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Q NO 1:

Deterministic Stochastic

Effect

Effect

- 1= Deterministic effects of radiation exposure are produced by high radiation dose.
- stochastic effect of radiation exposure are the result of low doses delivered over a long period.

- 2= Damage to multiple cell.
- Damage to single cell.

- 3= Effects are seen above a threshold dose.
- No threshold dose.

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4= Occure at
level of
cell.

occure at
level of
tissues.

5= seen when
the cells are
modified
rather than
killed.

seen when
the cells
are killed
or loose
capability to
divide.

6= severity
independent
of dose
received

severity may
be proportional
to the
dose
received

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7:	Deterministic in nature	Probabilistic in nature
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8:	can be completely avoided	cannot be completely avoided.
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9:	causal relationship between radiation exposure and the effect.	causal relationship cannot be established at low doses.
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10= sure to : occurs only
occur at among a
an adequate small
dose percentage
of those
exposed.

11= Radiation chromosomal
sickness damage.

12= Example:

Cataracts,

Fertility
impairment

Leukemia,

malignant
tumors.

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Q NO : 2 :

RADIATION :

In

physics radiation
is the emission
or transmission of
energy in the form
of wave or particles
through space or
through a material
medium.

This includes :

⇒ electromagnetic radiation

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- => Radio waves
- => microwaves
- => infrared
- => visible light
- => ultraviolet
- => x-rays,
- => gamma radiation

we are all exposed
to radiation every
day, mainly from
the sun and soil.
Other sources of
radiation are man-made

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Like x-rays ,
CT scans , and
nuclear medicine
studies.

RADIOACTIVITY:

Define: Radioactivity
is the spontaneous
emission of particles
and energy in
order to become
stable.

some atoms exist in

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an abnormally
excited state
characterized by an
unstable nucleus.

To reach stability
the nucleus
spontaneously emits
particles and energy
and transforms itself
into another atom.

This process is
called radioactive
disintegration or
radioactive decay.

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NON IONIZING RADIATION

⇒ The type of radiation is low energy radiation no ion charge are produce in this radiation.

Example:

UV rays,
microwaves, Radiofrequency
waves are some
examples of Non-

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ionizing radiation.

⇒ These x-rays are not directly harmful impact our life.

⇒ Non ionizing radiation originates from various sources naturally originated or man-made.

IONIZING

RADIATION:

The radiation which

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has very high
energy is called
ionizing radiation.

⇒ It is dangerous
and leaves bad
impact on human
body.

Example:

Alpha, Beta,
x-ray are some
examples of ionizing
radiation.

It has high energy
and displace electron

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from the orbit -

HARMFUL RADIATION

Radiation damages the cells that make up the human body.

=> Low levels of radiation are not dangerous, but medium levels can lead to sickness, headaches, vomiting and a fever.

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⇒ High levels can
kill you by causing
damage to your
internal organs. It's
difficult to treat
high radiation
exposure.

⇒ Exposure to radiation
over a long time
can cause cancer.

TYPES:

⇒ Gamma rays are the
most harmful external

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hazard.

⇒ Beta particle can partially penetrate skin, causing beta burns.

⇒ Alpha particles cannot penetrate intact skin.

⇒ Gamma and x-rays can pass through a person damaging cells in their path.

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Q NO : 3 A

Three basic principles
should be adhered
to when dealing
with radiation
and making
radiographs:

Time

Distance

shielding

These principles form
the basis of a

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broader radiation
safety concept
called **ALARA** (As
Low As Reasonably
Achievable).

Time:

Time refers to
the time the patient
or the technician
is exposed to
primary (x-rays in
the collimated beam
directed toward the
patient) or

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secondary (x-rays
scattered away from
the patient and
outside the
collimated field.)
radiation from
the x-ray tube.

=> Time can be
minimized by:

1= Keeping the time
station of the
x-ray machine to
the lowest

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possible number.

2= Minimizing your
time in the
room during the
exposure.

Distance:

The
principle of distance
means that there
needs to be
physical distance
between the
technician and the
patient / x-ray tube

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at the time of
exposure.

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Radiation protection
Devices:

1= FILTRATION: Metal

filters, usually
aluminum or copper,
are inserted into
the the x-ray tube
housing. which absorbed

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low energy x-ray-

These low energy

x-ray increase

patient dose-

2= COLLIMATION:

collimation restricts

the useful x-ray

beam to that part

of the body to

be imaged-

3= PROTECTIVE APPAREL

lead - impregnated

material is used.

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to make aprons
and gloves worn
by radiologists
and radiologic
technologist during
fluoroscopy and
some radiographic
~~proce~~ procedures.

4: GONADAL SHIELDING

The same lead
impregnated material
used in aprons
and gloves is

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used to fabricate
gonadal shields.

5: PROTECTIVE BARRIERS:

The radiographic or
CT control console
is always located
behind a protective
barrier. often, the
barrier is lead
lined and is
equipped with a
leaded glass window.

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Q NO: 4:

RADIATION PROTECTION DESIGN

FEATURES:

protective x-ray tube

Housing:

Every x-ray tube must be

contained within

a protective housing

that reduce leakage

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radiation during use.

Must be less than
 100 mR/hr at a distance
of 1 m from protective
housing.

Control panel:

must
show exposure conditions
and when tube is
energized.

SID Indicator:

A source
to image receptor
distance indicator
must be provided.

This can be as simple
as a tape measure
attached to the

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to the tube housing,
or as advanced
as lasers.

Collimation: light -

localized, variable -
aperture rectangular
collimators should be
provided.

Cones and ~~diag~~
diaphragms may replace
the collimator for
special examinations.

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Positive Beam

Limitation:

Automatic
Light - localized, variable-
aperture collimators were
required on all but
special x-ray imaging
system manufactured in
the United States b/w
1974 and 1994.

Beam Alignment:

In addition
to proper collimation,
each radiographic tube
should be provided with
a mechanism to
ensure proper alignment

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of the x-ray beam
and the image
receptor.

Filtration:

inherent plus
added.

⇒ Total must be at
least 2.5mm above
70 KVP.

Reproducibility:

constant
out put radiation
intensity.

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Linearity: constant output for varied mA setting while time is adjusted to keep mAs the same.

Q NO: 5

GM counter: Geiger-Muller counter is a device used for the detection and measurement of all types of radiation.

⇒ Alpha, beta and gamma radiation.

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Basically it consists of a pair of electrodes surrounded by a gas.

These electrodes have a high voltage across them. The gas used is usually Helium or Argon.

The discharge spreads in the GM region throughout the volume of the detector and the pulse height becomes independent of the primary ionization or the energy

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of the interacting particles.
In GM counter detector
the gas multiplication
spreads along the entire
length of the anode.

Gas filled detectors
cannot be operated
at voltages beyond the
GM region because they
continuously discharge.

Geiger-Muller counters
basically consist of three
main elements:

- 1= Geiger-Muller tube,
- 2= processing and display
electronics.

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$\beta =$ power supply.

The Geiger counter is an instrument used for radiation dosimetry, radiological protection, experimental physics and nuclear industry.