EAST WEST UNIVERSITY

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Assignment

Submitted To

Faculty Name : Prof. Dr. Md. Shafiqul Islam

Submitted By

Name : Sheikh Sarafat Hossain

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(1) (a) Radiation is the emission or transmission of every energy in the form of waves or particles through space or through a material medium. Difference between ionizing and non ionizing radiation:

(i) ionizing radiation has high energy, non-ionizing has less energy level.

(ii) It can ~~eom~~ emit electrons or other particles from atom but non-ionizing can not emit but excite electrons.

(iii) It has shorter wavelength than non-ionizing radiation.

(iv) Alpha, Gamma and X-rays are ionizing radiation, UV rays, radiowaves, microwaves are non-ionizing.

□ Sources of radiation

- cosmic rays
- air
- Watching TV
- Food
- Medical X-ray
- nuclear industry.

(b) units of radiation are

(i) Roentgen
(ii) Gray
(iii) sievert
(iv) RAD
(v) REM

Roentgen: It is used to measure radiation exposure that will liberate a change of air

1 Roentgen = 2.58×10^{-4} coulomb/kg

GRAY: It is used to measure the quantity of radiation in an energy deposition of 1 Joule/kg

The relationship of RAD and REM is,

REM = RADS x Quality Factors

(c) Types of radiation health effects are

(i) cell death (ii) cell transformation (iii) both

Radiation can cause biological damages on cells. If radiation falls on human body, it produces moving electrons. The electrons cause excitation, ionization in chemical and molecular changes. It also produce free radicals and cause damage tissue and affect its normal function.

Stochastic	Deterministic
It has no threshold dose. It occurs at low doses. It's mechanism is cell modification It can't be completely avoided	It has threshold dose. It occurs only at high dose. It's mechanism is cell killing. It can be avoided.

Properties of deterministic effect:

- It has a threshold dose.
- It can be completely avoided.
- occurs only at high dose.
- main mechanism is cell killing

Somatic effect is a radiation effect occurs on an exposed individual during his life time. ~~is eat~~

(2) (a) ~~Ans (a)~~ $\frac{\pm dN}{dt} \propto N$

$$\Rightarrow -\frac{dN}{dt} = \lambda N$$

$$\int_{N_0}^{N} \frac{dN}{N} = -\int_0^t \lambda dt \qquad [\text{decay constant}]$$

$$\Rightarrow \ln N - \ln N_0 = -\lambda(t-0)$$

$$\Rightarrow \ln \frac{N}{N_0} = -\lambda t$$

$$\Rightarrow \frac{N}{N_0} = e^{-\lambda t}$$

$$\Rightarrow N = N_0 e^{-\lambda t}$$

$t = T_{1/2}$
$N = \frac{N_0}{2}$

For half life, $\frac{N_0}{2} = N_0 e^{-\lambda T_{1/2}}$

$$\Rightarrow \frac{N_0}{2} = N_0 e^{-\lambda T_{1/2}}$$

$$\Rightarrow \frac{1}{2} = e^{-\lambda T_{1/2}}$$

$$\Rightarrow 2 = e^{\lambda T_{1/2}}$$

$$\Rightarrow \ln 2 = \lambda T_{1/2}$$

$$\Rightarrow T_{1/2} = \frac{\ln 2}{\lambda}$$

$$\Rightarrow T_{1/2} = \frac{0.693}{\lambda}$$