
Motorbike	100 dB
Chainsaw	110 dB
Amusement arcade	110 dB
Sandblasting	112 dB
Stereo	115 dB
Concert	120 dB
Jet taking off	120 dB
Fireworks	150 dB
Gunfire	170 dB

MAJOR SYSTEMS OF CARDIOVASCULAR CIRCULATION

Cardiopulmonary



Systemic



VASCULAR RESISTANCE

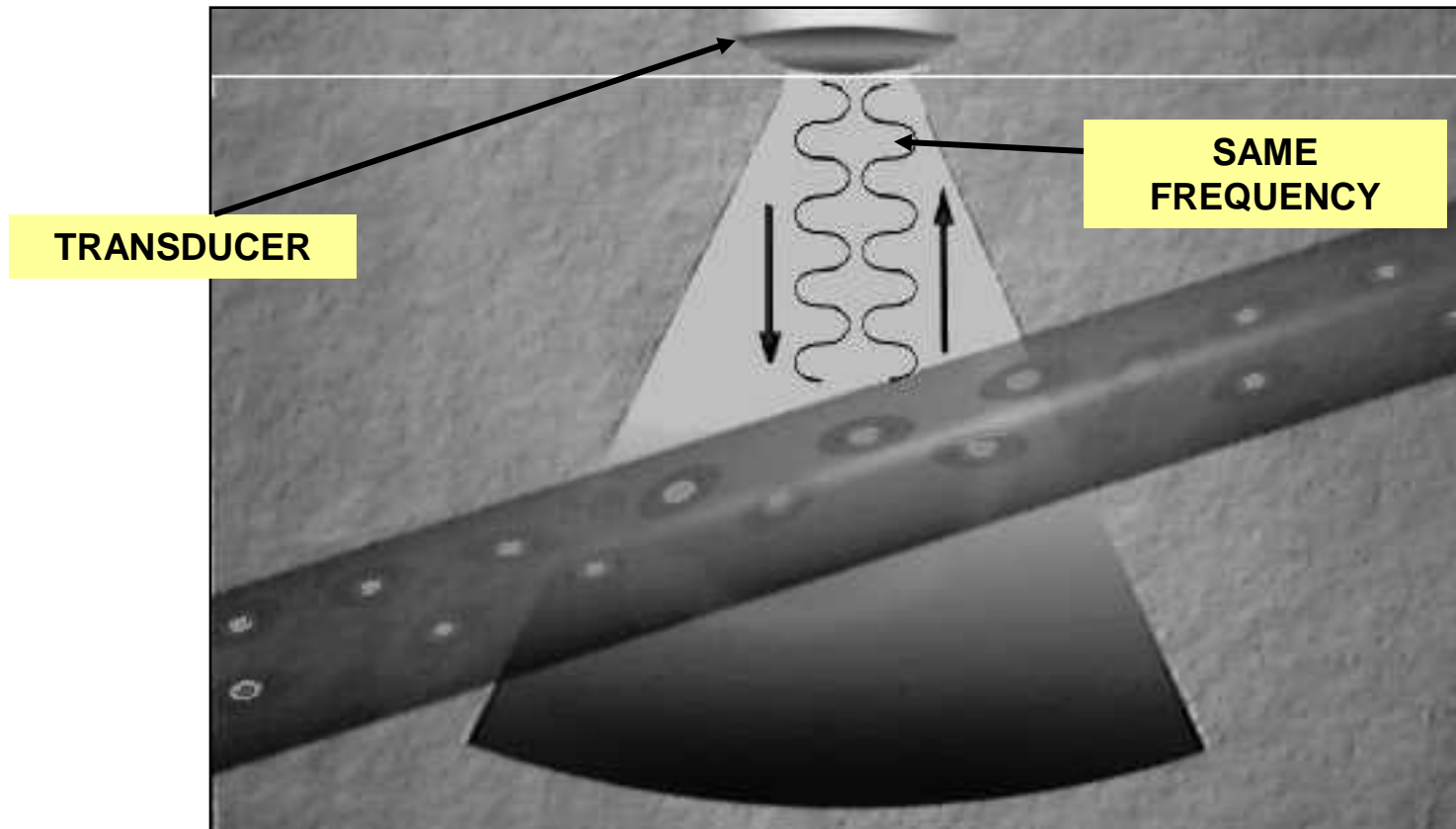
RESISTANCE IN THE VASCULAR SYSTEM

Aorta	4%
Large Arteries	5%
Main Branches	10%
Terminal branches	6%
Arterioles	41%
Capillaries	27%
Total venous	7%

