Energy levels and branching ratios [96Si12].

$^{64}_{31}$Ga

E^* [keV]	J^π	L (τ,t)	I_t (τ,t)	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage				
					E_f^*:	0.0	42.8	128	171	323
					J_f^π:	0^+	$\langle 2^+\rangle$	1^+	$\langle 3^+\rangle$	$\langle 2^+,1^+\rangle$
0.0	0^+	0*	9	2.627(12) m	74Ro16					
42.85(8)	$\langle 2^+\rangle$		18	>1 μs	74Ro16	100				
128.05(10)	1^+		10	6.9(7) ns	74Ro16	74(5)	≈26			
170.95(9)	$\langle 3^+\rangle$		6	≈3 ns	74Ro16		100			
322.99(8)	$\langle 2^+,1^+\rangle$		23		74Ro16	21(4)	68(14)		10(2)	
427.03(6)	1^+		39		74Ro16	89(3)	11.2(12)			
534.53(11)	$\langle 3^+\rangle$						59(12)		41(9)	
538.00(10)	$\langle 4^+\rangle$						62(12)		38(9)	
550.29(11)	$\langle 1,2^+\rangle$		32		74Ro16	21(4)		79(16)		<14
605.12(12)	$\langle 2^+,3^-\rangle$		21		74Ro16				100	x
666.94(16)	1^+		26		74Ro16	100				
707.48(10)	$\langle 4^+\rangle$		14		74Ro16		75(15)		x	25(9)
712.15(15)								35(7)	65(13)	
765.23(15)	$\langle 3,2^+\rangle$		7		74Ro16					
817.4(3)	$\langle 1^+\rangle$		25		74Ro16		x			
828.92(15)										
852(3)	$\langle 2^+,3^+\rangle$		13		74Ro16					
937(2)	$\langle 1^+,0^+\rangle$		18		74Ro16					
1020.8(1)	$\langle 5^+\rangle$		28		74Ro16				x	
1035(6)										
1054(4)			17		74Ro16					
1136(5)			2		74Ro16					
1233(4)			14		74Ro16					
1279.79(15)	$\langle 4^+\rangle$		14		74Ro16				x	
1357.10(17)	$\langle 5^+\rangle$		14		74Ro16				x	
1421(3)			11		74Ro16					
1460(3)			14		74Ro16					
1478.71(17)										
1552(5)			7		74Ro16					
1578(6)			6		74Ro16					
1685.09(16)	$\langle 5^+\rangle$		32		74Ro16				x	
1785(4)			34		74Ro16					
1798.50(11)	$\langle 6^+\rangle$									
1818(4)			x		74Ro16					
1842.80(12)	$\langle 5^-\rangle$									
1859.4(17)			82		74Ro16					
1905.1(23)	$\langle 0^+\rangle$	0**	25		74Ro16					
1949.51(18)	$\langle 6^+\rangle$									
2004(4)			6		74Ro16					
2033.20(12)	$\langle 7^-\rangle$									
2052.90(15)	$\langle 6^+\rangle$		14		74Ro16					
2104.3(4)										
2180.9(17)			43		74Ro16					
2336.7(18)			16		74Ro16					
2353.6(4)										

(continued) **$^{64}_{31}$Ga**

E^* [keV]	J^π	L (τ,t)	I_t (τ,t)	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage					
						E_f^*:	0.0	42.8	128	171	323
						J_f^π:	0^+	$\langle 2^+\rangle$	1^+	$\langle 3^+\rangle$	$\langle 2^+,1^+\rangle$
2384(4)			19		74Ro16						
2396.3(3)	$\langle 7^-\rangle$										
2415(3)			34		74Ro16						
2446.2(19)			50		74Ro16						
2547.6(17)			25		74Ro16						
2940	$\langle 2^+\rangle$										
3089.51(15)	$\langle 8^-\rangle$										
3102.71(15)	$\langle 9^-\rangle$										
3163.9(3)											
3573.9(2)	$\langle 9^+\rangle$										
4473.0(3)	$\langle 11^+\rangle$										
5629.1(4)	$\langle 12\rangle$										
			74Ro16		Ref.						

* Antianalog state [70Hi06, 70No05, 96Si12].
** Analog state of 0^+ ground state of ^{64}Zn with ratio $\sigma(g.s)/\sigma(1905)$=0.09 [70Hi06].
I_t is an approximate yield of tritons from (τ,t) reaction in units number of tracks per 0.1 mm strip measured at 9° [74Ro16].

