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FINAL TERM

Subject ; Radiobiology and Radiation Protection:

Q:1

Differentiate between deterministic and stochastic effects of radiation ?

ANSWER

Difference between deterministic and stochastic effect ;

Deterministic Effect :	Stochastic Effect :
• Deterministic effect of radiation	Stochastic effect of radiation

exposure are produced by high radiation doses.	exposure are the result of low doses delivered over a long period.
• The deterministic effects of high dose radiation exposure are usually easy to observe and measure.	The stochastic effects are also easy to observe, but it is impossible to associate particular late response with a previous radiation exposure.
• Deterministic effect are also called non-stochastic effect These effect depend on time of exposure, doses, type of Radiation. It has a threshold of doses	Stochastic effect is those effect which occur when a person receives a high dose. There is no threshold dose.

• A threshold dose below which no effect is seen	They have no threshold dose
• Worsening of the effect as dose increases over the threshold	They increase in likelihood as dose increase
• Different effects, tissues and people have different threshold doses for deterministic effects	There is no dose above which stochastic effect are certain to occur.

Q:2

Explain briefly following terms radiation, radioactivity, non ionizing radiation and harmful radiation

ANSWER

a: Radiation :

- Radiation is the process of sending off energy in the form of light, heat, x-rays or nuclear particles.

EXAMPLE :

An example of radiation are the energy waves off of a nuclear bomb.

b: Radioactivity :

- Radioactivity is the spontaneous emission of radiation in the form of particles or high energy photons resulting form a nuclear reaction

EXAMPLE :

A light bulb may emit radiation in the forms of heat and light, yet it is not radioactive.

c: Non-ionizing radiation:

- A type of low-energy radiation that does not have enough energy to remove an electron (negative particle) from an atom or molecule.

INCLUDES:
visible, infrared, and ultraviolet light; microwaves; radio waves and radiofrequency energy from cell phones.

d: Ionizing radiation:

Ionizing radiation is a type of energy released by atoms in the form of electromegnetic waves or particles.
People are exposed to natural sources of ionizing radiation, such as in soil, water and vegetation, as well as in human-made

sources, such as dental x-rays and medical devices.

e: Harmful Radiation:

- Radioactive materials that emit alpha and beta particles are most harmful when swallowed, inhaled, absorbed or injected.
- Gamma rays are the most harmful external hazard
- Beta particles can partially penetrate skin, causing "beta burns" Alpha particles cannot penetrate intact skin.

Q: 3 (A)

Write two basic principles of radiation protection?

ANSWER :

Basic principle of Radiation :

Three principles for radiation safety :

1. Time
2. Distance
3. Shielding

2. These principles form the basis of a broader radiation safety concept called ALARA (As low as reasonably achievable)

TIME :

Time refers to the time the patient or technician is exposed to primary or secoundary radiation from the x-ray tube. Time can be minimized by ;

- keeping the time station of the x-ray machine to the lowest possible number(s) and the highest mA station, in order to obtain the desired mAs when making the exposure.
- Minimizing your time in the room during the exposure.

SHIELDING;

Shielding is required if you are staying in the room at time of exposure or within the walls of the room.

- Shielding involves wearing lead aprons, gloves and thyroid shields (0.5mm lead equivalent)
- Every radiation worker must be over 18 years of age, have appropriate dosimetry to record any radiation exposure, and declare

pregnancy.
Lead shielding never protect the individual from primary radiation exposure, only secondary or scatter radiation exposure.

DISTANCE:

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

- Use of positioning devices allows everyone to physically exit the room at time of exposure.
- Holding the patient at the time of exposure provides the greatest chance of secondary
- Never stand directly to the x-ray tube or directly infront of the tube.

Q:3 (B)

Q Write names of the radiation protection device.

ANSWER:

- Radiation Protection Aprons
- Radiation protection Aprons & accessories.
- Radiation protection gloves
- Radiation protection glasses
- Thyroid shields
- Apron Racks
- Radiation protection barriers and table shields
- Drape Shields
- Veterinary radiation protection
- lead collar

Q:4

What are features for radiation protection design?

ANSWER:

Features for radiation Protection design:

- **Protective X-ray tube housing:**
  Protective housing to reduce leakage radiation
  Must be less than 100 mR/hr at a distance of 1m from protective housing.
- **Control Panel:**
  Must show conditions and when tube is energized
  Beam ON must be clear to techs.
- **SID Indicator:**
  Indicator must be present

12:

must be accurate within 2% of the indicated SID

Collimation :

Light field, variable aperture X-ray beam and light filed must coincide within 2% of SID

PBL-Positive beam Limitation:

Auto collimation circa 1974-1994
Must be accurate within 2% of SID

Beam Alignment :

Tube is alignment with image receptor.