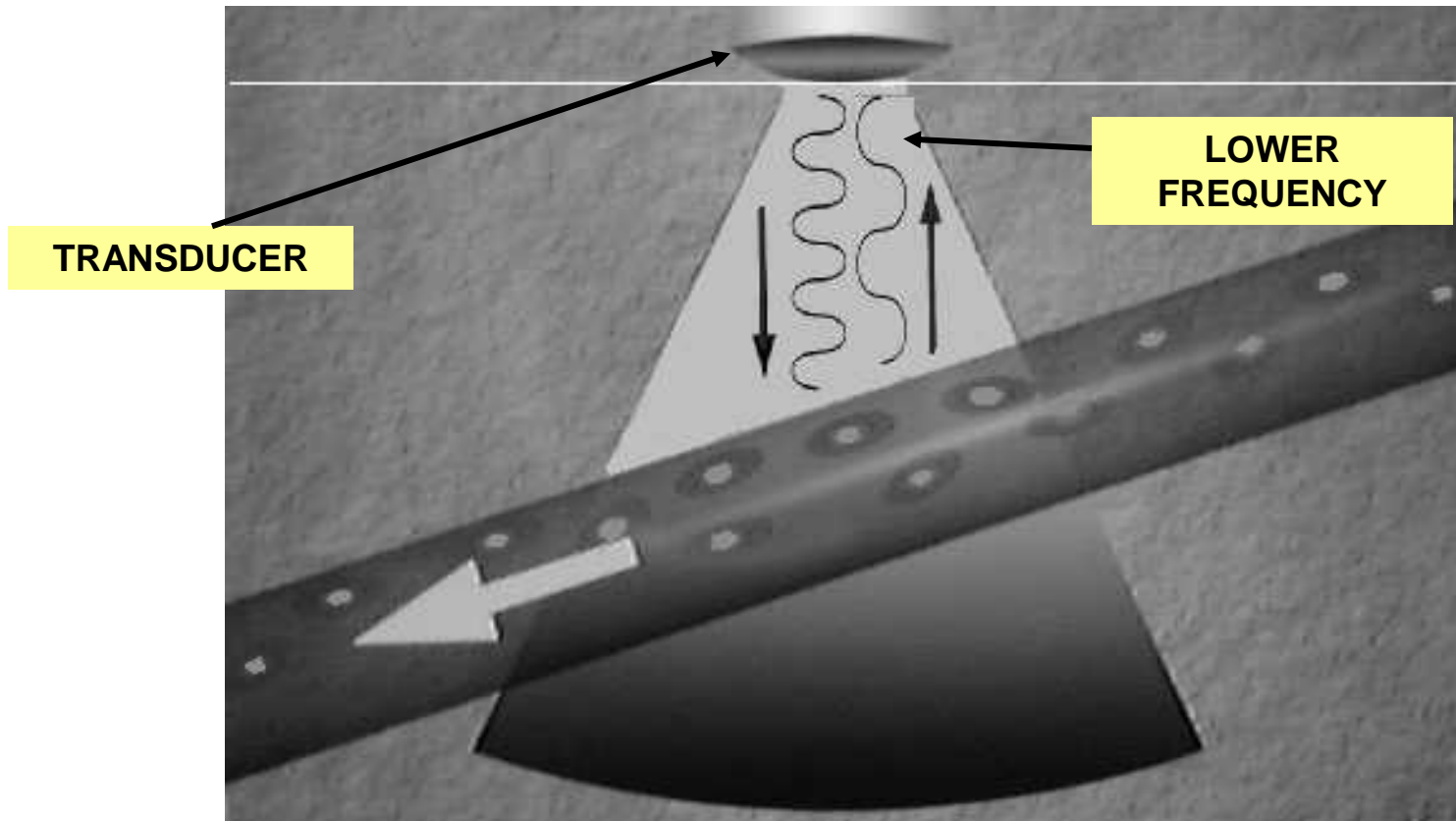
DOPPLER

DOPPLER PRINCIPLES

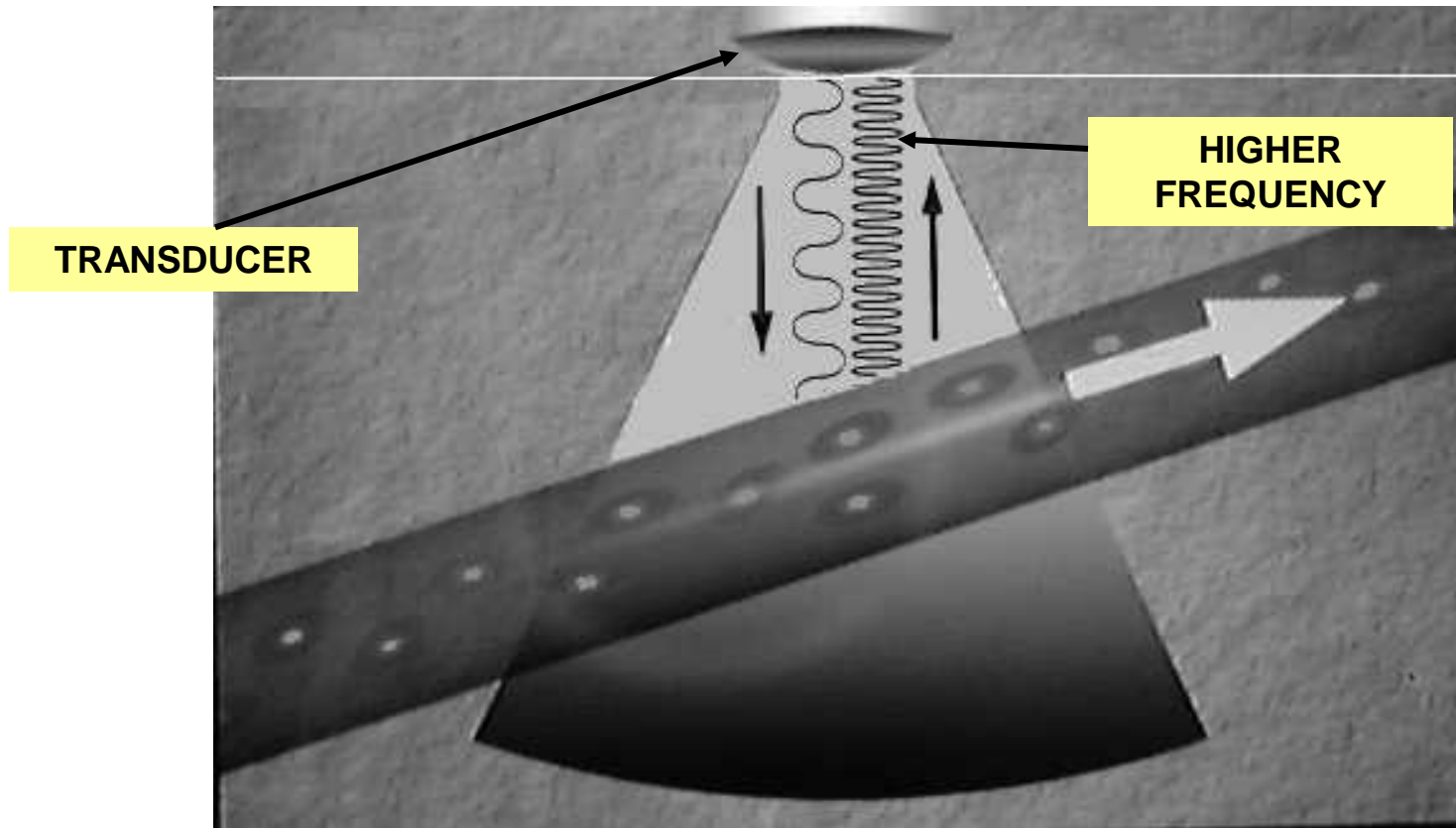
DOPPLER



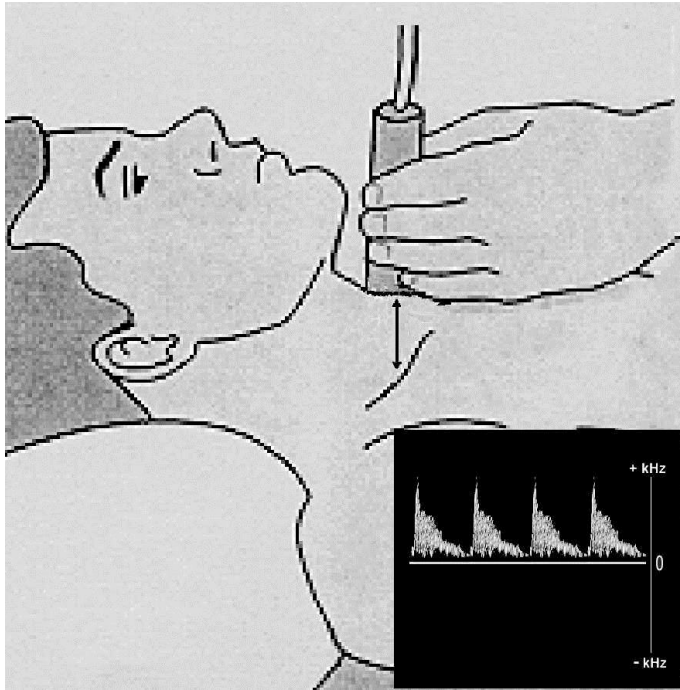
DOPPLER



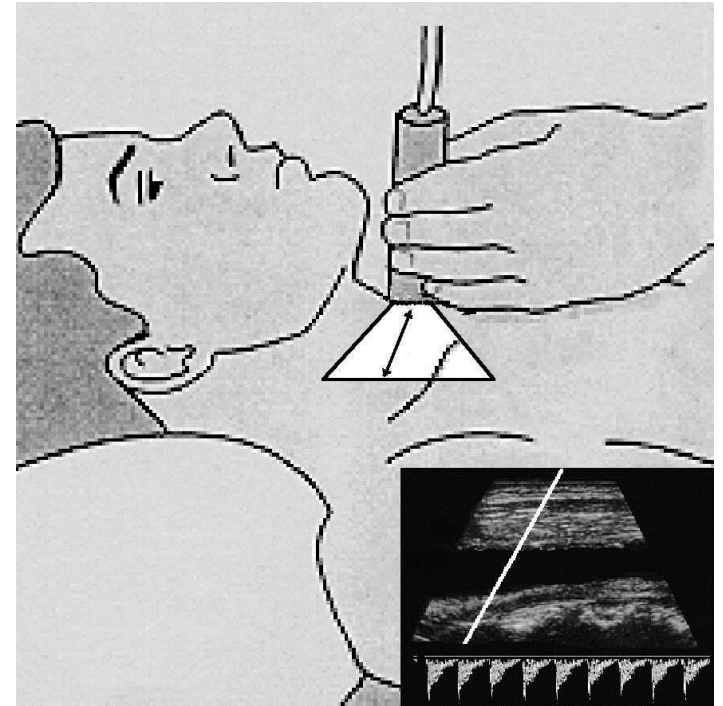
DOPPLER



CW SPECTRAL DOPPLER

