

Name

Hazrat omer

ID

13919

Subject

Therapeutic R-

Simmester

6th

Pragrame

Bs Radiology.

Submitted to

Mam AToofah Azmat.

Date

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Q NO 1

Side effect of therapeutic radiology on the human body?

The side effect depend the types of radiation.

There are two types of side effect.

- (1) Acute side effects.
- (2) Late side effects.

Acute side effects.

- Nausea and vomiting.
- Damage the epithelial surfaces.
- Mouth, Throat, and stomach sores.
- Intestinal discomfort
- Swelling.
- Infertility.

(3)

(2) Late side effects.

- Fibrosis.
- Epilation.
- Dryness.
- Lymphedema.
- Cancer.
- Heart diseases.
- cognitive decline.
- Radiation proctitis.
- cumulative side effects.
- Effects on Reproduction.
- Effects of pituitary system.

Nausea and vomiting This

is not a general side effect of radiation therapy and mechanistically associated only with treatment of the stomach or abdomen.

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which commonly react
a few hours after
treatment

Damage to the epithelial
surface?

Epithelial surface
may sustain damage
from radiation therapy.
Depending on the area
being treated. This
may include the
skin, oral mucosa, pharyngeal
bowel mucosa and ureter.

Intestinal discomfort
The lower bowel may
be treated directly
with radiation or by
exposed by radiation
therapy to other pelvic
structures. Female genital
treat symptoms are
Sores