Filteration :

Inherent plus added
Total must be at least 2.5 mm above 70 kVp

Reproducibility :

Constant output / radiation intensity
Should not exceed 5%

through same technique

Linearity;

Constant output for varied mA setting while time is adjusted to keep mAs the same.
Max variation is 10% from one mA to adjusted mA station.

Q5:

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

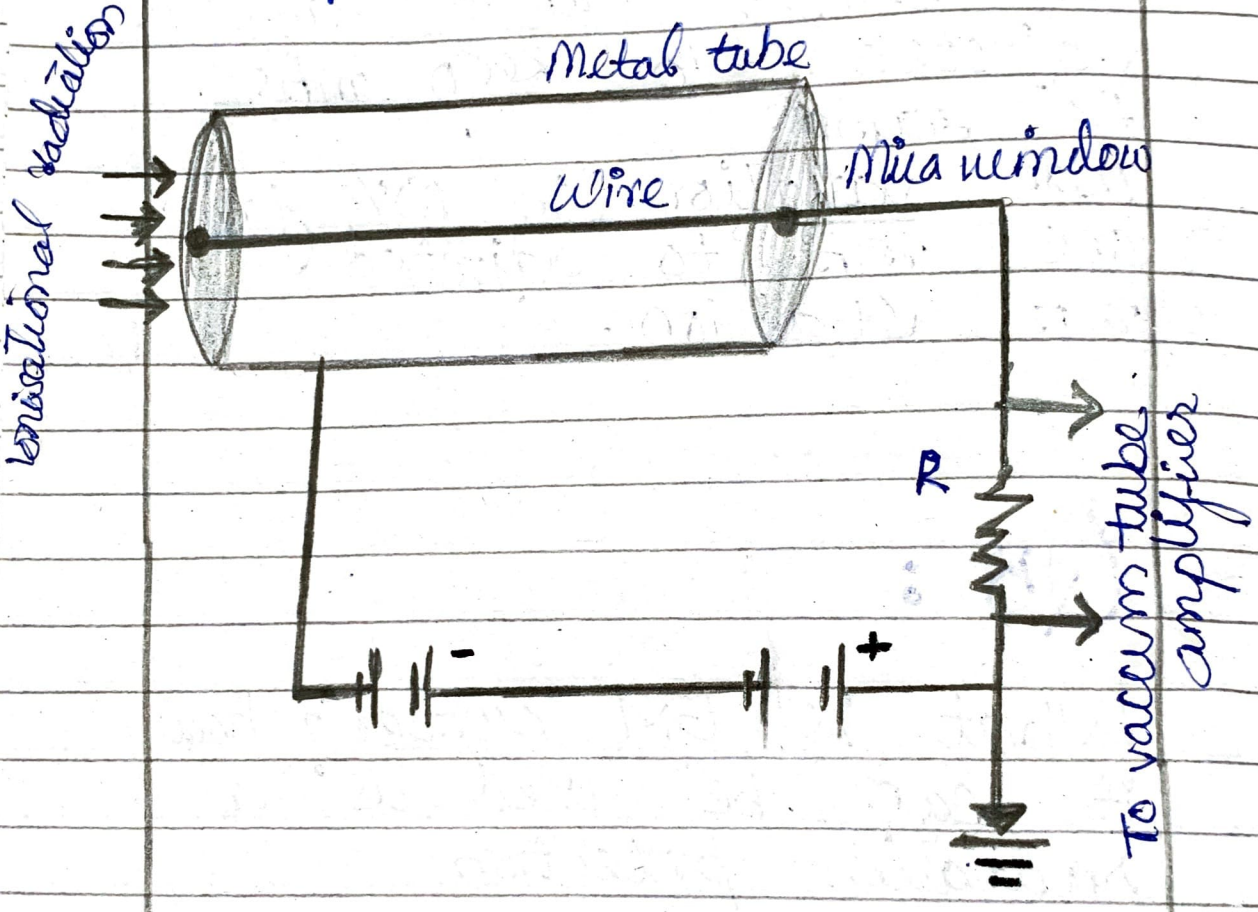
ANSWER.

GM Counter:

A geiger counter is an instrument used for detecting and measuring ionizing

radiation. Also known as a Geiger-Muller counter.

DIAGRAM;



Geiger counters are used for contamination control in nuclear medicine laboratories. As portable survey instruments, they are used to detect the presence of radioactive contamination on work surfaces and laboratory

Apparatus. Geiger counter is an instrument used for detecting and measuring ionizing radiation. It detects ionizing radiation such as alpha particles, beta particles and gamma rays using the ionization effect produce in a Geiger-Muller tube, which give its name to the instrument.