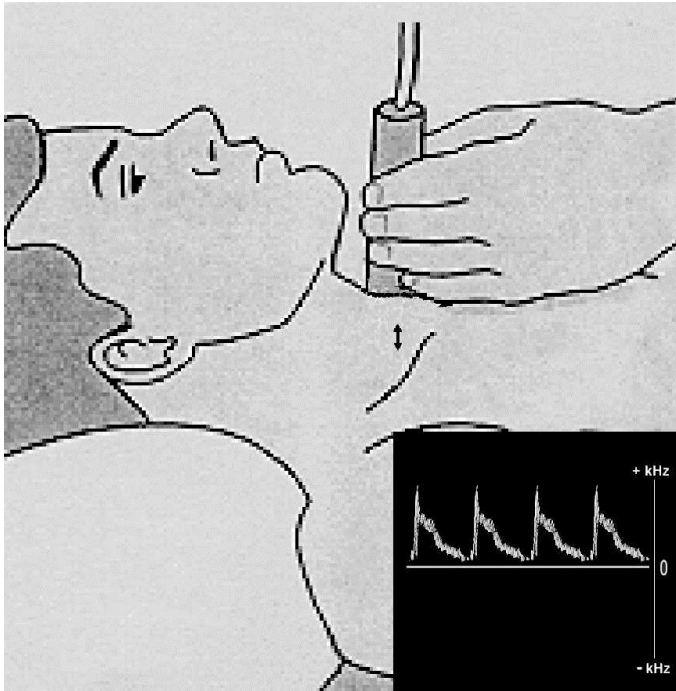


NON-IMAGING CW

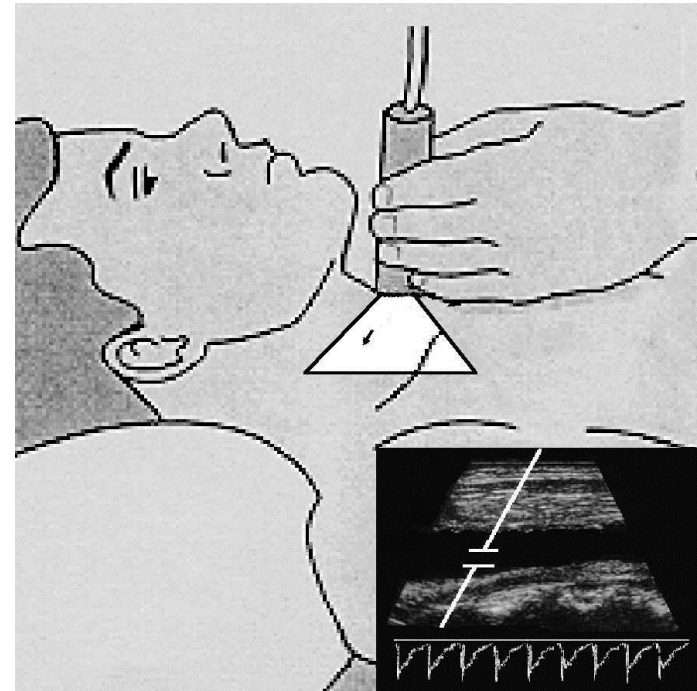


B-MODE IMAGING AND CW

PW SPECTRAL DOPPLER

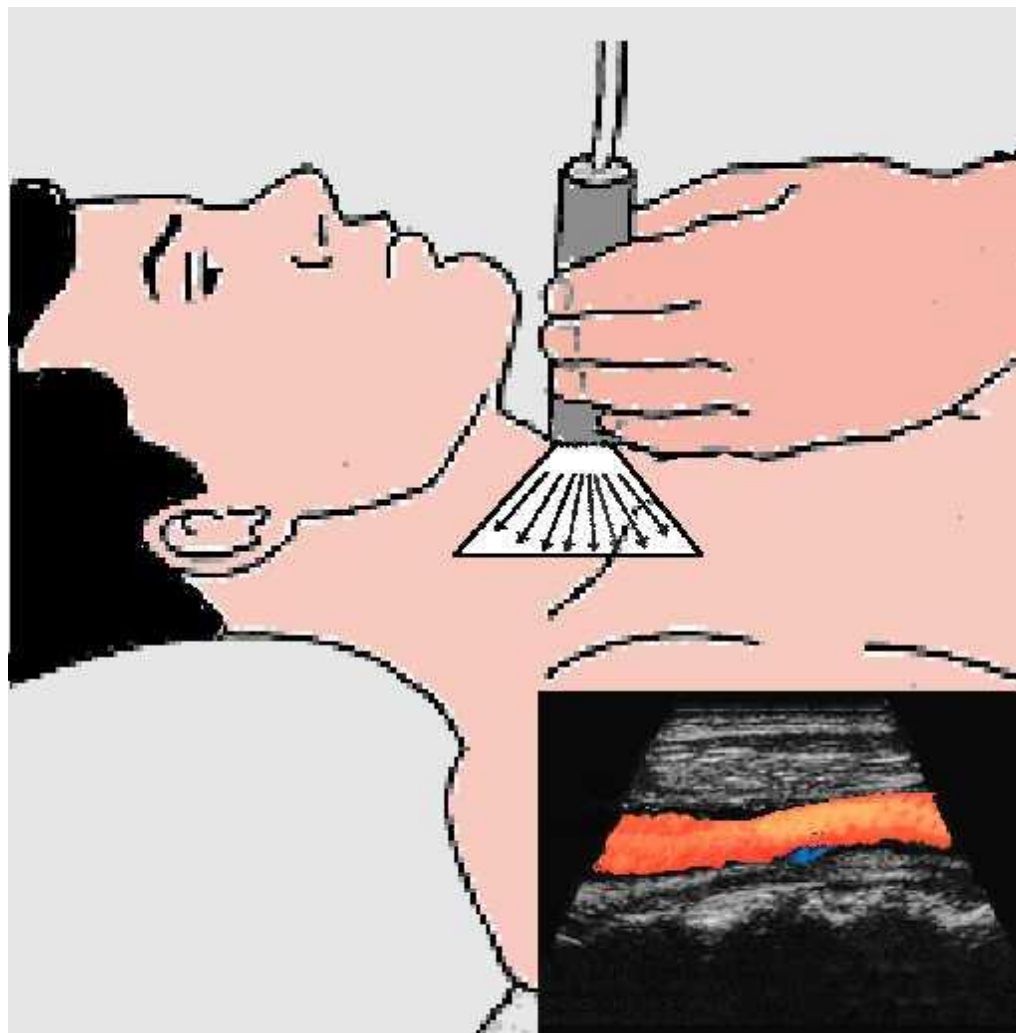


NON-IMAGING PW

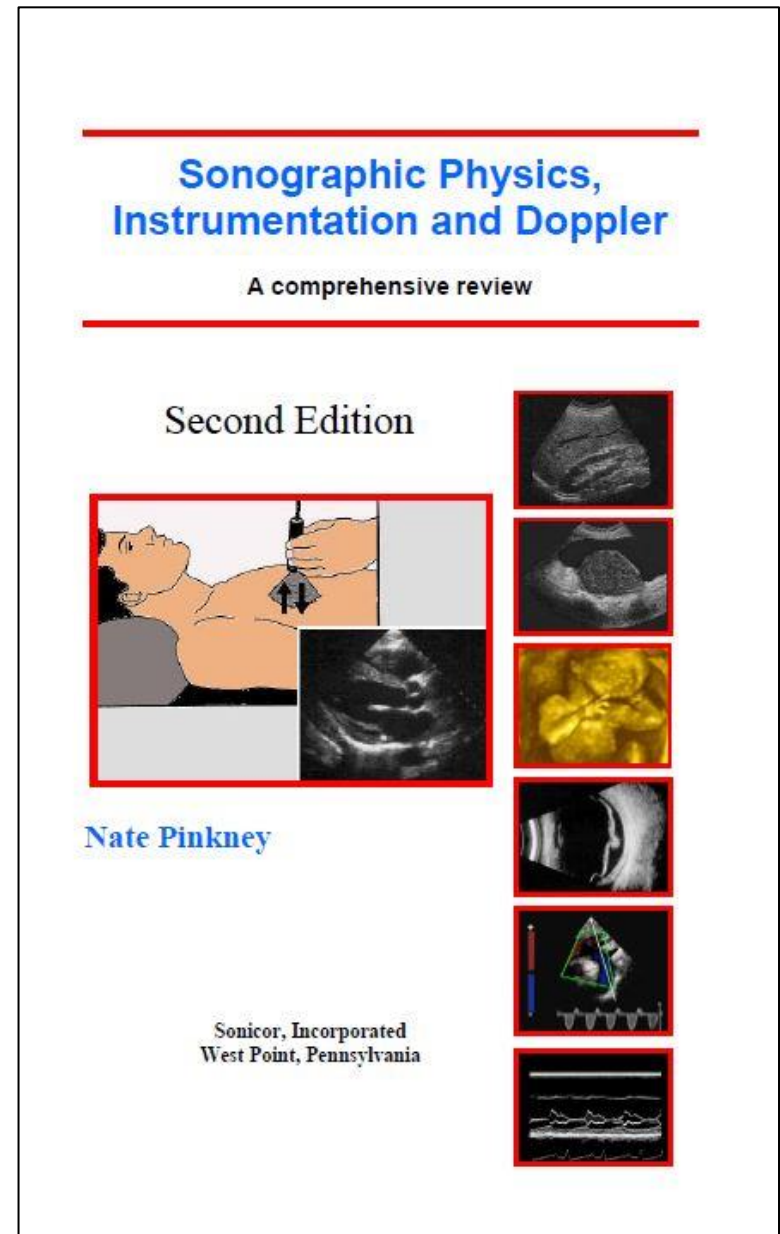