NAUSEA AND VOMITING



DAMAGE TO EPITHELIAL SURFACES



LATE SIDE EFFECTS

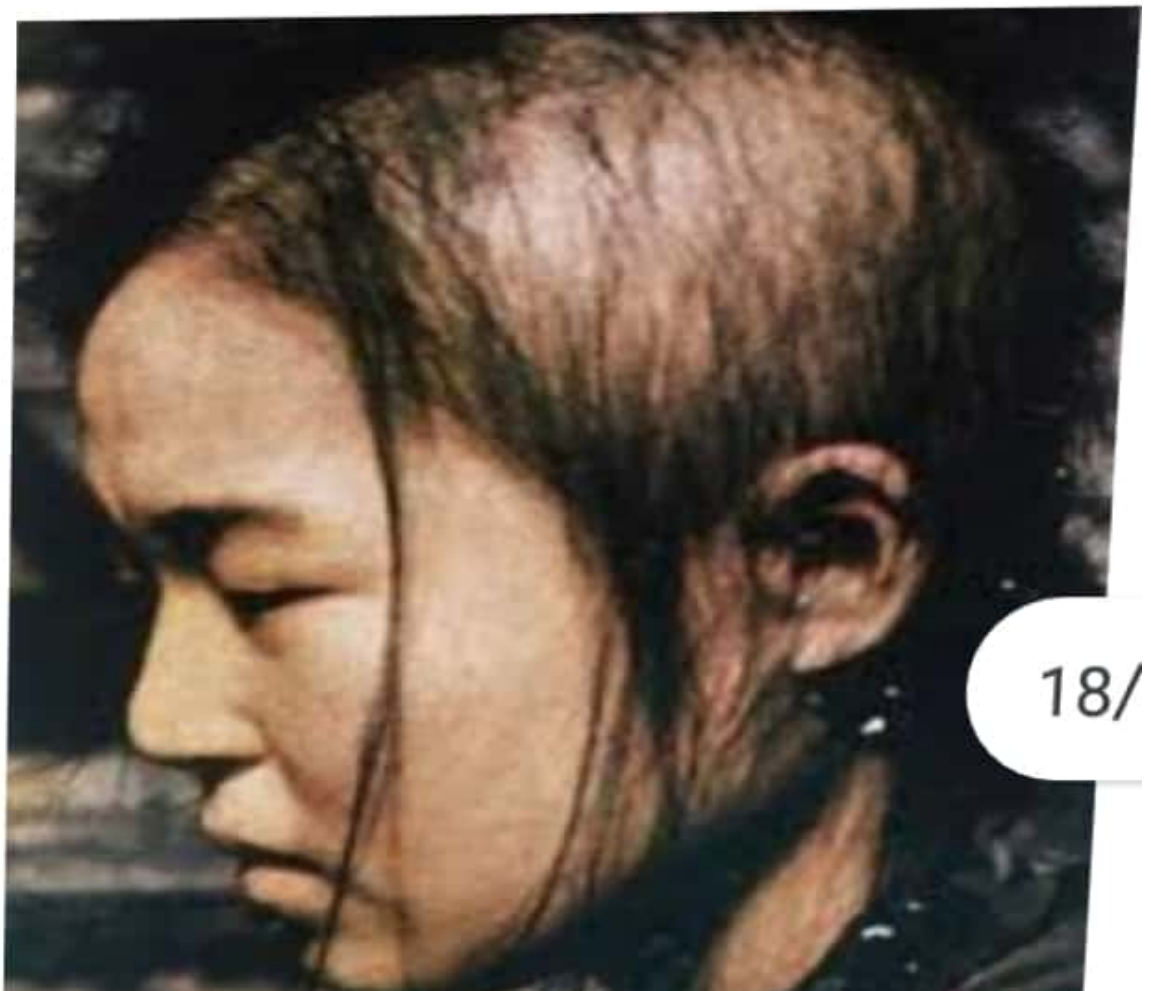
- FIBROSIS



INTESTINAL DISCOMFORT

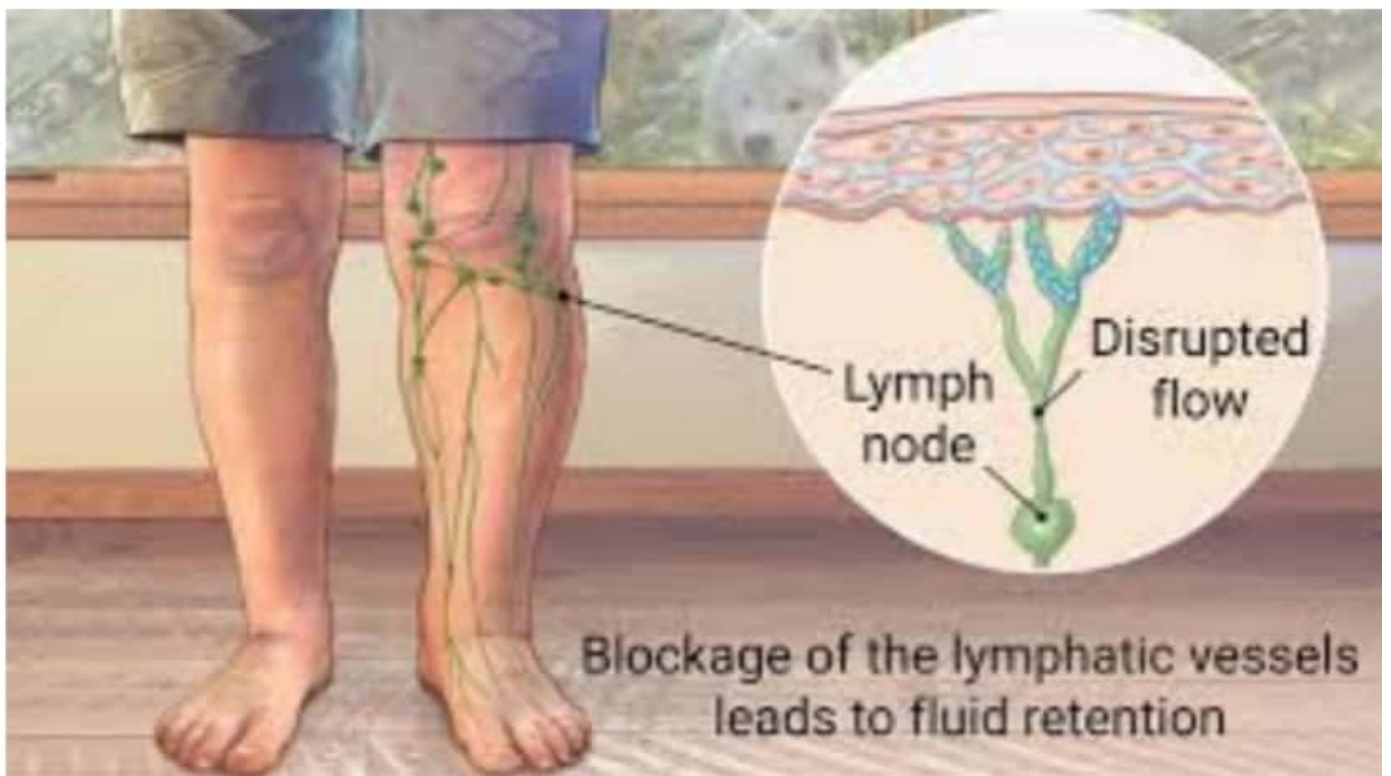


- EPILATION (HAIR LOSS)



18/

- LYMPHEDEMA



Sickness diarrhoea and
nausea.

