Q.1 Define the following terms:

1. *Ultraviolet light* *2. Ionizing Radiation* *3. Radioactivity*

Q.2 What is activity of one gram Ra-226 whose half life is 1622 year ?

Q.3 How much time is required for 5 mg of Na-22 (T1/2 =2.60y) to reduced to 1 mg ?

Q.4 How much time is required for an amount of Sr-90 (T1/2 =28y) to be reduced by 75% ?

Q.5 An archaeologist finds a 25g piece of charcoal in the ruins of an ancient city. The sample shows a 14C activity of 250 decays/min. How long has the tree from which this charcoal came been dead? (14C has a half-life of 5730y)

Q.6 A sample of carbon of mass 7.60 g taken from an animal jawbone has an activity of 4.00 decays/min. How old is the jawbone? (14C has a half-life of 5730y)

Q.7 A patient receives an injection of (1.1*108Bq) of 131I , which accumulates in the thyroid (mthyroid ≈ 20 g) , the mean energy of the emitted radiation is 300 kev, what is the dose rate to the thyroid ?

Q.8/Choose the correct answer:

1)- ……Produced by a low-density gas.

i)-Continuous spectrum. ii)-Emission spectrum. iii)-Absorption spectrum. iv)- X-ray Spectrum

2)- ……Has a high charge It is dangerous if swallowed.

i)-Alpha ray. ii)-Beta ray. iii)-Gamma ray. iv)- X-ray.

3)- The penetration of x-rays is a function of…….

i)- Energy of the photon ii)- Electron shell. iii)- Voltage applied iv)- None of them

4)- At …….. cells are able to repair damage without cell death

i)- Higher LET. ii)- lower dose. iii)- Higher dose. iv- all of them.

5)-……..has zero mass It is stopped by thick lead or concrete.

i)- Alpha - ray. ii)- Beta- ray. iii)- Gamma - ray. iv)- X- ray.

Q.9 Find the longest wavelength present in the (Balmer series) of hydrogen, ? if you know the R=Rydberges constant = $(1.097 * 10^{7}\, m^{-1})$

Q.10 Determine the wavelength of the (first line) of the (Paschen series) of the hydrogen atom ? if you know the R= Rydberges constant = $(1.097 * 10^{7}\, m^{-1})$

Q.11 Illustrate schematically the following terms?

1)- Rutherford Model . 2)- Compton scattering. 3)- Bremsstrahlung radiation.

Q.12 Calculate the repulsive electric force on proton whose center is (r = 2.4×10-15 m) from the center of another proton . Assume the protons are uniformly charged sphere of positive charge . (Electrical force constant k = 9.0 x109 N.m2 /C2 , Charge of proton = +1.6x10 -19 C)

Q.13 What is the frequency of violet light with wavelength 400 nm ?

Q.14 Find the shortest wavelength present in the radiation from an x-ray machine whose accelerating potential is 50,000 V.

Q.15 Choose the isotopes, isotones and isobars from the following?.

$^{123}_{53}\mathbf{I}$, $^{131}_{50}\mathbf{Sn}$, $^{125}_{48}\mathbf{Cd}$, $^{131}_{51}\mathbf{Sb}$, $^{126}_{49}\mathbf{In}$, $^{125}_{53}\mathbf{I}$

Q.16 Explain the following with the example?.

1- Isotpes . 2- Isobars. 3- Isotones. 4- Mirror nuclei.

Q.17 The half life of radon is 3.8 days. After how many days will only one twentieth of radon sample be left over?

Q.18 Complete the decay equations below: 1) $^{25}_{11}\mathrm{Na} \rightarrow \; Mg + \beta^{-}$ 2) $^{224}_{88}\mathrm{Ra} \rightarrow \; _{86}Rn + \; ^{4}\alpha$ 3) $^{16}_{8}\mathrm{O} \rightarrow \; _{7}N + \beta$

Q.19 The half-life of 226Ra is 1620 years , Calculate ;

a)The decay constant of 226Ra in units of sec-1

b)The number of radioactive atoms in 1g of 226Ra .

c) The activity of 1g of 226Ra .

Q.20 One milligram of polonium-210 (210Po), half-life 138.3 days , is allowed to decay for 1Year ,what is its activity at the end of that time ?

Q.21 The half-life of radioactive ^{60}Cois 5.26 years . What is the activity of a 1g sample of ^{60}Co in units of curie , and its activity after 5.26 Years ?

Q.22 The half –life of radon 222 (^{222}Rn) is 3.85 days . How long it take for 60 percent (60%) of a sample of radon (^{222}Rn) to decay?

Q.23 Determine the dose equivalent for a working for two months at an average distance of 50 cm from a 100 $\boldsymbol{\mu Ci}$ Na-22 source ?

Q.24 A worker receives a whole body dose of D=0.1 mGy from 2 Mev neutrons. Estimate the dose equivalent?

Q.25 What is the effective dose $\boldsymbol{H_{\varepsilon}}$ to a worker who receives uniform whole body doses of 8.4 mGy from Gamma-rays and 1.2 mGy from 80 kev neutrons ?