

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

বিস্মিল্লাহির রাহমানির রাহীম



উদ্দামা

একাডেমিক এন্ড এডমিশন কেয়ার

Class 10: Physics (Chapter-14)

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EEE, BUET

Physics to Save Life

Lecture: P-35

আলোচ্য বিষয়াবলি

- ❖ Contributions of Jagadish Chandra Bose
- ❖ X-Ray
- ❖ Ultrasonography
- ❖ CT Scan
- ❖ MRI: Magnetic Resonance Imaging
- ❖ Angiography
- ❖ Endoscopy
- ❖ ECG
- ❖ ETT
- ❖ Radio Therapy
- ❖ Isotopes

Contributions of Jagadish Chandra Bose

- Sending wireless radio signal in distant place for the first time
- Reducing the wavelength of electromagnetic field to the order of millimeter (5mm)
- Using semiconductor junction to detect radio signal
- Scientifically proofed that tress ~~response~~ can response to various stimuli

X-Ray

Biomedical Instrument

heat emission of electron
negatively charged

Battery

100KV

High voltage

Cathode

Electron

Anode

connected to positive

Tungsten filament

High boiling point

X-ray

heat

free electron emission terminal

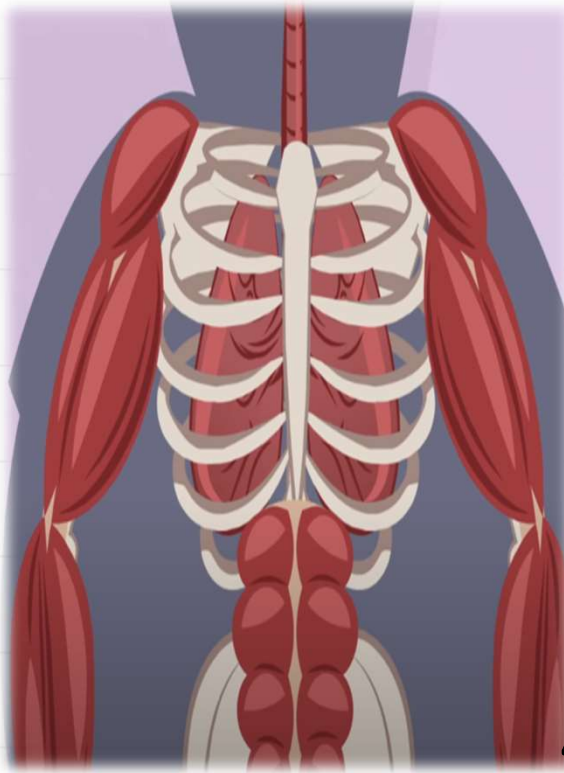
- 1) small wavelength
- 2) high frequency
- 3) not visible

4) more energetic than visible light

X-Ray



Patient



Ca^{40}



X-Ray



Lead Apron
↓
Pb 250



POLL QUESTION-01

What are the properties of X-rays?

☒ (a) Smaller wavelength

☒ (b) Higher frequency

☒ (c) Visible

X [not - visible]