Energy levels and branching ratios [96Si12]. Part 2 **$^{64}_{31}$Ga**

E^* [keV]	J^π	Branching ratios in percentage									
	E_f^*:	535	538	707	828.92	1020.79	1279.79	1357.10	1685.09	1798.50	1842.80
	J_f^π:	$\langle 3^+\rangle$	$\langle 4^+\rangle$	$\langle 4^+\rangle$		$\langle 5^+\rangle$	$\langle 4^+\rangle$	$\langle 5^+\rangle$	$\langle 5^+\rangle$	$\langle 6^+\rangle$	$\langle 5^-\rangle$
707.48(10)	$\langle 4^+\rangle$	x									
765.23(15)	$\langle 3,2^+\rangle$		100								
828.92(15)			100								
1020.8(1)	$\langle 5^+\rangle$	x	x	x							
1279.79(15)	$\langle 4^+\rangle$	x	x	x							
1357.10(17)	$\langle 5^+\rangle$		x								
1478.71(17)		x	x	x							
1685.09(16)	$\langle 5^+\rangle$				x	x					
1798.50(11)	$\langle 6^+\rangle$		x	x	x	x					
1842.80(12)	$\langle 5^-\rangle$			x		x	x				
1949.51(18)	$\langle 6^+\rangle$		x			x		x			
2033.20(12)	$\langle 7^-\rangle$					x				x	x
2052.90(15)	$\langle 6^+\rangle$					x		x	x		x
2104.3(4)									x		
2353.6(4)						x					
2396.3(3)	$\langle 7^-\rangle$										x

Energy levels and branching ratios [96Si12]. Part 3 **$^{64}_{31}$Ga**

E^*	J^π		Branching ratios in percentage						
		E_f^*:	2033.20	2052.90	2396.3	3089.51	3102.71	3573.9	4473.0
[keV]		J_f^π:	$\langle 7^- \rangle$	$\langle 6^+ \rangle$	$\langle 7^- \rangle$	$\langle 8^- \rangle$	$\langle 9^- \rangle$	$\langle 9^+ \rangle$	$\langle 11^+ \rangle$
3089.51(15)	$\langle 8^- \rangle$		x		x				
3102.71(15)	$\langle 9^- \rangle$		x						
3163.9(3)				x					
3573.9(2)	$\langle 9^+ \rangle$					x	x		
4473.0(3)	$\langle 11^+ \rangle$							x	
5629.1(4)	$\langle 12 \rangle$								x

Energy levels and branching ratios [93Bh04]. **$^{65}_{31}$Ga**

E^*	$2J^\pi$	L	C^2S	L	C^2S'	L	C^2S'	L	C^2S'	$T_{1/2}$ or	Ref.
[keV]			(d,n)		(τ,d)		(τ,d)		(τ,d)	Γ_{cm}	
0.0	3^-	1	1.15	1	1.3	1	2.5	1	1.34	15.2(2) m	70Co17
61.97(13)	$\langle 1 \rangle^-$	1	0.90	1	1.0			1	1.04	<1.2 ns	70Co17
190.80(14)	5^-	3	4.20	3	4.5	3	3.9	3	5.05	<700 ps	70Co17
649.68(14)	1^-,3^-	1	0.51	1	0.58	1	0.55	1	0.63		70Co17
809.26(13)	1^-,3^-	1	0.23			1	0.27	1	0.24		70Co17
814.89(20)	3^-		incl	1	0.26		incl				70Co17
1075.76(22)	7	[1]	0.02								70Co17
1084(8)	7^+,9^+	4	0.31	4	0.39			4	0.39		70Co17
1135											
1287.3(4)	$\langle 9 \rangle^-$									<1.4 ps	
1298.6(2)											
1326.2(8)											
1352.9(5)											
1370.9(10)											
1377.4(3)	5^-,7^-	3	0.91	3	0.78	3	0.78				70Co17
1469											
1521.4(4)	$\langle 5^- \rangle$										
1662.0(2)	1^-,3^-	1	0.19	1	0.16	1	0.18	1	0.14		70Co17
1807											
1864(7)	1^-,3^-	1	0.10	1	0.10			1	0.19		70Co17
1879.4(2)		[3]	0.18								70Co17
1902(2)											
1966.7(3)											
1983.1(5)											
2037.7(3)	9^+	4	4.37	4	4.5	4	5.0	4	3.90	7(4) ps	70Co17
2046.3(4)											
2161.7(4)											
2206.6(5)	5^-	$\langle 3 \rangle$	0.73	3	0.65			3	0.58		70Co17
2213(15)		[4]	0.78								70Co17
2280						[3]	0.7				74Ze01

