**Acute radiation exposure** is when an individual receives a high radiation dose over a relatively short period of time. Acute radiation exposure also called Acute Radiation Syndrome (ARS). ARS results when an individual receives a whole body exposure of 100 to 200 Rems or more (Roentgen Equivalent Man) over a 24-hour period of time. The table below shows the likely symptoms associated with differing levels of exposure.

**Alpha Particle:** A positive electrically charged particle of radiation consisting of two protons and two neutrons (same as a helium nucleus). It is emitted from the nucleus of many radioactive materials during radioactive decay. Alpha particles have a very low kinetic energy and therefore can be stopped by a sheet of paper or clothing. However, if ingested, alpha particles have a Quality Factor (QF) of 20 times that of straight gamma or X-ray radiation, making them dangerously toxic if inhaled or ingested.

**Beta Particle:** negatively charged particles having mass and charge equal in magnitude to that of an electron.

**Biological half-life:** the amount of time required for one half of a radioactive substance to be removed (from a human) by the natural biological processes (urination, sweating, bowel movements, vomiting)

**Chronic radiation exposure** occurs over an extended or prolonged period of time and the results are often varied depending on the dose of exposure, duration of exposure and individual reaction to the over-exposure.

**Gamma Radiography:** Radiographs (film, DDA plates, CR plates) are exposedusing a gamma ray camera or radiograph shooting machine which can be portable, fixed in a cabinet or located in a vault.

**Gamma Source (source):** Industrial gamma radiography typically uses a man=made (activated) radiation source (Cobalt-60, Iridium-192, and Cesium-137). These sources are typically created for specific purposes and applications.

**Gamma Radiation:** is a penetrating, ionizing, electromagnetic radiation arising from the radioactive decay of atomic nuclei, containing the shortest wavelength of the electromagnetic spectrum.

**Ionizing Radiation:** a type of radiation that is able to disrupt atoms and molecules on which they pass through, giving rise to ions and free radicals.

**Neutron:** a subatomic particle with about the same mass as a proton but without an electric charge. Neutrons are present in all atoms except the Hydrogen atom.

**Particulate (or particle) Radiation:** is the radiation of energy by means of fast-moving subatomic particles. Alpha particles, Beta particles, neutrons, and positrons are examples of particulate radiation.

**Photons:** Discrete particles of light or electromagnetic radiation hypothesized to explain the corpuscular theory of radiant energy.

**Roentgens (R),** is the unit of measuring radiation exposure in **AIR** for X-rays and gamma rays, which is based on the ionization produced in air. More specifically, the Roentgen is defined as “the radiation flux which will produce 2.083 x 109 ion pairs per cubic centimeter (one electrostatic unit of charge either positive or negative) at a standard temperature and standard pressure (0° C and 760 mm Hg). Nevertheless, for all practical purposes – commit to memory that Roentgens measure ionizing radiation in air.

**Radiation Absorbed Dose (RAD)** is the accepted unit of measurement of absorbed dose in **tissue**. 1 RAD represents 100 ergs of energy imparted per gram of material at the place of exposure.

**Quality Factor (QF)** is a factor or multiplier of the actual biological effects or damage of the specific radiation type on the human tissue. In a sense, not all Roentgens impart equal damage to tissue and therefore we use a QF multiplier to calculate for the Roentgen Equivalent Man (REM). Table 7A below will demonstrate the various QF value of differing ionizing radiation sources.

**Roentgen Equivalent Man (REM)** is defined as the quantity of ionizing radiation of any type which, when absorbed in a biological system, results in the same biological effects as one unit of absorbed dose in the form of low linear energy transfer (LET) radiation. More practically, REM is defined as the product of the RAD multiplied by the QF.

**X-ray** – a type of ionizing radiation formed in a Cathode Ray Tube (CRT) when high velocity electrons flow from the cathode to the anode.