☒ (d) a & b

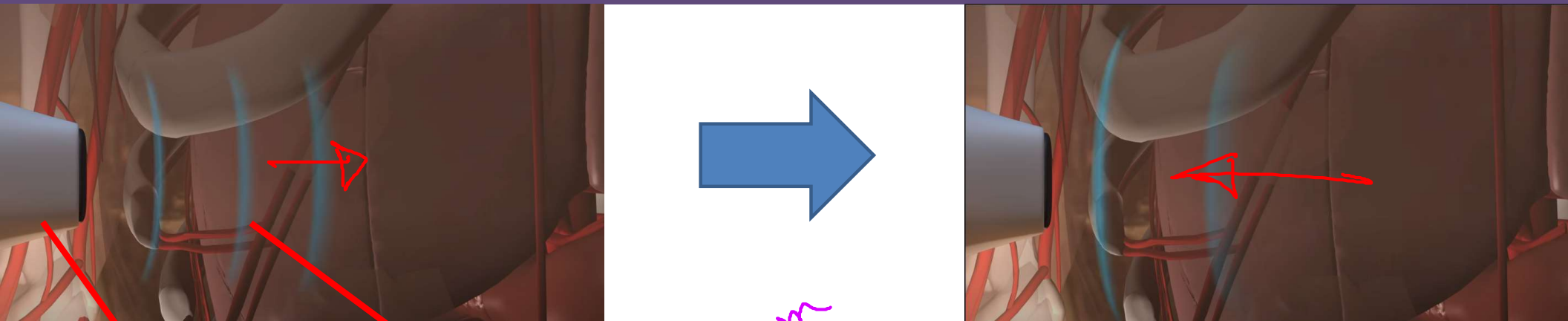
Correct
answer

Ultrasonography

Sound
Ultra-sound
1-20 MHz
frequency range



Ultrasonography

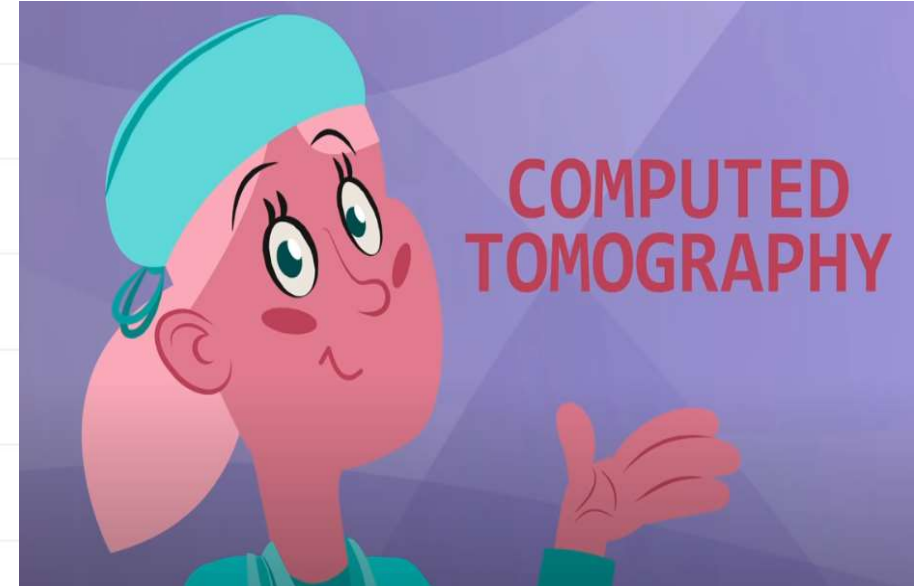


sound narrow beam

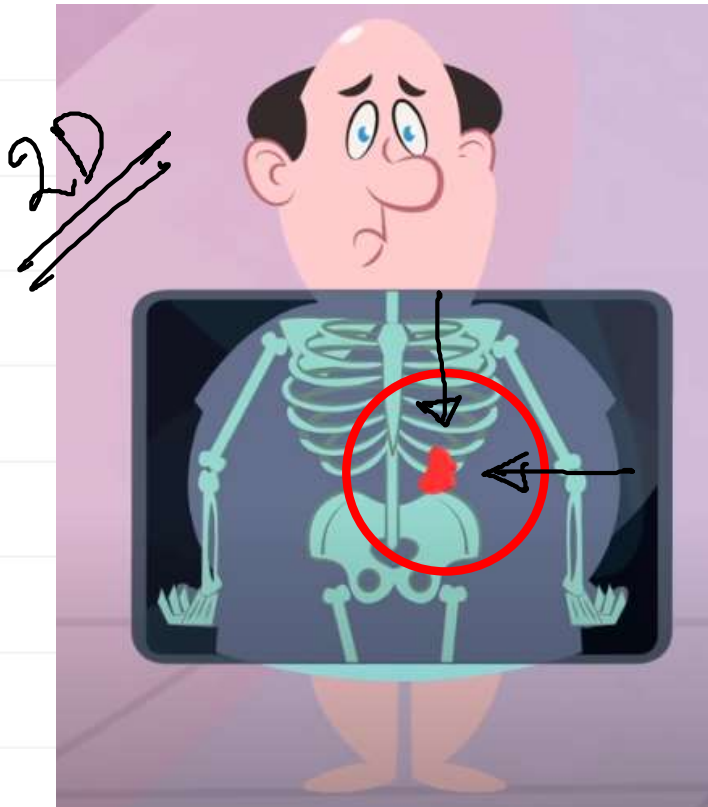
Transducer
↳ electrical signal ↔ sound signal
↳ by internal organs
↳ Reflect, absorb or transmitted
↳ Reflected sound intensity and timings
↳ echo Image