(continued) **$^{65}_{31}$Ga**

E^* [keV]	$2J^\pi$	L	C^2S (d,n)	L	C^2S' (τ,d)	L	C^2S' (τ,d)	L	C^2S' (τ,d)	$T_{1/2}$ or Γ_{cm}	Ref.
2323.8(5)											
2357											
2388											
2426.6(10)											
2447.0(5)											
2470											
2502.9(5)											
2548											
2575											
2647											
2669											
2704.1(15)											
2716											
2754											
2788.3(5)	$\langle 13^- \rangle$									0.6(3) ps	
2811.0(13)	$\langle 3,5 \rangle$										
2813.4(6)	$\langle 11 \rangle$										
2820(7)	$3^+,5^+$	2	0.30	2	0.16			2	0.15		67Be18
2860											
2906											
2924(11)	$3^+,5^+$	2	0.45	2	0.59			2	0.59		67Be18
2929.4(7)											
2960											
3006(15)	$\langle 3^+,5^+ \rangle$	$\langle 2 \rangle$	0.13								70Co17
3036											
3064.8(4)	$\langle 13^+ \rangle$										
3071.9(8)											
3076.7(11)											
3085.1(4)											
3094.5(11)											
3143											
3173											
3197.0(7)											
3229											
3250											
3279.3(7)											
3310											
3415											
3488											
3732.4(4)	$\langle 13,15 \rangle$										
4122.7(5)	$\langle 17 \rangle$										
4132.7(8)											
4330.9(6)	$\langle 15 \rangle$										
4433.2(5)	$\langle 21 \rangle$										
4546.9(5)	$\langle 17,19 \rangle$										

(continued) **$^{65}_{31}$Ga**

E^* [keV]	$2J^\pi$	L	C^2S (d,n)	L	C^2S' (τ,d)	L	C^2S' (τ,d)	L	C^2S' (τ,d)	$T_{1/2}$ orRef. Γ_{cm}
4850.7(11)										
4919.5(11)										
5022.7(11)										
5065(5)										
5116(1)										
5192(10)										
5240(1)										
5298(1)										
5339(1)										
5352(1)	$\langle 1^+ \rangle$									
5384(1)										
5393(1)										
5438(1)										
5466.9(9)										
5481(1)										
5507(1)										
5553(5)										
5563(10)										
5597(5)										
5642.9(11)										
5656(5)										
5678(5)										
5709(5)										
5758.5(12)										
5799(5)										
5819.0(12)										
5844(5)										
5852.4(13)										
5868(5)										
5900(5)										
5927(10)										
5934.6(25)										
5940(10)										
5993(10)										
6148.7(15)										
6536.0(13)										
6670	1^-									
6716	3^-									
6814.9(11)										
6824(10)	$\langle 9 \rangle$									
6835(10)										
6839(10)										
7039.1(15)										
7113	5^+									
7136(5)	$\langle 3 \rangle$									

(continued) **$^{65}_{31}$Ga**

E^* [keV]	$2J^\pi$	L	C^2S (d,n)	L	C^2S' (τ,d)	L	C^2S' (τ,d)	L	C^2S' (τ,d)	$T_{1/2}$ or Γ_{cm}	Ref.
7141(3)	$\langle 5\rangle$										
7145(5)	$\langle 5\rangle$										
7150(5)											
7365.3(17)											
7658(5)	1^+										
7688(5)											
7942.7(18)											
8602(5)											
8612.1(18)											
8830(5)											
8885(5)											
			70Co17		67Be18		74Ze01		67Be18		Ref.
			86Wa02		86Wa02						Ref.

Additional data on this isotope can be found in [01We11, 91Zh28, 74Ro16].

Given values C^2S' for proton transfer reactions are results of recalculation in [86Wa02] of data for reactions (d,n) and (τ,d) contained in [70Co17] and [67Be18], respectively; $(2J+1)C^2S$ from [74Ze01] and [67Be18] are given for comparison.

