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BS RADIOLOGY 4TH SEMESTER

PAPER RADIATION PROTECTION

Question No. 1

Differentiate between Deterministic and stochastic effect

	DETERMINISTIC EFFECT	STOCHASTI EFFECT
1.	Deterministic effects are those responses which increase in Severity with increased dose if the dose increase the severity of an effect increases.	Effects that occur by chance and which may occur without a threshold level of dose, whose probability is propotional to the dose and whose severity is independat of the dose
2.	All early effect and most tissue late effect is deterministic.	The Stochiastic effect is Cancer.
3.	Deterministic effect are also known as non-stochastic effects to Contrast	In Stochastic effect probability of an effect increase with close.

	Them with chance-like stochastic effect eg cancer induction.	Stochastic effect has no dose threshold.
4.	Deterministic effects has a threshold of dose	Severity of the effect is not dose related.
5.	Severity of the effect is dose related EXAMPLE:- Skin burns.	EXAMPLE:- hereditary effects
	lethal DNA damage	Sub lethal DNA Damage
6	In Deterministic effect Cell death occur	In Stochastic effect Gene mutation occur.
7.	Decrease the function of Tissue and organ.	Replication of mutated cells.
8	for example: Xerostomia, osteoradionecrosis, Contracts and decrease fetal development	for example:- leukemia, Thyroid Cancer, Salivary gland tumors, Heritable disorders.
9.	ACUTE EFFECTS:-	ACUTE EFFECTS:-
	* Local Exposure Erythema, Epilation Sterility, Fetal Abnormality.	No acute effect

*Whole body exposure GIT injury, Cardiovascular injury etc.

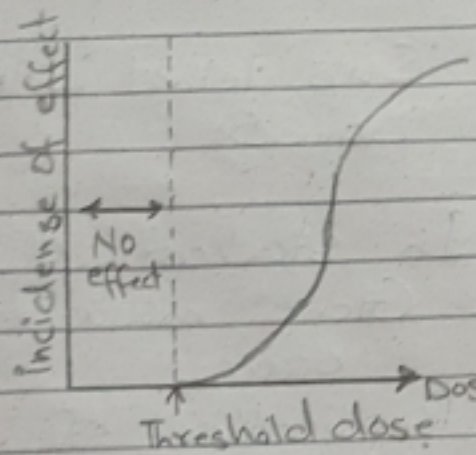
LATE EFFECTS:-

Solid Cancer, lukemia

10. LATE EFFECTS:-

Contracts

GRAPH



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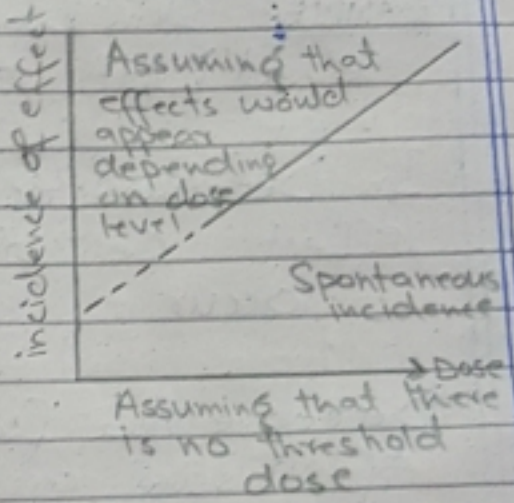


QUESTION No. 2

RADIATION:-

is energy emitted from unstable atoms in the form of electromagnetic waves or photons or in the form of subatomic particles to become more stable. The nuclei of unstable atoms disintegrate or decay as they give off excess energy in the

Form of radiation. This includes; electromagnetic radiation such as radio waves, visible light and x-rays.

low level of radiation are not dangerous but medium levels can lead to sickness headaches, vomiting and a fever. High level can kill you by causing damage to your internal organs - its difficult to treat high radiation exposure.

EXAMPLE:-

A burning of candle emits radiation in the form of heat and light.
The sun emits radiation in the form of heat light and particle.

There are three primary types of radiation:-

Alpha:- These are fast moving helium atoms.
Beta:- These are fast moving electrons.

Gamma:- These are photons just like light, except of much higher energy, typically from several keV to several MeV.

RADIOACTIVITY:-

Radioactivity is the spontaneous emission of radiation

in the form of particles or high energy photons resulting from a nuclear reaction.

- it is also known as radiactive decay, nuclear decay, nuclear disintegration or radioactive disintegration.
- There are many forms of electromagnetic radiations. They are not always produced by radioactivity.