CT Scan

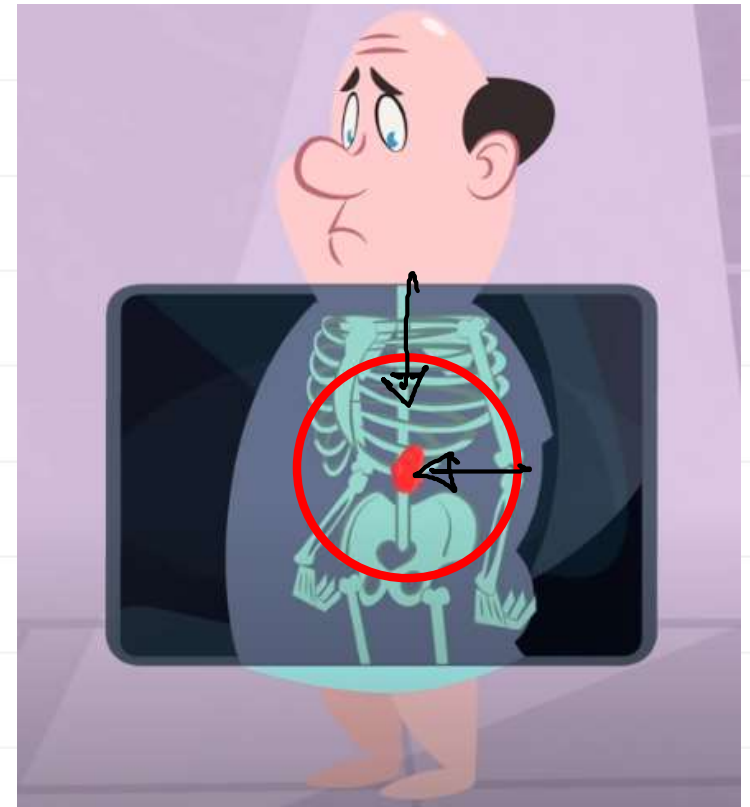
CT
Scan ~~X~~ Ray



CT Scan



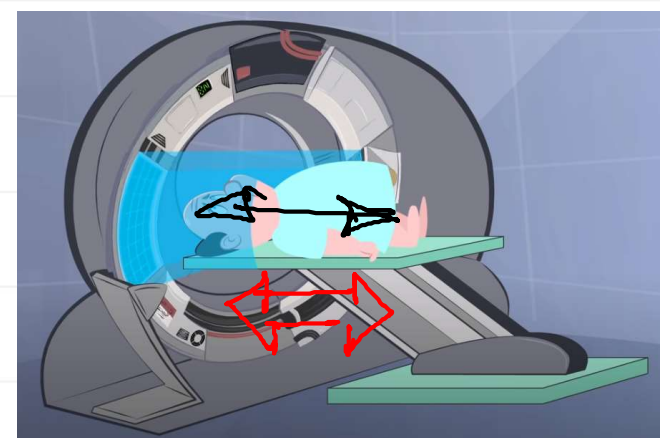
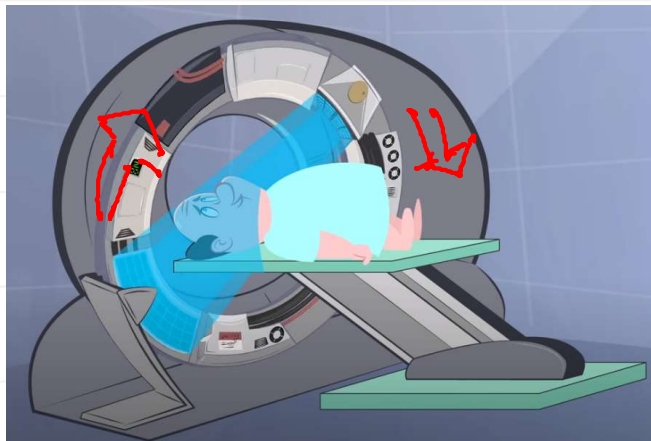
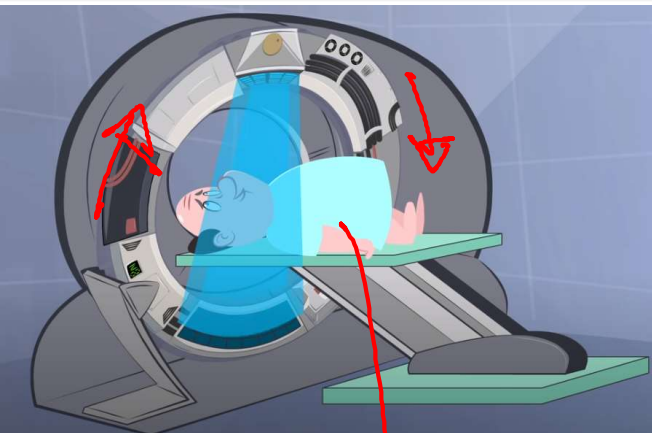
from
Different
angle



CT Scan



CT Scan



360°
Patient

MRI

CT scan \Rightarrow X-Ray

MRI \Rightarrow Strong magnetic field

MRI

\Downarrow
proton will be aligned

\Downarrow
Electromagnetic signal

\Downarrow
proton energy absorbed
 \Downarrow emit \Rightarrow Image



Giant magnet

H_2O 70%
H \rightarrow Basically proton

\rightarrow strong magnet

POLL QUESTION-02

What is the full form of CT-scan?

