RADIOACTIVITY MEASUREMENT UNITS

MEASURING THE DOSE	Gy J = × Kg ⁻¹	(SI UNITS)
EXTENT OF DAMAGE	Sv = J × Kg ⁻¹	(SI UNITS)
RADIATION MEASUREMENT		(NO S.I.)
MEASURE OF ACTIVITY OF THE RADIONUCLIDE	Bq 1dis × s = ⁻¹	(SI UNITS)
MEASURE OF ACTIVITY OF THE RADIONUCLIDE	Ci = 3.7 × 10¹⁰ Bq	(NO S.I.)
MEASURE OF ACTIVITY OF THE RADIONUCLIDE	Rd = 10 ⁶ Bq	(NO S.I)
MEASURING THE DOSE RADIATION ABSORBED	Rad = 0.01 Gy	(SI UNITS)
MEASURING THE DOSE EQUIVALENT RADIATION	Rem = Rad × Q	(SI UNITS)
	MEASURING THE DOSEEXTENT OF DAMAGERADIATION MEASUREMENT IONIZINGMEASURE OF ACTIVITY OF THE RADIONUCLIDEMEASURE OF ACTIVITY OF THE RADIONUCLIDEMEASURING THE DOSE RADIATION ABSORBEDMEASURING THE DOSE EQUIVALENT RADIATION	MEASURING THE DOSEGy J = × Kg ⁻¹ EXTENT OF DAMAGESv = J × Kg ⁻¹ RADIATION MEASUREMENT IONIZINGSv = J × Kg ⁻¹ MEASURE OF ACTIVITY OF THE RADIONUCLIDEBq 1dis × s = -1MEASURE OF ACTIVITY OF THE RADIONUCLIDECi = 3.7 × 10 ¹⁰ BqMEASURE OF ACTIVITY OF THE RADIONUCLIDERd = 10 ⁶ BqMEASURE OF ACTIVITY OF THE RADIONUCLIDERd = 10 ⁶ BqMEASURING THE DOSE RADIATION ABSORBEDRad = 0.01 GyMEASURING THE DOSE EQUIVALENT RADIATIONRem = Rad × Q

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The gray (Gy) It is the unit of measurement of the <u>absorbed dose of radiation</u> the International System (SI).

An exhibition of 1 graycorresponds to a radiation that deposits a Joules per kilogram of matter (both biological tissues that anything else). Dimensionally you have: $1 \text{ Gy} = 1 \text{J} \times \text{Kg}^{-1}$

The grayIt replaced the Rad sometimes used; It applies: 1 Gy = 100 Rad.

The gray It was established in 1940 by Louis Harold Gray.

Sievert

The sievert (Sv) It is the unit of measurement of the <u>dose</u> <u>equivalent energy</u> in the SI and is a measure of the effects and the damage caused by the radiation of an organism. The equivalent dose is the same size of the absorbed dose, or energy per unit mass:

 $1SV = 1J \times Kg$

CAUSE OR MEDICAL PRACTICE	dose equivalent
Annual natural radiation background (medium)	2.4 mSv
Maximum annual natural background dose (Ramsar)	260 mSv
conventional radiography	1 mSv
CT, computed tomography	3 ~ 4 mSv
PET, positron emission tomography	10 ~ 20 mSv
Scintigraphy	10 ~ 20 mSv
Radiotherapy	10 ~ 40 Sv

Dimensionally you have: $1 \text{ Sv J} = 1 \times \text{Kg}^{-1}$ in addition to Sv using his sub-multiple: millisievert (MSv = 10^{-3} Sv) and less significantly: microsieverts (10⁻⁶ Sv) the sievert replaced Rem, we have: 1 Sv = 100 rem

typical Equivalent doses

(To give an idea of the value of 1 Sv)

EVENT	DOSE	
Radioactivity 'NATURAL	2.4×10^{-3} Sv per year	
RADIOGRAPHY ORDINAR	1 × 10 ⁻³ Sv	
ТАС	3 ~ 4 × 10 ⁻³ Sv	
PET or SCINTIGRAPHY	10 to 20 × 10 ⁻³ Sv	
RADIOTHERAPY	Dozens of Sv, even beyond the 40 Sv, on the tumor only	
dose equivalent	BIOLOGICAL EFFECTS	
1 Sv	temporary alterations hemoglobin	
2 ~ 5 Sv	nausea, hair loss, bleeding	
4 Sv	death in 50% of cases	
6 Sv	unlikely survival	
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 The Gy It represents an absolute dose of energy absorbed by a unit mass (A)

the equivalent dose and Sv rather reflect the biological effects of radiation on the organism. The different types of radiation may in fact be more or less harmful to the body