Swelling

A part of the
general inflammation that
occurs swelling of soft
tissues may ^{cause} ~~occur~~ problem
during radiation therapy.

Q no 2

Linear accelerators

High energy radiation
is delivered to tumors
by means of a linear
accelerator. A beam
of electrons is generated
and accelerated through
a waveguide that
increases their

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energy to the (keV) to (MeV) range. These electron strike a tungsten target and produce x-rays. x-rays generated in the 10-30 keV range are known as Grenz rays whereas the energy range for superficial units is about 30-125 keV. Orthovoltage units generate x-rays from 125-500 keV.

Definition:

A medical linear accelerator customizes high energy x-rays or electrons to conform to a tumor shape and destroy cancer cells while sparing surrounding normal tissue.

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Equipment used for?

This device mostly commonly used for external beam radiation treatments for patients with cancer.

The LINAC is used to treat all body sites using conventional techniques.

How does the equipment work?

The linear accelerator uses microwave technology to accelerate electrons in a part of the accelerator called the "wave guide" then allows these electrons to collide with a heavy metal target to produce high energy x-rays. These high energy x-rays

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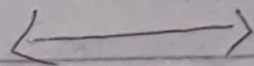
are shaped as the exit
the machine to conform
to the shape of the
patients tumor and
the customized beam is
directed to the patients
tumors. The beam is
usually shaped by multiple
multifocal collimator that
is incorporated into the
head of the machine.

The patients lies on a
movable treatment couch
and lasers are used
to make sure the
patient is in the proper
position. The treatment
couch can be move in
many direction including
up, down, right, left,
in and out. The beam
comes out of the a part
of the accelerator

(9)

called a gantry which can be rotated around the patient.

Radiation can be delivered to the tumor from ~~or~~ many angle by rotating the gantry and moving the treatment couch.



(2) Q103:

Interaction of radiation with matter.

Interaction between penetrating Radiation and matter when x-ray or gamma rays are directed into an object. Some of these photons interact with the ~~particular~~

particles of the matter and their energy can be absorbed or scattered.

This absorption and scattering is called attenuation.

① Photo electric effect

Definition

The ejection of electrons from a metallic surface when the light of suitable frequency is allowed to fall on the surface.

Photoelectric effect:

This suitable frequency is called threshold frequency and corresponding wavelength is called threshold wavelength.

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Work function:

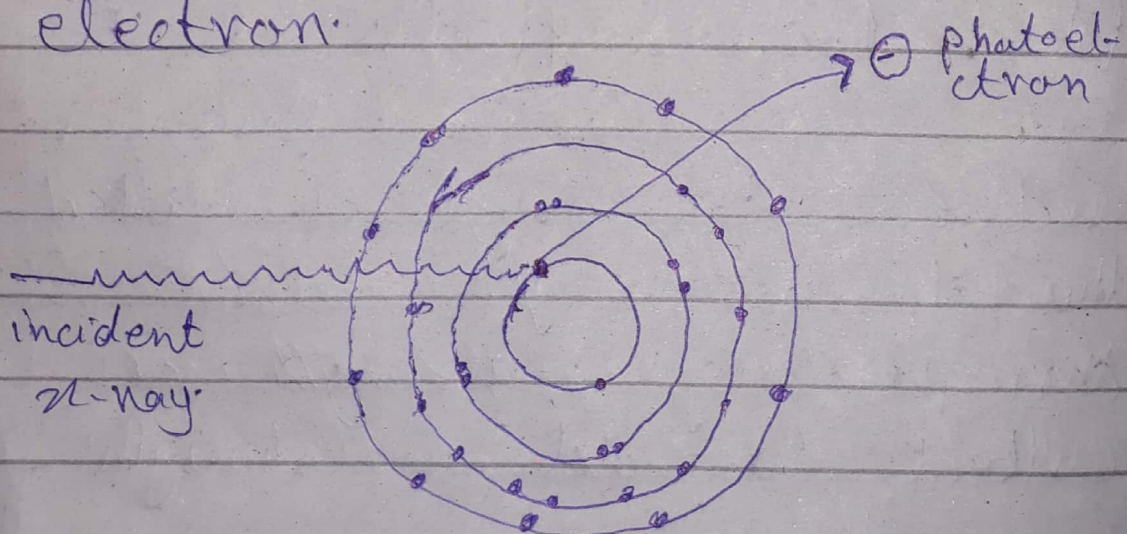
The energy required to remove an electron from the highest filled level in the fermi distribution of solid $W = h\nu_0$