(a) Computed Treatment Scan

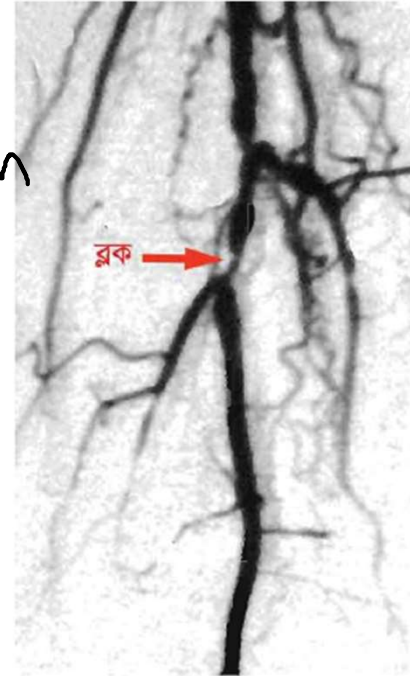
☒ (b) Computed Tomography Scan

(c) Computed Tomology Scan

(d) Conercial Tomography Scan

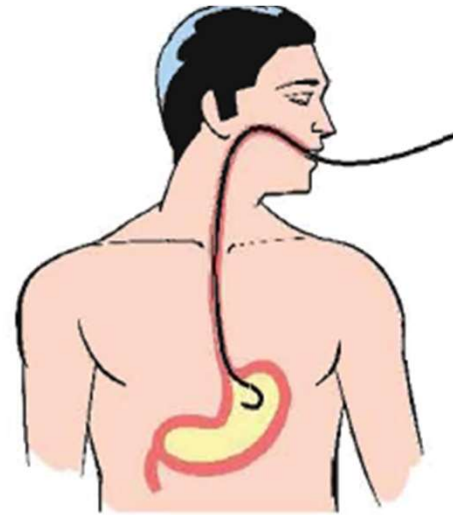
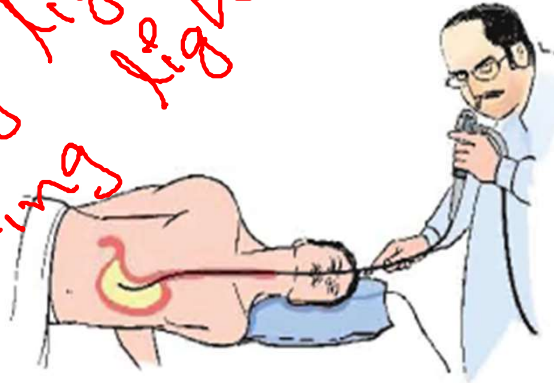
Angiography

Dye
⇓
Catheter
⇓
Insert a
⇓
Ballon
⇓
Expand and compression
⇓
Block removed



ENDOSCOPY

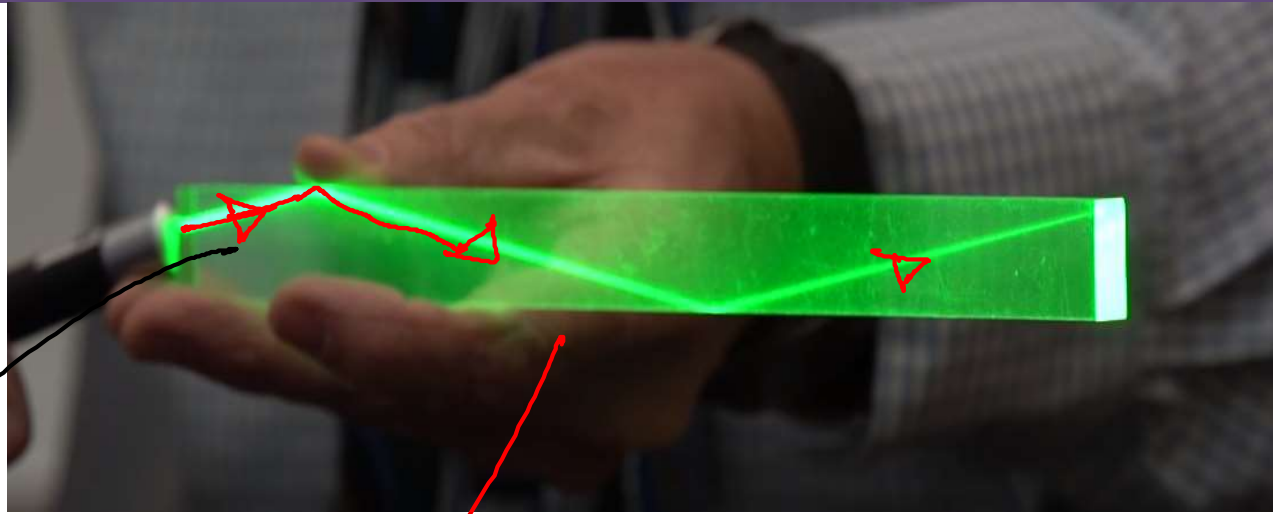
two tubes
optical fiber
→ sending light
→ receiving light