FOR EXAMPLE:-

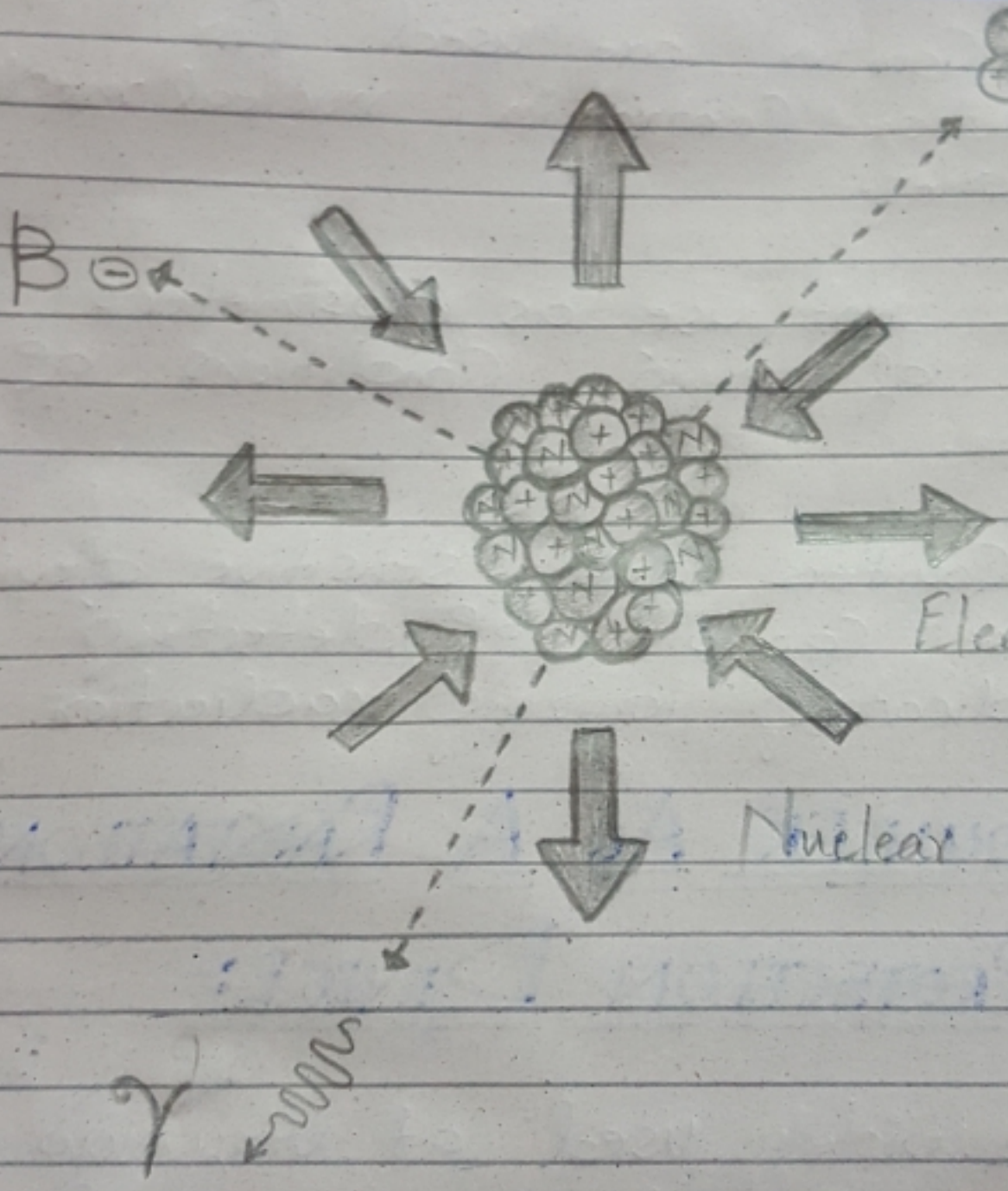
light bulb may emit radiation in the form of heat and light, yet it is not radioactive. A substance that contains unstable atomic nuclei is considered to be radioactive.

TYPES OF RADIOACTIVE DECAY:-

There first three types of radioactive to be ~~considered~~ discovered were alpha, beta and gamma decay.

- Alpha decay
- Beta negative decay
- Gamma decay
- Positron emission also called beta positive decay.

RADIOACTIVITY



NON IONIZING RADIATION:-

- Non ionizing radiation is a type of electromagnetic radiation that does not carry enough energy per quantum (photon energy) to ionize atom or molecules completely remove an electron from an atom or molecule.
- Instead of producing charged ions when passing through matter, non ionizing electromagnetic radiation has sufficient energy only for excitation.
- CAUSE:-
Non-ionising radiation can cause localized heating, or photochemical reactions can occur with possible permanent harm. Exposure should therefore be minimised.
- Most types of non-ionizing radiation have not been found to cause cancer
- Non-ionizing radiation include the spectrum of ultraviolet visible light, infrared, microwave, radiofrequency.

