Assignment No. .....

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Dep = Radiology

Radiation Protection.

Assignment No..... 1).....

1) Differentiate btw deterministic & stochastic effect?

Deterministic Effects:	Stochastic Effects:
1) The effect dose not occure.	Effect that occure by chance.
2) Threshold below which the effect dose not occure.	may occure without a threshold level of dose.
3) Reletively high dose over a short Period of time.	Probability is propotional to the dose.
4) These effects depend on time of exposure, doses, type of radiation.	Those effects which occure when a person receives a high dose of radiation.
5) The severity of which varies with the dose.	Severity is independent of the dose.
6) The effect does not occure.	The main stochastic effect is "cancer".

Assignment No..... 2) .....

2) Explain :-

i) **Radiation :-**

Radiation is the emission or transmission of energy in the form of waves or particles through space or through a material medium. This include electromagnetic radiation such as radio waves, visible light and x-rays.

Example :-

→ Ultraviolet light from the sun.
→ X-rays from an x-ray machine.
→ Electromagnetic radiation from your cell phone etc.

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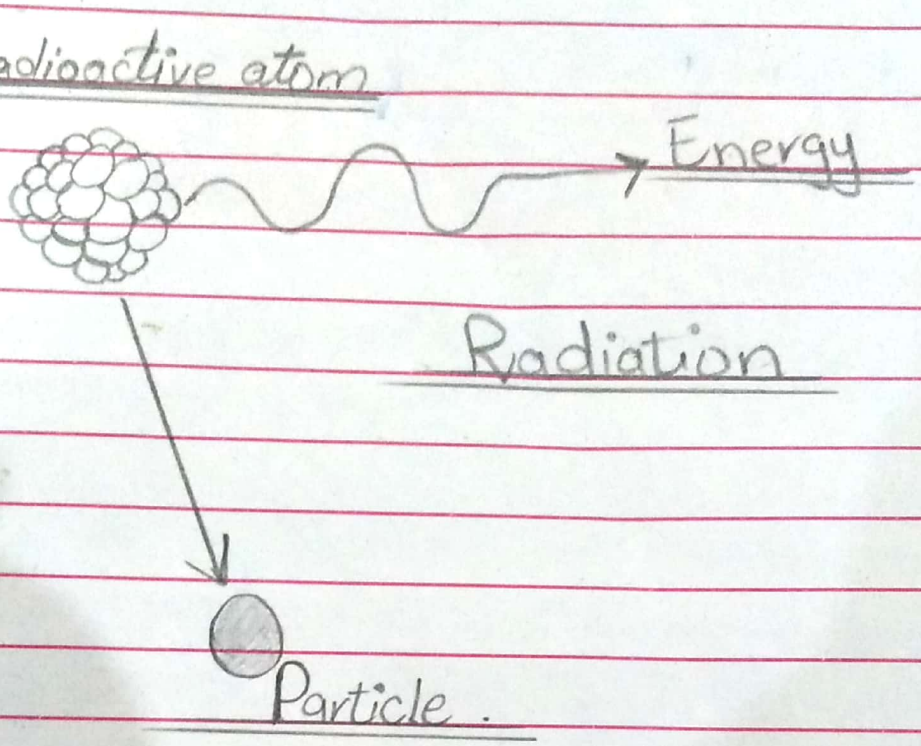
ii) **Radioactivity :-**

The spontaneous emission of radiation in the form of Particles or high energy Photones resulting from a nuclear reaction. A substance that contain unstable atomic nuclei is considered to be radioactive, radioactive decay is a random or stochastic process that occures at the level of individual atoms.



iii) Non-Ionizing radiation :

=> Non ionizing radiation is described as a series of energy waves composed of oscillating electric and magnetic fields travelling at the speed of light.

=> Non-ionizing radiation includes the spectrum of ultraviolet (UV).
⇒ Visible Light.

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⇒ Infrared (IR).
⇒ Microwave (MW).
⇒ Radio frequency (RF).
⇒ Extremely low frequency (ELF).

⇒ The movement of an electron to a higher energy state.

4) Ionizing Radiation :-

⇒ Ionizing radiation is radiation with enough energy so that during an interaction with an atom, it can remove tightly bound electrons from the orbit of an atom, causing the atom to become charged or ionized.

⇒ Ionizing radiation causes two types of harm to humans direct tissue damage or cancer.

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Types of Ionising radiation include :-

→ X-rays / gamma rays.
→ Alpha Particles.
→ beta Particles.
→ neutron Particles.

5) Harmful radiation :-

→ Radiation damages the cell that makeup the human body.
→ Low level of radiation are not dangerous.
→ Medium level can lead to sickness, headache, vomiting and fever.
→ High level can kill you by causing damage to your internal organs. its difficult to treat high radiation exposure.
→ Gamma rays are the most harmful, external hazard.
→ Beta can partially penterate skin causing "beta burns".

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→ Alpha Particle cannot Penetrate intact skin.
→ Gamma and x-rays can pass through a person damaging cells in their Path.

Q3) write two basic Principal of radiation Protection?

Two basic Principle of radiation Protection:-

Time :- The amount of radiation exposure increases and decreases with the time people or workers spend near the source of radiation. Reducing the time of an exposure reduces the dose Propotionally. If the time spent in a given radiation field is doubled, the worker's dose is doubled. Therefore, to limit radiation dose, the time spent in the field must be limited.

Distance :- The radiation dose recieved from a source is inversely propotional to the square of the distance of separation.

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As a rule, if you doubled the distance, you reduce the exposure by a factor of four.

b Part) write down the names of the radiation Protection device ?

Radiation Protection devices :-

1) Protective X-ray Tube Housing.

2) Control Panel.

Q7) What are features of radiation Protection design ? Explain ?

Design of Protective barriers :-

Protective X-ray tube housing (To reduce leakage radiation) :
must be less than 100 mR/hr at a distance of 1m from Protective housing.

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Control Panel:
(Must show exp. conditions & when tube is energised):
Beam ON must be clear to techs.

SID Indicator:-
must be accurate within 2% of the indicated SID.

Collimation:
X-ray beam and light field must coincide win 2% of SID

PBL - Positive Beam Limitation:-
Must be accurate within 2% of SID.

Beam Alignment:-
Aligned with the image receptor.

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Filteration :-
(Inherent Plus added)
Total must be at least 2.5 mm above 70 KVP.

Reproducibility :-
(constant output radiation intensity) or
Should not exceed 5% through same technique.

Q5) what is GM Counter. how it can be used as radiation Protection device ?

GM Counter :-

A Geiger counter is an instrument used for detecting and measuring ionizing radiation. Also known as Geiger Counter Mullar.

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Exp :-

It detects ionizing radiation such as alpha Particles, beta Particle, and gamma rays using the ionization effect Produced in a Geiger-Mullar tube, which gives its name to the instrument.

Used as a radiation Protection device :-

→ Radiation Passes through gas and ionized atoms of gas.

→ Electron 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.

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→ The GM counter are used for contimination control in nuclear medicine laboratories.

→ This is used to detect the presence of radioactive contimination on work surface and laboratory apparatus.

→ Geiger counter are very sensitive instrument that are capable of detecting and indicating singal ionizing events.

→ If thay are equipped with an audio amplifier and a speker, 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 $1 Gy_a/hr$ (100 mR/hr).

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Geiger Muller Tube e-