ENDOSCOPY

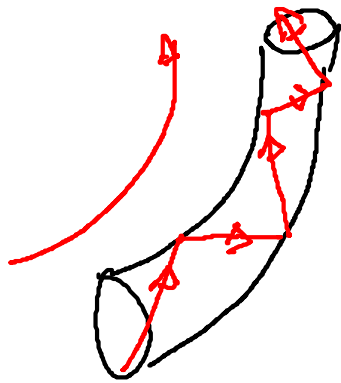
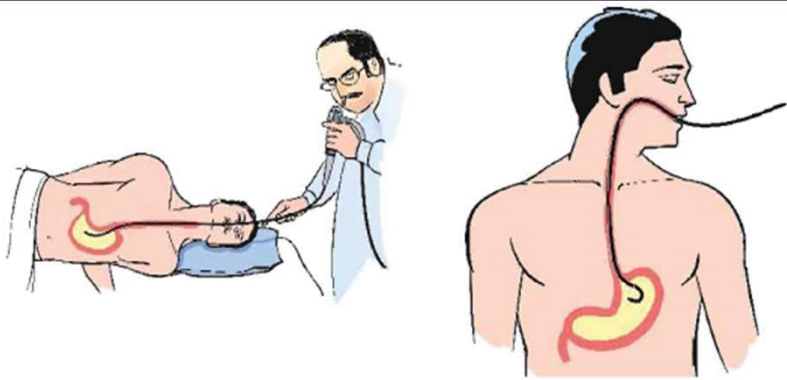
Total
Internal
Reflection

tube made of
optical
fiber



straight
tube

ENDOSCOPY