Energy levels and branching ratios [93Bh04]. Part 2 **$^{65}_{31}$Ga**

E^*	$2J^\pi$	Branching ratios in percentage									
	E_f^*:	0.0	61.97	190.8	649.7	809	815	1076	1135	1287	1662
[keV]	$2J_f^\pi$:	3^-	$\langle 1\rangle^-$	5^-	1^-,3^-	1^-,3^-	3^-	7		$\langle 9\rangle^-$	1^-,3^-
61.97(13)	$\langle 1\rangle^-$	100									
190.80(14)	5^-	100									
649.68(14)	1^-,3^-	88	7.0(11)	5.3(7)							
809.26(13)	1^-,3^-	88(5)	5(3)	6.3(10)							
814.89(20)	3^-	30(20)	70(20)		x						
1075.76(22)	7	71(9)		29(11)							
1287.3(4)	$\langle 9\rangle^-$			100				x			
1298.6(2)		5(3)	70(5)	25(5)							
1326.2(8)				100							
1352.9(5)		100									
1370.9(10)				100							
1377.4(3)	5^-,7^-	70(5)	30(5)								
1521.4(4)	$\langle 5^-\rangle$	56(16)		44(12)							
1662.0(2)	1^-,3^-	6(2)	43(2)	14(2)		37(2)					
1879.4(2)		14(3)	6(1)	33(3)	33(4)	14(1)					
1902(2)		52(13)						48(17)			
1966.7(3)		100									
1983.1(5)			15(5)	70(5)		15(5)					
2037.7(3)	9^+			5.6(7)				29(5)		66(5)	

(continued) **$^{65}_{31}$Ga**

E^*	$2J^\pi$	Branching ratios in percentage									
	E_f^*:	0.0	61.97	190.8	649.7	809	815	1076	1135	1287	1662
[keV]	$2J_f^\pi$:	3^-	$\langle 1\rangle^-$	5^-	1^-,3^-	1^-,3^-	3^-	7		$\langle 9\rangle^-$	1^-,3^-
2046.3(4)						85(7)		15(7)			
2161.7(4)		23(4)	63(4)		14(3)						
2206.6(5)	5^-	70(10)		30(10)							
2323.8(5)		100									
2426.6(10)		15(5)	30(5)		15(5)	40(5)					
2447.0(5)		100									
2502.9(5)			70(10)		10(10)	10(10)	10(10)				
2704.1(15)		100									
2788.3(5)	$\langle 13^-\rangle$									100	
2811.0(13)	$\langle 3,5\rangle$	20(10)		80(10)							
2813.4(6)	$\langle 11\rangle$									100	
2929.4(7)					50(15)	50(15)					
3085.1(4)		12(5)									
3197.0(7)						44(20)		40(12)			
3279.3(7)		22(5)				25(5)					53(7)
5852.4(13)											100
6824(10)	$\langle 9\rangle$			<2.2	x			<4.3	<4.3		
7141(3)	$\langle 5\rangle$				21(2)						

Energy levels and branching ratios [93Bh04]. Part 3 **$^{65}_{31}$Ga**

E^*	$2J^\pi$	Branching ratios in percentage									
	E_f^*:	1879	1902	2037.7	2046.3	2206.6	2704.1	2788.3	2811.0	2813.4	3064.8
[keV]	$2J_f^\pi$:			9^+		5^-		$\langle 13^-\rangle$	$\langle 3,5\rangle$	$\langle 11\rangle$	$\langle 13^+\rangle$
3064.8(4)	$\langle 13^+\rangle$			100							
3071.9(8)				100							
3076.7(11)				100							
3085.1(4)		64(7)	24(5)								
3094.5(11)				100							
3197.0(7)					16(8)						
3732.4(4)	$\langle 13,15\rangle$							61(4)		15(2)	23(3)
4122.7(5)	$\langle 17\rangle$										100
4132.7(8)											100
4330.9(6)	$\langle 15\rangle$										98(18)
5934.6(25)							100				
6814.9(11)				x							
6824(10)	$\langle 9\rangle$			100							
6835(10)				100							
6839(10)				100							
7141(3)	$\langle 5\rangle$					55(4)			24(2)		
7145(5)	$\langle 5\rangle$					100					

Energy levels and branching ratios [93Bh04]. Part 4

$^{65}_{31}$Ga

E^*	$2J^\pi$					Branching ratios in percentage						
		E_f^*:	3732.4	4122.7	4433.2	4546.9	5022.7	5466.9	5642.9	6148.7	6536.0	7039.1
[keV]		$2J_f^\pi$:	⟨13,15⟩	⟨17⟩	⟨21⟩	⟨17,19⟩						
4330.9(6)	⟨15⟩		1.8(9)									
4433.2(5)	⟨21⟩			100								
4546.9(5)	⟨17,19⟩		87(10)	13(5)								
4850.7(11)				100								
4919.5(11)				100								
5022.7(11)				100								
5466.9(9)				40	60							
5642.9(11)						x						
5927(10)				100								
6148.7(15)							100					
6536.0(13)								100				
7039.1(15)									100			
7365.3(17)											100	
7942.7(18)										100		
8612.1(18)												x

Energy levels and branching ratios [98Bh02].

