Date: 22-06-2020

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ID # : 15254.

Final Term:

Course Title: Radation protection.

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Q.1 Differentiate b/w Deterministic and Stochastic effect of Radation?

Ans 1: => Deterministic Effect of Radation:

If the Radation Response Increases in Severity with increasing Radation dose, it is called Deterministic effect of Radation.

Deterministic Radation responses are those that exist/ exhibit increasing Severity and Increasing Radation dose.

It is also knows as non-Stochastic effect

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* Deterministic effect depend upon time doses type of exposure Radation.

one Characterstic of Deterministic is threshould dose. which is mean exposure of Radation under the level.

=> **Deterministic effect of Radation of Humans:**

Acute Radation Syndrome.
Hematological Syndrome
CNS Syndrome

2 Local tissue demage.
Skin
* Gonads
Cytogenetic demage.

3/ Extremities.

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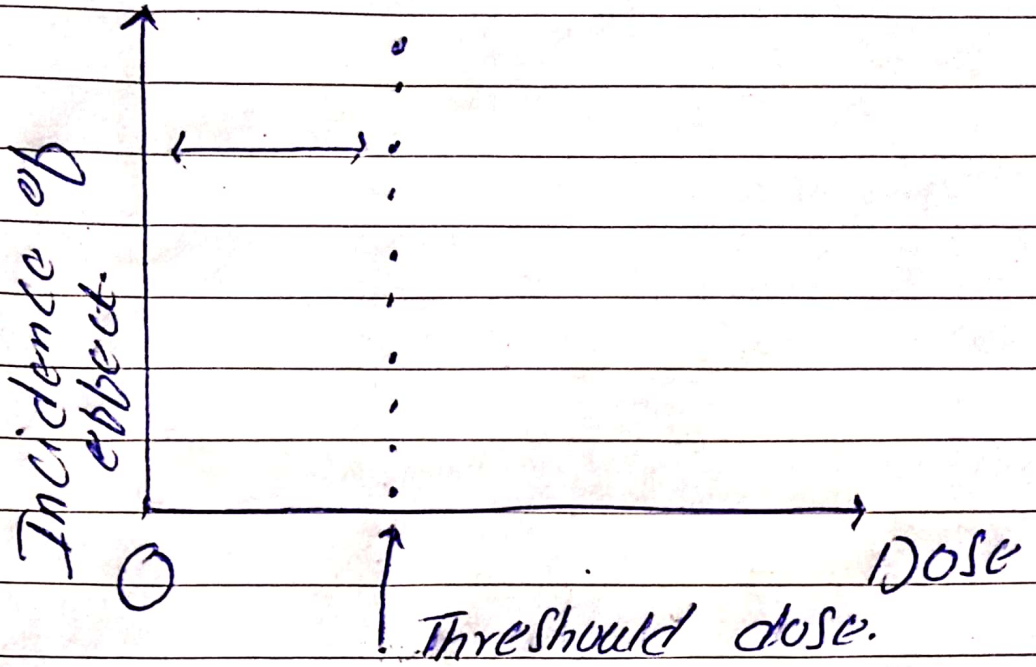
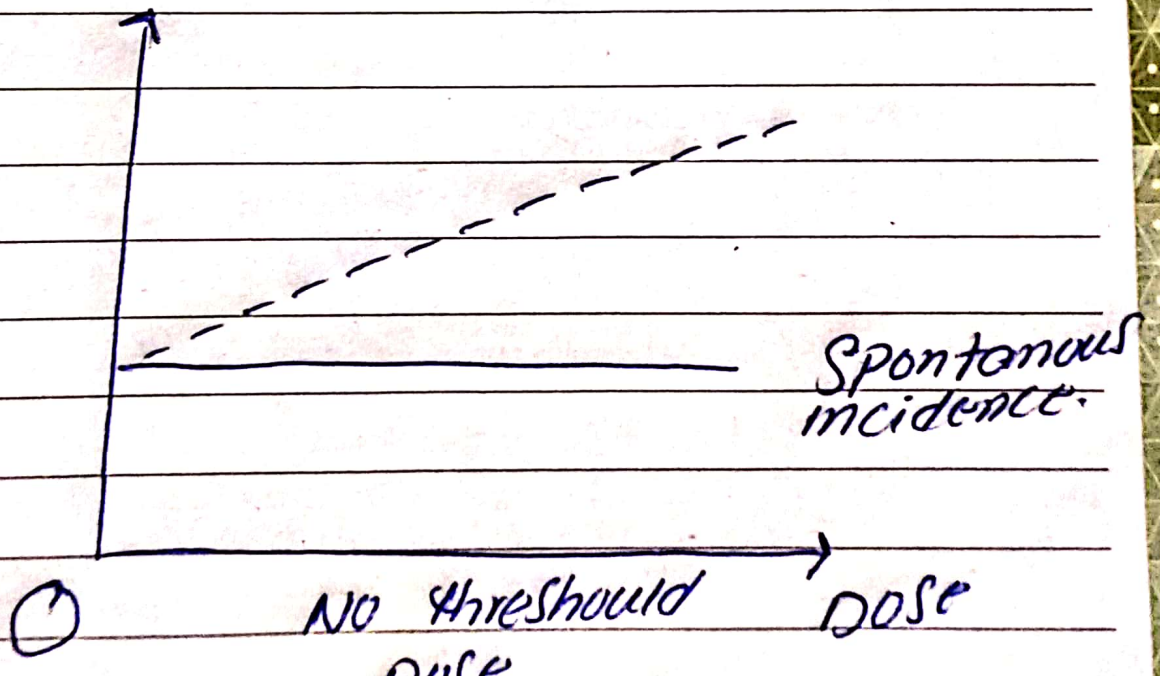