Mathematically formula.

$$E_i = E_b + E_{KE}$$

where E_i is the energy of the incident x-ray.

E_b is the electron binding energy and E_{KE} is kinetic energy of the electron.



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Compton effects.

also called Compton scattering. α -ray throughout the diagnostic range can undergo an interaction with outer shell electrons that not only scattering ~~with outer shell~~ the α -rays but reduces its energy and ionizing the atom as well.

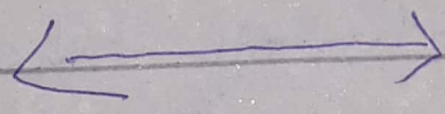
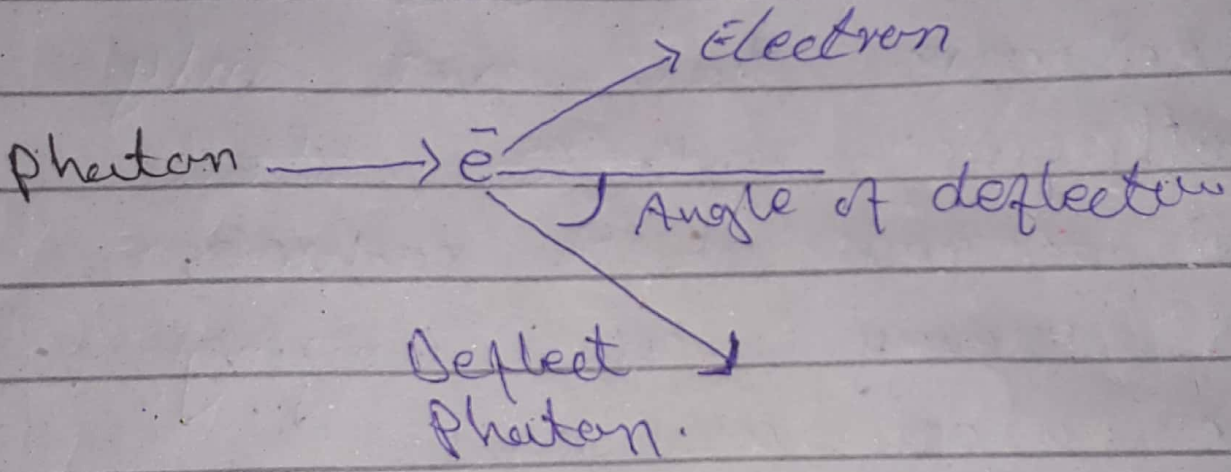
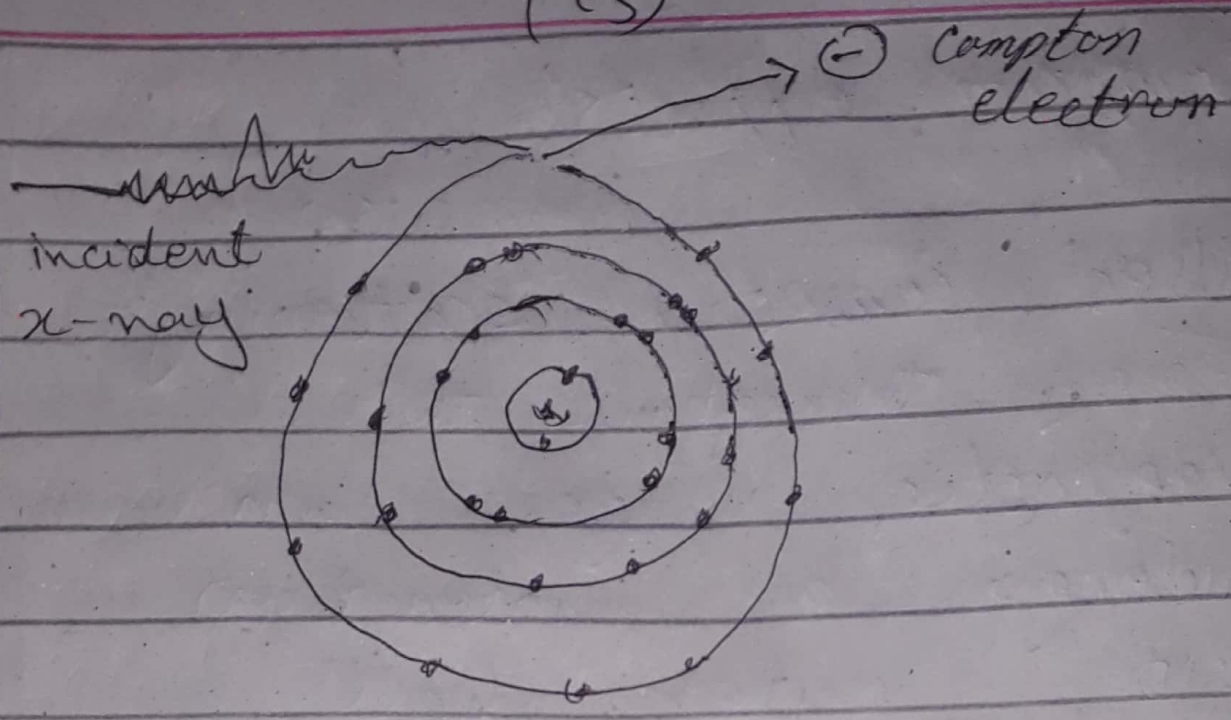
This interaction is called Compton scattering.