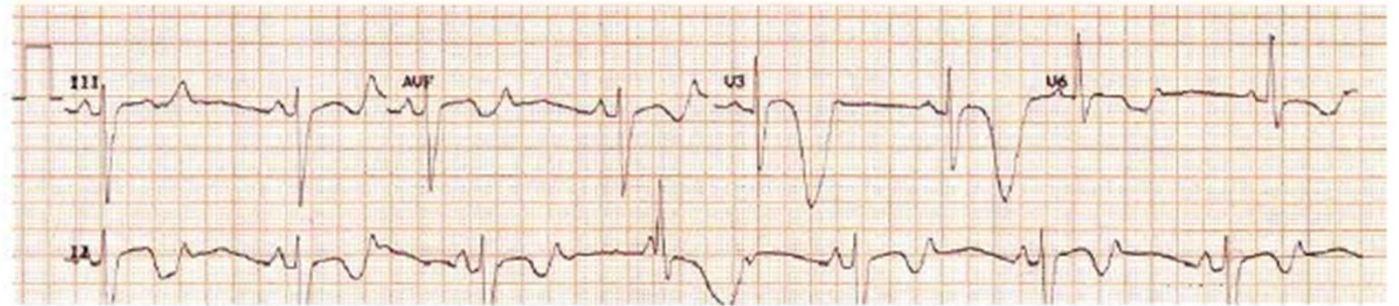


sending
light



ECG

Electro
-cardiogram
patient



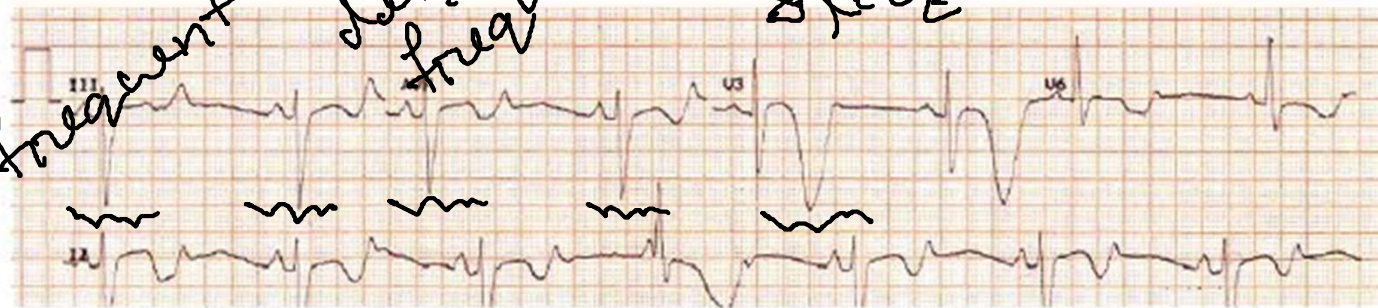
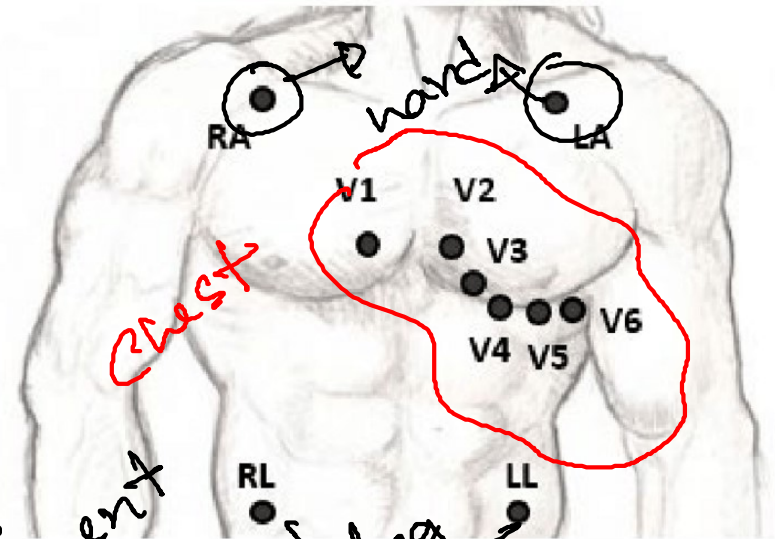
ECG