=> Stochastic effect :-



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Stochastic effect that occur by chance and which may occur without a there should level of Dose.

The main effect of Stochastic effect is Cancer.

It is increasing Radiation dose is called Stochastic effect.

The principal Stochastic effect of low doses over a long period consist of Radiation.

Stochastic effect of Radiation on Human.

1/ Leukemia, Bone Cancer, Lung Cancer, Thyroid Cancer.
2/ Local tissue damage.
3/ Shortening of life span.
4/ Genetic damage.

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Q.2 Briefly explain following terms, Rel Radiation:

(1) => **Radation :**

Radation is the Emission or transmission of Energy in the form of waves or particles through Space or material medium.
The kind of Radation are Electromagnetic (like light) and particulate.

Such as Radio waves, microwaves, Infrad, visible light.

2/ => **Radio activity :**

Radio activity is the Spontaneous emission

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of particles and energy in order to become Stable.

=> To reach Stablity the nucleus Spontaneously emits particles and energy itself to another atom. This process is called Radioactivity disteseration.

(3) Ionizing Radation:

It is special type of Radation that includes x-rays. Ionizing Radation is any type of Radation that capable of Removing an orbital electron from an atom which it interact. This type of Radation is called Ionozing Radation and matter

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4 => Non Ionizing Radation :

Non Ionozing Radation refer to type of electro -magnetic Radation that doses not Carry enough energy per quantum (photon energy).

to Ionize atoms or molecules that is Completly remove electron from an atom.

It does not penetrate deep into tissues but increase risks to demage skin and eyes.

5/ Hormful Radation :

Radation demages that cells that makes up Human body Low level of Radation can leads to Sickness.

High level of Radation

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Can causing damage, our Internal organs.
Gamma Rays: are most harmful external hazards.
Beta particles: are partially penetrate skin.
Alpha particles: Can penetrate and infect skin.
Gamma and X-rays pass through a person damaging cells and their path.

Q.3 What are the two basic basic principal of Radation protection?

Ans: (1) **Manimize Time:**

The dose to an Individual is directly related to duration of radeation exposure.

Time =) Exposure = Exposure rate X Exposure time.

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Keep the time of exposure to radation as short as possible.

→ maintain a large distance as possible b/w the source of Radation and exposed person.

→ Insert Sheilding material b/w the radation source and exposed person.

2nd Maximize Distance

If the distance from source exceeds five times the source diameter, It can be treated as point source.

$$\frac{\text{New exposure}}{\text{old exposure}} \rightarrow \frac{\text{New distance}}{\text{old distance Square}}$$

As the distance b/w the source of Radation and person increase, Radation decreases rapidly.

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Q.3/ => Names of Radation B. protection devices.