when this scattering the incident α -ray interact with an outer shell electron and ejects it from the atom thereby ionizing the atom.

The eject electron is called Compton electron
~~same formula.~~

$$E_i = E_s (E_s + E_{KE})$$

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QNO 4

Brachytherapy:-

Brachytherapy (internal radiation therapy) is delivered by placing radiation source inside or next to the area requiring treatment.

Brachytherapy is commonly used as an effective treatment for cervical prostate, breast and skin cancer and can also be used to treat tumors in many other body sites.

As with stereotactic radiation brachytherapy treatments are often known by their brand names.

For example, brand name for breast cancer brachytherapy treatments include

SAVI. mamosite, an d
Contura.

Brand name for ~~br~~ prostate
cancer include proxeon

These characteristic of
~~br~~ brachytherapy provide advan-
tage over external beam
radiation therapy. the tumor
can be treated with
very high dose of
localized radiation, whilst
reduce the probability of
unnecessary damage to surrou-
nding healthy tissues.

A course of brachytherapy
can often be completed
in less time than other
radiation therapy treatment
technique. This can help
to reduce the chance
of surviving cancer cells

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dividing and growing in the intervals between each radiation therapy does.

In brachytherapy dose distribution is almost totally depending on the inverse square law because the source is usually within the tumor volume, because of the inverse square law dependence proper placement of radiation sources is crucial.

Physical characteristics of commonly used radioisotopes.

Isotope	Energy.	Half life
Radium-226	0.830	1.600 yr
Calcium-137	0.662	30 yr
Cobalt-60	1.250	5.26 yr
Iodine- ¹²⁵ 125	0.028	60.2 yr
Gold-198	0.412	2.7 d
Iridium 192	0.380	74.2 d

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Q 1105

Volumetric Modulated Therapy.

VMAT is a new radiation technique which can achieve highly conformal dose distribution on target volume coverage and sparing of normal tissue. The specificity of this technique is to modify the three parameter during the treatment VMAT deliver radiation by rotating gantry usually 360° rotating field with one or more arcs. Changing speed and shape of the beam with multiple collimators sliding window system of moving and output rate of

of the medical linear accelerator.

VMAT also has the potential to give additional advantage in patient treatment, such as reduced delivery time of radiation compare with conventional static, IMRT.

What type of cancers is VMAT used to treat:

VMAT can be used to treat large areas of the body with uneven boundary and tumors located close to vital organs without fear of damage to these organs by high

cases of radiation.

Many different cancers can be treated using VMAT including head and neck cancers.

brain tumors, gastrointestinal cancers, prostate cancers and lung cancer.

~~END~~

Two types of therapy

- particle therapy.
- An Auger Therapy.

END