total
to spots
Electrode

Electrical
signal
receive

patient's
situation

too frequent or
less frequent



ETT

During exercise
+ ECG

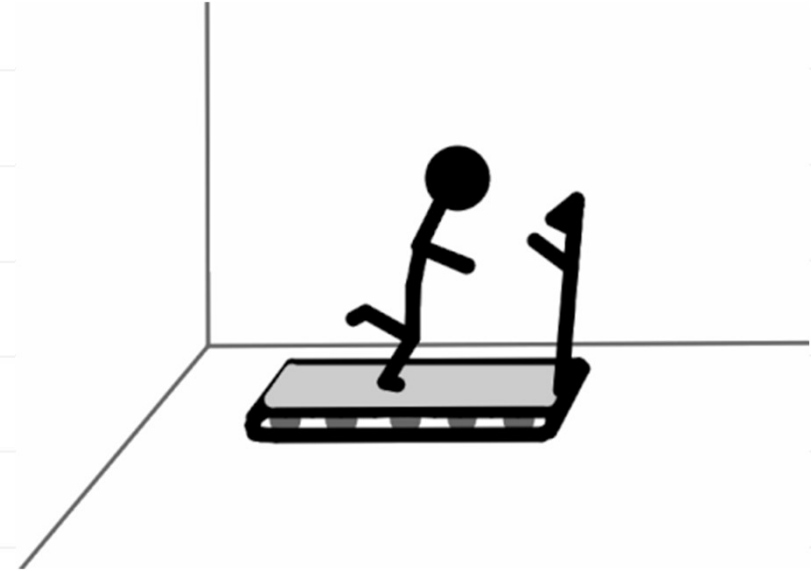
ETT



Exercise tolerance test

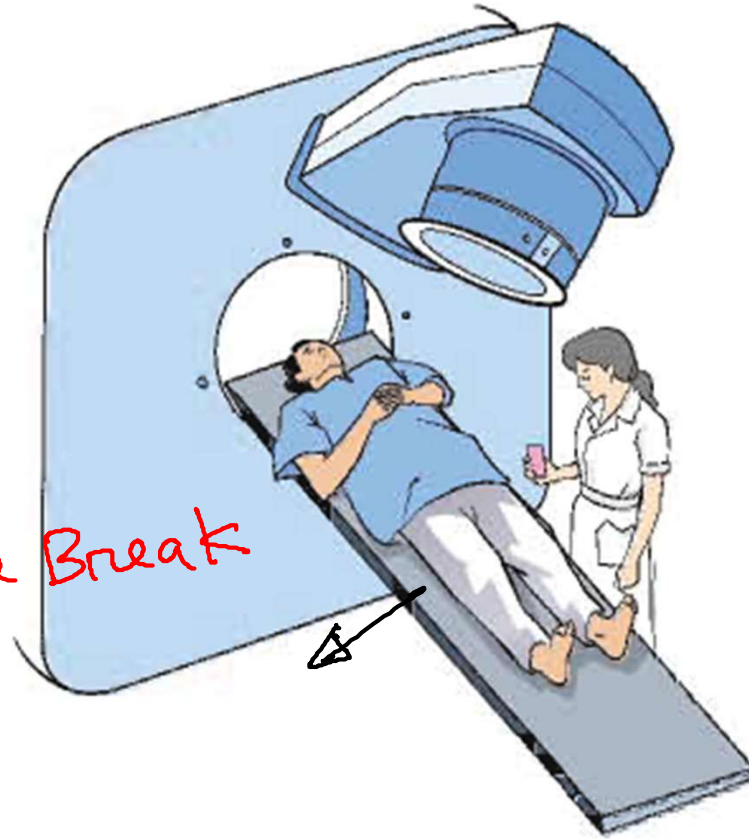
treadmill

ETT



RADIO THERAPY

X-Ray
↓
High energy
↓
In addition
→ healthy cell
↓
Cancerous