* Radation protection Aprons.

* Radation protective Apron Accessories.

=> Radation protection Gloves.

=> Radation protection Glasses.

=> Radation protection thyroid Sheilds.

=> Radation protection Apron Racks.

=> Radation protection Barrier and Table Sheilds.

=> Radation protection Drape Sheids.

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Q.4 => What are the features of Radation protection device?

Ans: (1) protective x-ray Tube Housing:

Every x-ray tube must be contained with a protective housing that reduced leakage radeation during use. Leakage radeation must be less than 1 mGya/hr (100 MR/hr) at a distance from protective housing.

=> Control pannel:

X-ray beam on must be positively and clearly indicated to radiologic technologist.

It must indicate the conditions of exposure must positively when x-ray tube is energized.

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3/ **Source to Image Receptor Distance Indicator:**

The SID indicator must to provided. The SID indicator must be accurate to within 2% of the indicator? SID.

4/ **Collimation:** The x-ray beam and light beam must concide to within 2% of SID.

Light localized variable aperture rectangular collimation should be provided.

Cones and diaphram may replace the collimation for special examanations.

5/ **Positive Beam Limitation:** The PBL must be accurate to within 2% of SID.

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6/ Beam Alignment:

In addition to proper collimation, each radiographic tube should be provided with mechanisms to ensure proper alignment of x-ray beam and image receptor.

7/ Filtration:

All General purpose diagnostic beams must have a total filtration of least 2.5 Al when operated above 70 kvp. Radiographic tubes operated blw 50 to 70 kvp must have least 1.5 mm Al.

8/ Reproducibility:

The variation in x-ray intensity should not exceeds 5%.

This is check by making repeated radiation exposures at the same techniques

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and observing the average variation in Radiation Intensity.

10/ Linearity :-

The maximum acceptable variation is linearity is to fi one mA station to Adjust mA station.

11/ Operator Sheild :-

The exposure Control should fixed to the operator Console and not a long Cord. The radiographic technologist may be in examination room during exposure.

12/ mobile X-ray Imaging System :-

A protective lead Apron Should be assigned to each mobile x-ray Imaging. The exposure switch Such as Imaging System 2 m from x-ray tube.

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Q.5 What is GM Counter? How it can be used Radiation protection devices?

Ans: Geiger – Muller Counters:: The G-M Counter was named by Hans. who inverted the device in 1908. It is a gas-filled detectors designed from maximum gas Amplification effects.

The principal of a GM Counter! centre wire (Anode) is maintained a high positive voltage relative to others cylindrical electrode Cathode.

The outer Electrode is metallic film Spayred on the inside of a

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a glass or plastic tube. Some gm / Gm Counters are thin Radation entrance at the one End of tube.

The Cylinder of the tube is Sealed and filled with a Special Gas mixture typically argon plus Quenching Gas.

When Ionization occur is Gm Counter electron are accelerated towards the centre wire.
Gas amplification occur as proportional Counter.

The avalanche Ionization in a Gm tube reaches a large are essentially constant

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Quantity of Electric Charge regards of voltage applied to tube.

The Gm Counter tube reales a large essentialy.

The Gas amplifications factors may be high has 10^{10}.

Commonly used quecheniny gases include heavy organic vapors eg (alcohol) and halogen eg (Cl_2).

The organic vapors are more effective agents but have disadvantage that their fragments do not recombine after dissociation.

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⇒Use of Gm Counter:

Geiger - muller Counter operate under given biser voltage b/w anode and cathode usually in the 800 to 1200 voltage Range.

Like the proptional Counter the high voltage accelerates the charge of produced the initial Ionization to where they enough Energy to ionize the electrons in the gas.

However the Cascading of Ion pairs electron to much larger degree and continous until the Counter is saturated with Ions. The all happens in fractions of a second

and results in electrical current pulse of constant voltage.

The Electric Circuit of Gm Counter Countries Counts and records the number of pulses and the information is often displaced in Counts per minute

B/C the Can displayed Individual Ionizing events. Gm Counter more Sensitive to low level of Radiation, than ion Chamber Instruments.

Since the Gm Counter produces more electrons than Ions Chamber Counter It does not requries the Same level of Electronic Sophisticated over Sorry Counter

Thank you +