IONIZING RADIATION:-

ionizing
radiation is any type of particle or electromagnetic wave that carry enough energy to ionize or remo electron from an atom.
There are two types of electro

netic waves that can ionize atoms x-rays and gamma rays and Sometimes they have same energy

ionizing radiation cause two types of harm to humans: Direct tissue damage and cancer.
This can lead to radian burns, radiation Sickness organ failure and even death.

TYPES OF IONISING RADIATON:-

Alpha particle which include two protons and two neutrons.
Beta particles, which are essentially electrons
Gamma rays and x-rays which are pure energy.

HARMFUL RADIATION:-

Radiation damages the cells that make up the human body. low level of radiation are not dangerous but medium levels can lead to Sickness headaches vomiting and fever High level can kill you by causing damage to your internal organs. it is difficult to treat high radiation exposure.

Alpha particles are the most

harmful internal hazard as Compared with gamma rays and beta particles.
- Radioactive materials that emit alpha and beta particles are most harmful when swallowed ih inhaled absorbed or injected.
- Gamma rays are the most harmful external hazard.

- Harmful radiation can damage hair, skin, organs and also. Cause DNA mutation; or Cancer.

Question No. 3

Basic Principle Of Radiatio Protection:-

There are three basic Principles of radiation Protection.
Time, Distance, Shielding.

Time:-

Radiation exposure can be accumulated over the time of exposure.
In C-arm fluoroscopy guided interventions the time spent checking the C-arm flouroscopy is related to the radiation exposure.

The longer the exposure time, the more radiation exposure to the pain physician.
it is important to reduce the usage time of C-arm fluoroscopy for reducing the usage time, the physician has to improve his skill in intervention and radiographer has to check the x-ray at correct location and at the moment without blurred image.

Distance:-

A greater distance from the radiation source can reduce radiation exposure. The amount of radiation exposure is not inversely proportional to the distance. This means that double distance from the radiation source can reduce the radiation exposure not to 1/2 but to 1/4 Therfore maintaining a greater distance from x-ray generator is a very effective method for radiation safty Safety.
In previous study of radiographs two step behind the mobile support structure can decrease the exposure of radiographers by about 80%.
In other study being only

Go 1m: farther from the Centre of x-ray field can decrease the radiation exposure by about 73%.

NAMES OF RADIATION PROTECTION DEVICE:-

- Radiation Protection Apron
- Radiation Protection Apron Accessories
- Radiation Protection Gloves
- Radiation Protection Glasses
- Radiation Protection thyroid Shields
- Radiation Protection Racks
- Radiation protection Barriess & Table Shield
- Radiation protection Drape Shields

Question No. 4

FEATURES FOR RADIATION PROTECTION DEVICE:-

Many radiation protection devices & accessories are associated with modern x-ray imaging Systems Two that are appropriate for all diagnostic x-ray imaging system relate to protective housing of the x-ray tube & to Control panel.

Protective X-ray tube Housing

Protective housing to reduce leakage radiation.

leakage radiation must be less than 1 mGy/hr (100 mR/hr) at a distance of 1m from the protective housing

CONTROL PANEL:-

The Control pannel must indicate the Conditions of exposure positively indicate when the x-ray tube is energized.

X-ray beam on must be positively and clearly indcated to the radiologic technologis.

SOURCE TO IMAGE RECEPTOR DISTANCE INDICATOR

- Indicator must be present.
- must be accurate with in 2% of the indicated SID

COLLIMATION:-

Light field, variable aperture

X-ray beam and light fiebl must

FILTRATION:-

- inherent plus added .....

- Total must be at least 2.5mm above 70 kvp

Question No. 5

GM Counter:-(Geiger-Muller)

- It is a type of gas filled detector which is used to detect and measure ionizing radiation or charge particle like α, β particle etc.

- The Geiger-Muller tube is filled with an inert gas such as helium, neon or argon a low pressure, to which a high voltage applied

- Geiger Counter are used for contamination control in nuclear medicine laboratories.
- They are not use as dosimeters because of varing conditions of radiation.
- Geiger Counters are sensitive device that are capable of detecting and indicating ionizing radiation

GM COUNTER AS A RADIATION PROTECTION DEVICE:-

- GM are widely used at very low radiation levels eg in area of public occupancy around radiotherapy treatment room.
- GM Counte exhibit strong energy dependence at i low photon energies
- No suitable for us impulse radiation field
- They are particularly applicable for leak testing & detection of radioactive Contamination.