$^{66}_{31}$Ga

E^*	J^π	I_d	$T_{1/2}$ or	Ref.		Branching ratios in percentage						
					E_f^*:	0.0	43.8	66.1	109	162	234	291
[keV]		(α,d)	Γ_{cm}		J_f^π:	0^+	1^+	$\langle 2\rangle^+$	1^+	$\langle 3\rangle^+$	2^+	$\langle 0,1\rangle^+$
0.0	0^+		9.49(7) h									
43.812(16)	1^+		18.0(9) ns			100						
66.139(19)	$\langle 2\rangle^+$		23.0(14) ns				100					
108.893(15)	1^+		1.2(2) ns			58(3)	33(2)	9(3)				
162.472(20)	$\langle 3\rangle^+$		13(5) ns				0.4	100	≤3.6			
234.043(17)	2^+					1.2(3)	91(5)		5.5(5)	2.4(4)		
290.908(25)	$\langle 0,1\rangle^+$						1.3(4)		99(6)			
335.404(20)	$\langle 2\rangle^+$						56(3)	20(2)	19.4(14)	5.0(6)		
381.86(2)	1^+					56	17(1)	1.6(1)	21(1)		2.6(5)	0.8(2)
415.34(3)	$\langle 4\rangle^+$		<2 ns					4(1)		96(7)		
423.77(3)	$\langle 3\rangle^+$							42(2)		47(4)	10(1)	
459.88(2)	2^+						64(5)	7.5(8)	22(2)	2.8(6)	2.2(6)	
516.20(4)	$\langle 4\rangle^+$		<2 ns					10(2)		90(5)		
536.62(2)	1^+					27(1)	2.7(1)	32(2)	2.3(5)		11(1)	24(1)
552.90(3)	$\langle 3\rangle^+$							45(3)		14(1)	34(3)	
620.98(3)	$\langle 2\rangle^+$						56(6)			21(2)	22(2)	
639.58(3)	$\langle 3\rangle^+$							16(3)		66(5)	2(1)	
664.20(2)	$\langle 1,2\rangle^+$					1.4(9)	29(3)	47(4)	10(1)	6(1)	x	
705.99(2)	1^+					46(2)	1.2(3)	6.3(3)	2.7(3)		35(2)	4.5(6)
721.89(3)	$\langle 3\rangle^+$							46(5)		15(2)	31(3)	
784.0(2)	⟨3⟩	43		94Fi01				100				

(continued) **$^{66}_{31}$Ga**

E^*	J^π	I_d	$T_{1/2}$ or	Ref.	Branching ratios in percentage						
					E_f^*: 0.0	43.8	66.1	109	162	234	291
[keV]		(α,d)	Γ_{cm}		J_f^π: 0^+	1^+	$\langle 2\rangle^+$	1^+	$\langle 3\rangle^+$	2^+	$\langle 0,1\rangle^+$
790.08(3)	$\langle 1,2\rangle^+$	incl				4(1)	64(7)	6(1)		8(2)	
838.93(3)						43(4)	12(2)	17(2)			
845.03(5)	$\langle 2^+–4^+\rangle$						75(7)		x	12(3)	
863.55(6)	$\langle 5\rangle$		<2 ns						16(5)		
866.09(5)	1^+				16(2)	<9	1.8(14)	52(2)			9(2)
943.86(5)	$\langle 2^+–4^+\rangle$						75(8)		10(5)	15(5)	
974.48(4)	$\langle 1,2^+\rangle$				19(3)	14(3)	52(5)	3(2)	4(3)	9(3)	x
998.62(7)	$\langle 1^+–3^+\rangle$					19(5)	34(6)	21(5)			
1001.4(2)							43(9)	57(28)			
1018.3(2)									55(28)		
1062.1(2)							100				
1065.1(2)	$\langle 1^+–3^+\rangle$					x		21(11)	79(15)		
1076.6(4)							23				
1081.2(4)								100			
1142.0(1)											
1164.2(2)						33					
1210.20(4)							19(11)	81(11)			
1350.6(1)	$\langle 5\rangle$										
1380(30)	$\langle 6^-\rangle$	77		94Fi01							
1450											
1456.1(1)	1^+				6(2)	28(2)		5(2)		33(2)	17(4)
1464.3(2)	$\langle 7\rangle$		57.3(14) ns								
1513.4(1)	$\langle 6\rangle$										
1556.65(3)	1^+					47(6)	8(2)			31(2)	5.4(10)
1573.7(3)	$1^{\langle +\rangle}$						93			7(6)	
1617.7(2)	$\langle 6\rangle$										
1769.4(2)	1^+				54(22)			27(22)			≈11
1774.9(2)	$\langle 7\rangle$										
2408.43(25)	$\langle 8\rangle$										
2512.44(21)	$\langle 8\rangle$		<2 ns								
2652.99(21)	$\langle 9^+\rangle$		<2 ns								
3043.45(18)	$\langle 9^+\rangle$	473	0.208(8) ns	94Fi01							
3362.3(3)											
3420.1(3)	$\langle 10\rangle$										
3850	$\langle 0^+\rangle$										
4110.4(3)	$\langle 10\rangle$										
4162.1(3)	$\langle 11\rangle$		<2 ns								
4192.7(3)											
4271.7(4)	$\langle 12\rangle$										
4302.7(3)											
5109.2(4)	$\langle 13\rangle$										
		94Fi01		Ref.							

