

6 Nuclear Medicine Radioisotopes

Content of this section:

Therapy, beta emitter: Si-32, P-32, S-35, Rb-86, Sr-89, Sr/Y-90, I-131, Xe-131m, Sm-153, Er-169, Ho-166m, Re-186, Re-188

Diagnostic:

In Vivo: Cr-51, Co-57,-58, Fe-59, Ga-67, Mo-99, Tc-99m, In-111, Cd-111m, I-123, Te-123m, Xe-133, Au-198, Tl-201

In Vitro: H-3, C-14, Si-32, P-32, P-33, S-35, I-125

PET, positron emitter: C-11, N-13, O-15, F-18, Na-22, Ge-68, Ga-68

Bone seeking: Ca-45, Ca-47, Sc-47, Sr-85, Sr-90, Y-90, Tc-99m, Tc-99

Body composition: H-3, Na-24, K-42, Cr-51, Br-82

6.1 Therapy (Beta Emitter)

isotope Q_ϵ, Q_β MeV $t_{1/2}$	β^- , ϵ -decay $E_\epsilon, E_\beta^{max}, (\bar{E}_\beta)$ MeV	β^- , ϵ -, IT- branch intens.** %	daughter-nuclide & E_γ γ -ray transition to final state in keV	E-list in I-order keV	γ^- , X- intens.* %
NDS:112,2199,2011 $^{32}_{14}\text{Si}$ 153 ₁₉ y	$Q_{\beta^-}=0.2272_3$ $\rightarrow \beta^-: 0.2272_3$ (0.069)	100	$\rightarrow ^{32}_{15}\text{P}$ (14.268 h) NO γ -RAYS OBSERVED		
NDS:112,2199,2011 $^{32}_{15}\text{P}$ 14.268 ₁₄ h	$Q_{\beta^-}=1.710664_4$ $\rightarrow \beta^-: 1.70664_4$ (0.695)	100	$\rightarrow ^{32}_{16}\text{S}$ NO γ -RAYS OBSERVED		
NDS:112,2715,2011 $^{35}_{16}\text{S}$ 87.37 ₄ d	$Q_{\beta^-}=0.16733_3$ $\rightarrow \beta^-: 0.1733_3$ (0.0486)	100	$\rightarrow ^{35}_{17}\text{Cl}$ NO γ -RAYS OBSERVED		
NDS:94,1,2001 $^{86}_{37}\text{Rb}$ $Q_{\beta^-}=1.77472_{14}$ 18.642 ₁₈ d	$\rightarrow \beta^-: 1.7742_{14}$ $\rightarrow \beta^-: 0.6972_{14}$ (0.6682 ₈)	91.36 ₄ 8.64 ₄	$\rightarrow ^{86}_{38}\text{Sr}$ (stable) $\rightarrow \gamma: 1077.0^{E2}$	1077.0 ₄	8.64 _?
NDS:85,1,1998 $^{89}_{38}\text{Sr}$ $Q_{\beta^-}=1.5009_{25}$ 50.563 ₂₅ d	$\rightarrow \beta^-: 1.5009_{25}$ $\rightarrow \beta^-: 0.5923_7$ (0.581)	99.99036 $9.64_5 \cdot 10^{-3}$	$\rightarrow ^{89}_{39}\text{Y}$ $\rightarrow \gamma: 908.96^{int, M4}$ ($t_{1/2}=15.663$ s)	908.960 ₂₅	$9.56_? \cdot 10^{-3}$
<i>int</i> ⁼¹³³ I(909.67, 0.214%)					
$^{90}_{38}\text{Sr}$ $Q_{\beta^-}=0.5460_{14}$ 28.90 ₃ y	$\rightarrow \beta^-: 0.5460_{14}$ (0.196)	100	$\rightarrow ^{90}_{39}\text{Y}$ ($t_{1/2}=64.10$ h) NDS:82,379,1997 NO γ -RAYS OBSERVED		
$^{90}_{39}\text{Y}$ NDS:82,379,1997 $Q_{\beta^-}=2.2801_{16}$ 64.00 ₂₁ h	$\rightarrow \beta^-: 2.2810_{16}$ $\rightarrow \beta^-: 0.0938_{16}$ $\rightarrow \beta^-: 0.5194_{16}$ (0.934)	$\beta: 100\%$ 99.9885 ₁₄ $1.4_3 \cdot 10^{-6}$ 0.0115 ₁₄	$\rightarrow ^{90}_{40}\text{Zr}$ $\rightarrow \gamma: 2186.242^{int}$ $\rightarrow \gamma: 1760.70^{E0}$ ($0^+ \rightarrow 0^+$) no single γ -ray transition allowable $\gamma\gamma/(e_K + e^\pm) = 1.8 \cdot 10^{-4}$ [11] $e_K/e^\pm \approx 3$ [4]	2186.224 ₂₅	$1.4_3 \cdot 10^{-6}$
<i>int</i> ⁼¹⁴⁴ Pr(2185.66, 0.694%)					