Homework on "Introduction to Medical Imaging"

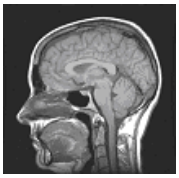
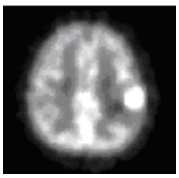
PROBLEM 1. Select the components that are needed in different imaging modality. Select all and only the required components.

	X-ray CT	PET	MRI	Ultrasounds
a) Transducer				
b) static magnet				
c) A/D converter				
d) Amplifier				
e) Computer				
f) Rotating gantry				
g) Photomultiplier tube				
h) Time delayer				
i) x-ray tube				
j) Cyclotron				
k) Gradient coils				
l) IV injector				
m) Phased array transducer				
n) Collimator				
o) RF coils				
p) Laser				
q) Motorized patient platform				
r) Radio tracers				
s) Display (monitor)				
t) Crogen (coolant)				

PROBLEM 2. Matching imaging modality corresponding to each of the images (a)-(d) below.

(1) MRI (2) X-ray CT (3) PET (4) B-mode Ultrasound

(a) (b) (c) (d)


Problem 3. Match the imaging modality, energy source, and typical operation frequency. Draw straight lines to connect energy source and frequency items to each imaging modality.

1) CT 2) MRI 3) Ultrasound Imaging (4) Nuclear medicine imaging

Energy sources:

(a) Lasers (b) Gamma rays (c) RF signals (d) X-rays (e) Acoustic waves

Typical operation frequencies:

(f) 300 THz (g) 10 EHz (h) 2 MHz (j) 64 MHz (k) 200 EHz

Note: KHz =10^3 Hz; MHz= 10^6 Hz; GHz = 10^9 Hz;

THz= tera Hz =10^{12} Hz; PHz = pera Hz=10^{15} Hz; EHz = exa Hz=10^{18} Hz;

Problem 4: Select all appropriate statements about the medical imaging modality

1) CT 2) MRI 3) Ultrasound Imaging (4) Nuclear medicine imaging

Statements:

(a) Most affordable
(b) Potential ionizing radiation side effects
(c) Can be portable
(d) Provide excellent soft tissue information
(e) Most useful for imaging anatomy of bony structures
(f) Most sensitive molecular imaging modality