Additional data on this isotope can be found in [94Ti02].

Energy levels and branching ratios [98Bh02]. Part 2 **$^{66}_{31}$Ga**

E^*	J^π		Branching ratios in percentage									
		E_f^*:	335	381.859	415.34	423.77	459.878	516.20	536.618	552.90	639.58	664.202
[keV]		J_f^π:	$\langle 2\rangle^+$	1^+	$\langle 4\rangle^+$	$\langle 3\rangle^+$	2^+	$\langle 4\rangle^+$	1^+	$\langle 3\rangle^+$	$\langle 3\rangle^+$	$\langle 1,2\rangle^+$
459.88(2)	2^+		1.5(6)									
516.20(4)	$\langle 4\rangle^+$				x							
536.62(2)	1^+			1.4(1)								
552.90(3)	$\langle 3\rangle^+$		1.2(8)		6(1)							
620.98(3)	$\langle 2\rangle^+$		1.8(8)									
639.58(3)	$\langle 3\rangle^+$		11.8(16)		2.3(11)	1.3(9)						
664.20(2)	$\langle 1,2\rangle^+$		7(1)									
705.99(2)	1^+		x	1.5(3)			x		2(1)			1.5(12)
721.89(3)	$\langle 3\rangle^+$		8(2)									
790.08(3)	$\langle 1,2\rangle^+$			1.2(11)			11.6(16)		3.0(11)		2.1(11)	
838.93(3)				6(2)					19(3)			
845.03(5)	$\langle 2^+–4^+\rangle$				13(2)							
863.55(6)	$\langle 5\rangle$				84(11)			x				
866.09(5)	1^+		7(2)	7(2)								7(2)
943.86(5)	$\langle 2^+–4^+\rangle$		x					x				
998.62(7)	$\langle 1^+–3^+\rangle$					12(6)			14(5)			
1001.4(2)				≤85								
1018.3(2)					45(23)							
1065.1(2)	$\langle 1^+–3^+\rangle$		x	x								
1081.2(4)				x								
1142.0(1)					33					16		
1164.2(2)				67								
1350.6(1)	$\langle 5\rangle$				95			x				
1456.1(1)	1^+								11(4)			
1556.65(3)	1^+			8(1)					1.0(6)			
1769.4(2)	1^+			8(6)								

Energy levels and branching ratios [98Bh02]. Part 3 **$^{66}_{31}$Ga**

E^*	J^π		Branching ratios in percentage									
		E_f^*:	705.995	721.89	783.96	863.55	866.09	1001.39	1141.99	1350.63	1464.33	1513.37
[keV]		J_f^π:	1^+	$\langle 3\rangle^+$	$\langle 3\rangle$	$\langle 5\rangle$	1^+			$\langle 5\rangle$	$\langle 7\rangle$	$\langle 6\rangle$
838.93(3)			2(1)									
1062.1(2)							x					
1076.6(4)			77									
1142.0(1)				23	28							
1350.6(1)	$\langle 5\rangle$					<26			5			
1464.3(2)	$\langle 7\rangle$					40				60		
1513.4(1)	$\langle 6\rangle$					42			33	25		
1556.65(3)	1^+							≤8				
1617.7(2)	$\langle 6\rangle$					100						
1774.9(2)	$\langle 7\rangle$											100