Cell
↓
DNA sequence Break
↓
Destory

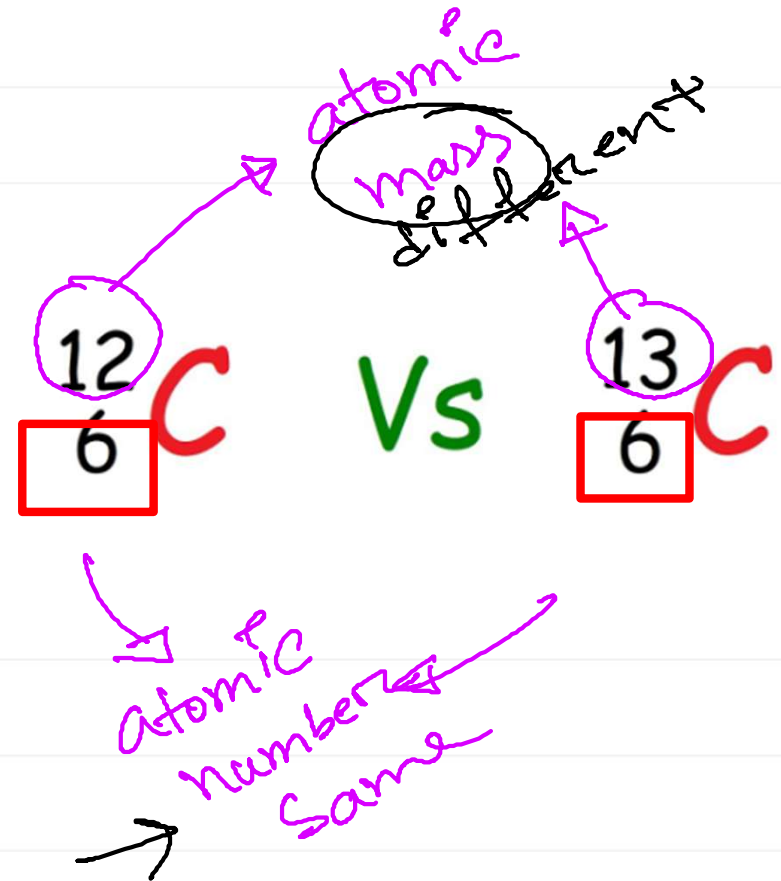


ISOTOPES

Isotope

Radio-active isotopes
+ medicine

⇒ trace



POLL QUESTION-03

To get a complete picture of heart how many electrical signals do we need in ECG ?

(a) 9

(b) 10

(c) 11

(d) 12

লেগে থাকো সৎভাবে,
স্বপ্ন জয় তোমারই হবে

ঊদ্ভাস-উন্মেষ শিক্ষা পরিবার