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Question # 1

Differentiate b/w deterministic & Stochastic effects of radiation?

Deterministic

- 1- Exposures are produced by high radiation doses.
- 2- Non-linear
- 3- The deterministic effects of high dose radiation exposure are usually easy to observe & measure.
- 4- A latent period is seen b/w the time of exposure & the events of manifest
- 5- Severity independent of dose received

Stochastic

- 1- Exposures are the result of low doses delivered over a long period.
- 2- linear energy
- 3- The stochastic effects are also observe, but it is nearly impossible to associate a particular late response with a previous radiation exposure.
- 4- A latent period is seen b/w the time of exposure & the events of manifest
- 5- Severity ^{maybe} independent of proportional to the dose.

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6- Deterministic effects of radiation ^{cause effects}
Hair loss, cataract
Skin injury etc

6- Stochastic effects
cause cancer,
leukemia, hereditary
etc.

Question # 2

Explain briefly following terms:

→ Radiation:-

Radiation is the emission and propagation of energy in the form of waves, rays or particles.

→ There are three types of radiation.

- 1- Non-ionizing radiation
- 2- Ionizing radiation
- 3- Neutrons.

→ Example:-

Electron dropping from one energy state to a lower state emit radiation in the form of a photon.

→ Non-ionizing radiation:-

This is the release of energy from

the lower energy region of the electromagnetic spectrum.

→ Sources-

- Light
- radio
- micro waves
- Infrared (heat)
- ultraviolet light.

3) Ionizing radiation:-

This is radiation with sufficient energy to remove an electron from an atomic orbital forming an ion.

→ Examples:-

- X-rays
- gamma rays
- alpha particles
- beta particles.

4) Radio activity:-

Radio activity is the decay or splitting of an atomic nucleus.

A radio active material releases radiation when it decays.

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→ Example :-

- Alpha decay
- Beta decay
- gamma decay
- Neutron release.
- Spontaneous fission

5) Harmful Radiation:-

There are some radiation which is harmful to human health.

→ Ionizing radiation is generated through nuclear reactions and can be very harmful to human health.

→ Radiation injury causes changes in the living tissues which cause radiation sickness.

→ Somatic Effects:-

It is harmful to person.

→ Genetic Effects:-

Effects seen in individual in unexposed generation

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Question # 3 1

a- Write two basic principles of radiation protection.

→ Minimize Time :-

The dose to an individual is directly related to the duration of radiation exposure.

→ Keep the time of exposure to radiation as short as possible.

→ Minimize Distance :-

As the distance between the source of radiation & the person increases radiation exposure decrease.

→ Maintain as large distance as possible b/w the source of radiation & exposed person.

b- Write down the names of the radiation protection device.

→ Radiation exposure device

→ Improvised nuclear 4

→ Radiologic dispersal 4

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Question # 4

What are features for radiation protection design? Explain briefly.

→ Radiographic Protection Features :-

→ Protective X-ray Tube Housing:-

→ X-ray tube must be contained with an a protective housing that reduces leakage radiation during use.

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

→ Control panel:-

Must show condition of exposure when tube is energized.

→ SID Indicator:

A SID indicator must be provided.

→ Must be accurate within 2% of the indicated SID.

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→ Collimation :-

Light-localized, variable-aperture rectangular collimators should be provided.

→ Positive-Beam Limitation :-

→ Auto collimation circa 1974-1994
Must be accurate w/in 2%
of SID.

→ Beam Alignment :-

Each radiographic tube should be provided with a mechanism to ensure proper alignment of x-ray beam & the image receptor.

→ Filtration :-

All general purpose diagnostic x-ray beams must have a total filtration.

Question #5

What is GM counter, how it can be used as a radiation protection device.

→ GM Counter:-

It is a device used for detection & measurement of all type of radiation.

→ Used as radiation protection device:-

- Radiation passes through gas and ionized atoms of gas.
- Electrons released in ionization are detected as an electrical signal.
- The larger the, the more sensitive the instrument.
Because there are more gas molecules for ionization.
- A pressurized chamber has more molecules available as well.
- The GM counter are used for contamination control in nuclear medicine laboratories.

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- The are used to detect the presence of ~~to~~ radioactive active contaminations on work surface & laboratory apparatus.
- Geiger counters are very sensitive instruments that are capable of detecting and indicating single ionizing events.
- If they are equipped with an audio amplifier & a speaker, one can even hear the crackle of individual ionization.
- The Geiger counter does not have a very wide range. Most instruments are limited to less than 1 mGy/hr (100 mR/hr).