(continued) **$^{66}_{31}$Ga**

E^*	J^π	Branching ratios in percentage									
	E_f^*:	705.995	721.89	783.96	863.55	866.09	1001.39	1141.99	1350.63	1464.33	1513.37
[keV]	J_f^π:	1^+	$\langle 3\rangle^+$	$\langle 3\rangle$	$\langle 5\rangle$	1^+			$\langle 5\rangle$	$\langle 7\rangle$	$\langle 6\rangle$
2408.43(25)	$\langle 8\rangle$									100	
2512.44(21)	$\langle 8\rangle$									100	
2652.99(21)	$\langle 9^+\rangle$									100	
3043.45(18)	$\langle 9^+\rangle$									15	

Energy levels and branching ratios [98Bh02]. Part 4 **$^{66}_{31}$Ga**

E^*	J^π	Branching ratios in percentage						
	E_f^*:	1774.90	2512.44	2652.99	3043.45	3420.1	4162.1
[keV]	J_f^π:	$\langle 7\rangle$	$\langle 8\rangle$	$\langle 9^+\rangle$	$\langle 9^+\rangle$	$\langle 10\rangle$	$\langle 11\rangle$
3043.45(18)	$\langle 9^+\rangle$	38	11	35			
3362.3(3)				100			
3420.1(3)	$\langle 10\rangle$				100		
4110.4(3)	$\langle 10\rangle$				100		
4162.1(3)	$\langle 11\rangle$				100		
4192.7(3)				100			
4271.7(4)	$\langle 12\rangle$					100	
4302.7(3)				100			
5109.2(4)	$\langle 13\rangle$						100

Energy levels and branching ratios [91Bh06]. **$^{67}_{31}$Ga**

E^*	$2J^\pi$	L	ε	σ (p,t)	L	S_N	L	$G_{\ell j}$	S_N	$T_{1/2}$ or	Ref.
[keV]		(p,t)	(p,t)	μb/sr		(τ,d)		(d,n)	(p,α)	Γ_{cm}	
0	3^-	0	2.9	957	1	1.43	1	1.44	1.5	3.261(1) d	84Ro24
166.98(3)	1^-	2	0.08	4.6	1	1.27	1	1.13	0.95	42(21) ns	84Ro24
359.12(25)	5^-			1.8	3	4.75	3	5.03	2.7	49(5) ps	71Be42
828.08(3)	3^-	0	0.03	12.2	1	0.4*	1	0.42	0.41	0.16(7) ps	84Ro24
910.93(2)	5^-	2	0.75	35.2						0.25(+9-5) ps	84Ro24
1081.62(4)	1^-	2	0.17	7.6	1	0.17*	1	0.20	0.115	0.28(12) ps	84Ro24
1202.27(2)	7^-	2	0.90	38.5			[4]**	0.32		1.5(10) ps	70Co17
1240(5)	$\langle 13\rangle$										
1412.71(2)	7^-	2	1.25	47.3						0.6(2) ps	84Ro24
1519.17(3)	9^-									1.9(8) ps	
1554.61(3)	5^-	2	0.16	7.2	3	0.46	3	0.71	0.47	0.18(4) ps	71Be42
1639.41(6)	3^-	0	0.004	2.1						0.14(4) ps	84Ro24
1735(5)	$\langle 15,17\rangle$										
1809.09(6)	3^-	2	0.08	3.0	1	0.05*	3**	0.13		0.2(1) ps	70Co17

