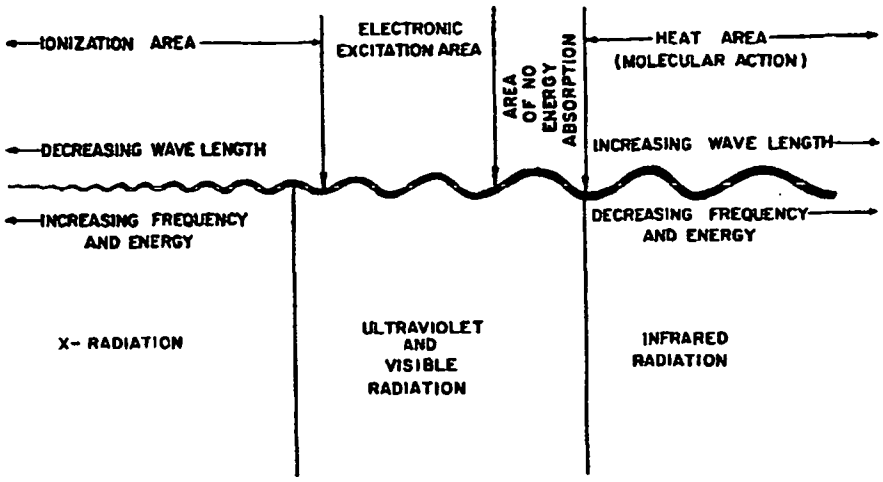

Fig 42-3 The relationship of various electromagnetic radiations in the energy spectrum

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As a general rule, if a known radionuclide is present, the kind of radiation, the energy of the radiation, the decay chains or daughter products, and the time necessary to reach a certain level of radiation can be predicted. Conversely, if an unknown radionuclide is present, sufficient measurements will lead to precise identification of the radionuclide

For example—because radionuclide of the element iron is chemically the same as its nonradioactive counterpart, stable iron, some of it can be mixed with the nonradioactive iron in order to tag it so that it can be followed in a process (or a corrosion test) to determine what is happening to it

By the same token, persons working with certain radioactive materials can easily detect the presence of the radioactive materials in minute amounts In the case of a radionuclide which has a very short half-life and which is disintegrating rapidly, the *weight* of the material may be very minute but the magnitude of the *exposure to disintegrating atoms* of the material may be very great Guide level concentrations may be found in Handbook 69 published by the National Bureau of Standards

The statement that the acceptable breathing levels of some materials are literally in terms of disintegrating *atoms per day* implies that these materials are extremely toxic They are, but as a general rule they are still measurable and quickly detectable Many toxic (but not radioactive) materials are used routinely in industry, and it may take hours or days to evaluate the extent of the risk Radionuclides, in contrast, usually can be readily detected with appropriate instruments

Units of radiation measurement

Radiation may be expressed in several different units The International Commission of Radiological Units and Measurements (ICRU) issued a report° in 1962 defining units and measurements Some of these units follow

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°U S Department of Commerce, National Bureau of Standards, Washington, D C *Radiation Quantities and Units* Handbook 84. Nov 1962 See also National Safety Council Industrial Data Sheets Nos 461 and 475, *Beta Ray Sealed Sources* and *X-Rays in Industry.*