 The dose equivalent H is obtained by multiplying the absorbed dose A for a dimensionless factor w_r dependent on the type of radiation:

$$\mathbf{H} = \mathbf{A} \times \mathbf{W}_r$$

RADIATION	w _r	H equivalent dose for Gy absorbed dose of A
X-ray, gamma or beta	1	1 Sv
alpha rays	20	20 Sv
Neutrons		from 3 to 11 Sv depending on the beam

Röntgen

The röntgen (R) Is the unit of measurement of ionizing radiation attributable only to X-rays and gamma rays. No longer part of the units of the SI

E 'defined as the amount of radiation that produces an air sample of 1 mL at 0 ° C and 1 atm, an ionization equal to an electric charge of 3.3356×10^{-10} C, or:

 2.08×10^9 ion pairs.

Examples

- A bright clock produces about 5 milliroentgen (mR) per year.
- An X-ray produces about 500 mR.

Becquere

 The becquerel (Bq) Is the unit of measurement of the SI activity of a radionuclide and is defined as the activity of a radionuclide that has a decay per second. dimensionally, you have:

 $1 \text{ Bq Dis} = 1 \times \text{s}^{-1}$

	EQUIVALENCES THAN THE OLD UNIT
1 Rd	10 ⁶ Bq = 1 MBq (megaBq)
1 Bq	2.7 × 10 ⁻¹¹ Ci = 27 picoCi

 The Bq It owes its name to Antoine Henri Becquerel, who in 1903 won the Nobel Prize for Physics with Pierre and Marie Curie.



- The curie (Ci) it's a'<u>unit of measure</u> dell '<u>activities</u> of an <u>radionuclide</u>.
 It was adopted during the International Congress of Radiology 1910 in Brussels, chaired by Marie Curie.
- A there It is approximately equal to the activity of 1 g of ²²⁶Ra, discovered by Marie and Pierre Curie, and is equivalent to:
 37 billion decays per second.
- The Ci It was replaced by bequerels (Bq) in the international system

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	E	QUIVA	LENCES	
1 there	3.7 × 10 ¹⁰ Bq	=	37 G <mark>Bq</mark>	(giga <mark>Bq</mark>)
1 Bq	2.7 × 10 ⁻¹¹ Ci	=	27 p <mark>C</mark> i	(pico <mark>C</mark> i)
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The rutherford (Rd), so named in honor of Ernest Rutherford is a radioactivity measurement unit no longer in use, corresponds to:

UNIT'	EQUIVALENCES			
1 Rd	10 ⁶ Bq = 1 MBq	or also	1 Bq = 10 ⁻⁶ Rd	

It is now replaced by the SI bequerels (Bq).



The rad (Radiation Absorbed Dose) is a unit of measurement of absorbed radiation dose, the following applies:
 Erg × 100 gram

The rad has been replaced by Gy in SI

 1 Rad = 0.01 Gy = 0.01 joules of energy absorbed by a kilogram of tissue.

Rem

The rem is a '<u>unit of measure</u> of the <u>equivalent dose</u> of <u>radiation</u>. The word rem is an <u>acronym</u> in <u>English language</u> for "radiaton equivalent man" or <u>radiation</u> equivalent to humans; It indicates the amount of radiation required to produce a biologically significant effect not necessarily harmful (radiolysis of the water molecule and creation of ion pairs, free radicals) is important to the concept of detriment and long-term biological effects. • The rem is defined as the product of the absorbed dose expressed in rad for a quality factor Q which takes into account the different biological impact reported to more or less sensitive radio organs (thyroid, gonads, crystalline the most sensitive) to different types of radiation

RADIATION	FACTOR OF QUALITY '(Q)	
X-ray and gamma rays	1	
neutrons	between 5 and 20 depending on the energy	
alpha radiation	20	

•In the SI rem It was replaced by Sv with the conversion:

1 Sv = 100 rem

 Since the dose of 1 rem is quite high, it often makes use of its submultiple, the millirem (10⁻³rem).