B-MODE IMAGING AND PW

COLOR-FLOW IMAGING



Answers to the following **NINE** practice questions were derived from material in the textbook:



Question 1

The binary number for 64 is:

- 00100000
- 00111110
- 00111111
- 01000000

Question 1

The binary number for 64 is:

- 00100000
- 00111110
- 00111111
- 01000000

Question 2

The prefix micro represents the mathematical value:

- 10^{-6}
- 10^3
- 10^{-3}
- 10^{-2}

Question 2

The prefix micro represents the mathematical value:

 10^{-6}

 10^3

 10^{-3}

 10^{-2}

Question 3

The representation for volume is:

- meters
- cm
- cm²
- cm³

Question 3

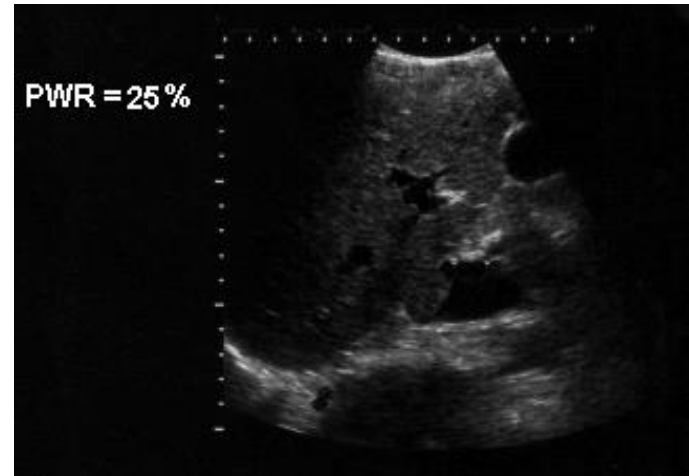
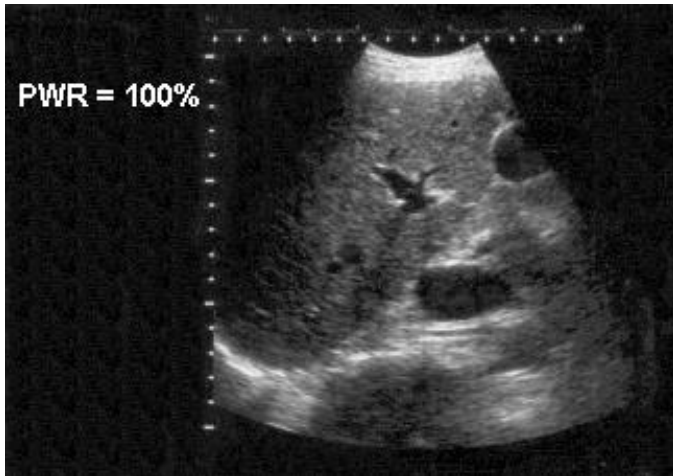
The representation for volume is:

- meters
- cm
- cm²
- cm³

Question 4

A 50% decrease in the **AMPLITUDE** of sound represents a change of:

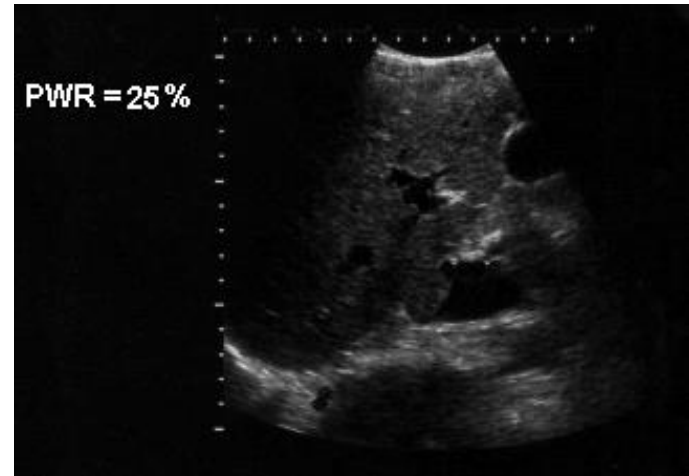
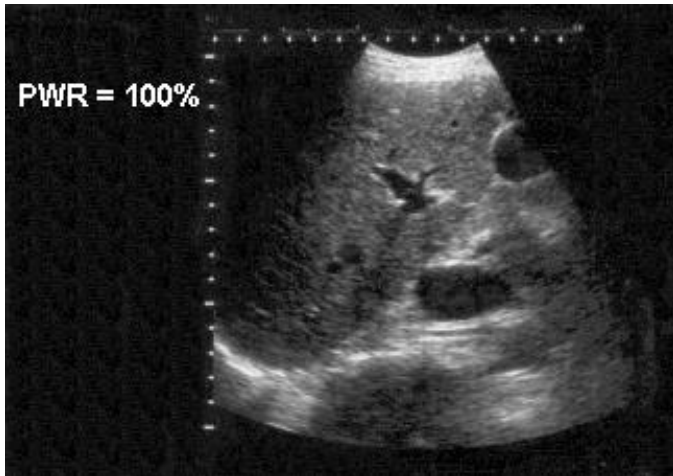
- 6 dB
- 50 dB
- +3 dB
- 3 dB



Question 4

A 50% decrease in the **AMPLITUDE** of sound represents a change of:

- -6 dB
- -50 dB
- +3 dB
- -3 dB



Question 5

If the relative output power of an ultrasound instrument is calibrated in decibels and the operator increases the output by 20 dB, the beam intensity is increased by:

- twenty times
- two times
- one hundred times
- one million times

Question 5

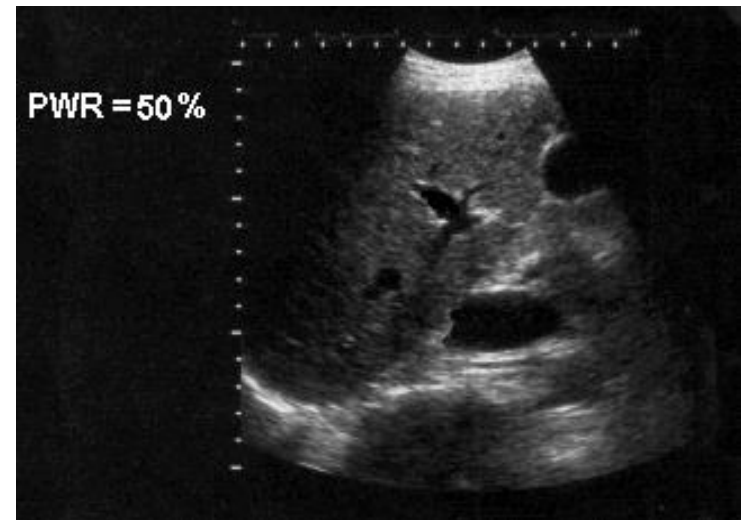
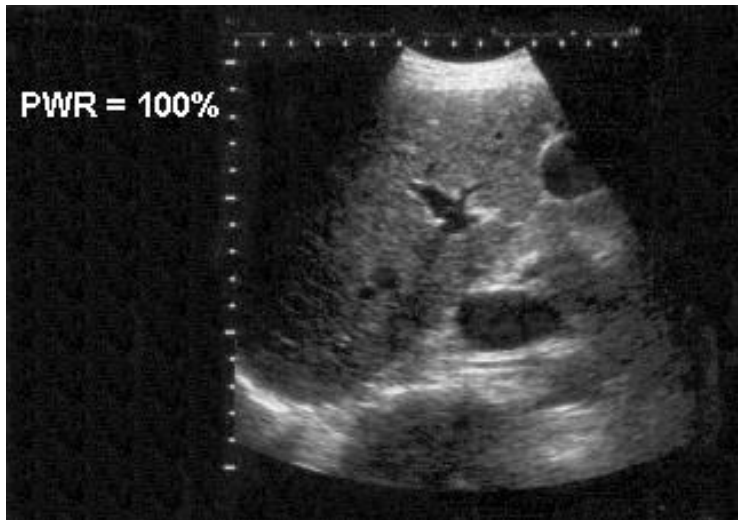
If the relative output power of an ultrasound instrument is calibrated in decibels and the operator increases the output by 20 dB, the beam intensity is increased by:

- twenty times
- two times
- one hundred times
- one million times

Question 6

A decrease in power or intensity by a factor of 2 represents a change of:

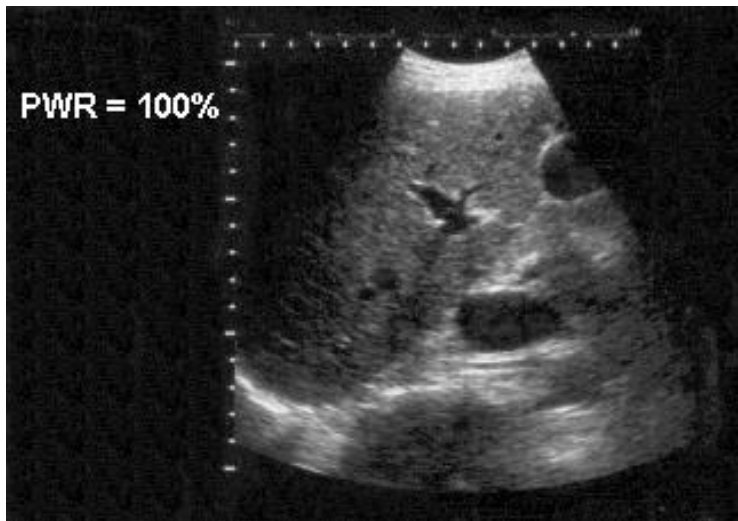
- 0 dB
- 3 dB
- 6 dB
- +3 dB



Question 6

A decrease in power or intensity by a factor of 2 represents a change of:

-  0 dB
-  -3 dB
-  -6 dB
-  +3 dB







Question 7

The **OUTPUT** control on an ultrasound system is set at maximum. The display indicates **PWR=0 dB**. If the **OUTPUT** control is used to reduce the intensity by one-half, the display will indicate **PWR=**

- 2 dB
- 0 dB
- 3 dB
- 6 dB

Question 7

The **OUTPUT** control on an ultrasound system is set at maximum. The display indicates **PWR=0 dB**. If the **OUTPUT** control is used to reduce the intensity by one-half, the display will indicate **PWR=**

-  2 dB
-  0 dB
-  - 3 dB
-  - 6 dB

Question 8

The two **MAJOR** systems of cardiovascular circulation are:

- pulmonary and circulatory
- cardiopulmonary and pulmonic
- systemic and diastolic
- cardiopulmonary and systemic

Question 8

The two **MAJOR** systems of cardiovascular circulation are:

- pulmonary and circulatory
- cardiopulmonary and pulmonic
- systemic and diastolic
- cardiopulmonary and systemic

Question 9

During PW Doppler operation, if the blood is moving toward the source of the sound,

- the reflection is at a lower frequency than the transmission
- the reflection is at a higher frequency than the transmission
- reflected sound has the same frequency than the transmission
- continuous wave are reflected

Question 9

During PW Doppler operation, if the blood is moving toward the source of the sound,

- the reflection is at a lower frequency than the transmission
- the reflection is at a higher frequency than the transmission
- reflected sound has the same frequency than the transmission
- continuous wave are reflected

END OF LESSON 01

For information on the accompanying textbook, visit the Website:

www.Sonicorinc.com