(continued) **$^{67}_{31}$Ga**

E^* [keV]	$2J^\pi$	L (p,t)	ε (p,t)	σ (p,t) μb/sr	L (τ,d)	S_N (τ,d)	L (d,n)	$G_{\ell j}$ (d,n)	S_N (p,α)	$T_{1/2}$ or Γ_{cm}	Ref.
1975.2(11)										>0.1 ps	
1978.00(5)	5,7									0.3(+6-2) ps	
2040.90(5)	5^-	2	0.20	6.9						0.09(+3-2) ps	84Ro24
2073.76(3)	9^+				4	3.49	4	4.62	7.74		80Ro09
2124.46(5)	5^-	2	0.18	6.65						0.21(+14-7) ps	84Ro24
2141.85(8)	3^-	2	0.27	1.65						≥0.2 ps	84Ro24
2145.4(2)	⟨1⟩	0	0.027		1	0.07*					84Ro24
2172.13(7)	⟨3⟩$^-$	4	2.4	5.3						0.18(+8-5) ps	84Ro24
2176.08(5)	7^-			incl						0.06(+2-1) ps	
2176.32(8)				incl							
2190.65(6)	9^-									0.68(21) ps	
2262.7(19)				5.0							
2263.8(1)	9^-	4	2.5	incl						0.68(22) ps	84Ro24
2281.94(9)	7^-									0.06(2) ps	
2374.2(3)	3^+,7^+	3	0.25	7.5						>0.7 ps	84Ro24
2393(7)											
2407(4)	X$^-$	2	0.295	9.5	1	0.06*					84Ro24
2457(1)	11^-	4	4.3	9.0	⟨4⟩	0.38				>1.0 ps	71Be42
2526.7(5)	⟨1$^-$,3$^-$⟩	0	0.006	2.2							84Ro24
2545(6)	1$^-$,3$^-$	⟨2⟩	0.020	incl	1	0.10*	1	0.08			84Ro24
2568(6)	X$^-$	2	0.18	5.3							84Ro24
2597(1)	X$^-$	4	2.9	5.8							84Ro24
2619.5(5)	X$^-$	2	0.13	4.6							84Ro24
2644(5)	X$^-$	2	0.115	3.4							84Ro24
2651.4(9)	7^-									>1.0 ps	
2683(6)											
2730.6(4)	3^-	0	0.023	6.5							84Ro24
2748(5)		2	0.13	5.0	2	0.26	2	0.21			71Be42
2798(1)	⟨5$^-$,9$^-$⟩			14.0						0.4(1) ps	
2837(8)											
2857(7)	3^+,5^+						2	0.29			70Co17
2862.4(1)	11^+									0.9(3) ps	
2873(8)	3^+,5^+				2	0.30					71Be42
2898(5)	X$^{\langle-\rangle}$	⟨2⟩	0.075	3.0							84Ro24
2916(7)											
2930(8)											
2942(5)	3^-	0	0.023	5.9							84Ro24
2978(5)		⟨4⟩	1.6	3.3							84Ro24
2991(7)											
3014(7)											
3031.8(1)	13^+									4.5(4) ps	
3036(5)	3^-	0	0.052	14.5							84Ro24
3079(5)		⟨4⟩	1.6	3.2							84Ro24
3094(7)											
3113(7)											

(continued) **$^{67}_{31}$Ga**

E^* [keV]	$2J^\pi$	L (p,t)	ε (p,t)	σ (p,t) μb/sr	L	S_N (τ,d)	L	$G_{\ell j}$ (d,n)	S_N (p,α)	$T_{1/2}$ or Γ_{cm}	Ref.
3136(7)											
3150(7)											
3160.7(1)											
3191.1(9)	11^+									>1.0 ps	
3225.0(3)	3^-	0	0.018	9.3							84Ro24
3267(8)											
3291(5)		0+2	0.01+0.1	7.8							84Ro24
3310(5)		4	0.1	10							84Ro24
3337(5)	3^-	0	0.011	3.4							84Ro24
3375(5)	$\langle 3^+,5^+\rangle$						$\langle 2\rangle$	0.08			70Co17
3401.5(4)	$\langle 1^-,3^-\rangle$										
3452(5)	$1^-,3^-$	2	0.15	4.7	1	0.02*					84Ro24
3498(5)		2	0.125	3.7							84Ro24
3525.3(4)	$9^+,13^+$									>1.0 ps	
3577.9(1)	15^+									0.16(4) ns	
3628.6(7)	$13^+,17^+$									>0.5 ps	
3632.1(15)											
3654.6(8)	$\langle 1^-,3^-\rangle$										
3727.8(9)	$\langle 1^-,3^-\rangle$										
3760(20)											
3820(20)	$1^-,3^-$				1	0.03*					74Ze01
3856.0(1)	17^+									11(2) ps	
3870(20)											
3900(20)											
3940(20)											
3980(20)	$3^+,5^+$				2	0.14					71Be42
4070(20)											
4198.6(1)	$\langle 17^+\rangle$									<0.7 ps	
4200(20)	$3^+,5^+$				2	0.09					71Be42
4221.4(3)											
4290(20)											
4290.5(1)	19^+									12(2) ps	
4330(20)											
4360(20)											
4450(20)											
4500(20)											
4550(20)	$3^+,5^+$				2	0.11					71Be42
4720(20)	$3^+,5^+$				2	0.09					71Be42
4744.8(12)											
4760(20)	1^+				0	0.08					71Be42
4820(20)	$5^-,7^-$				3	0.34					71Be42
5225.7(4)	$\langle 23^+\rangle$										
5300											
5370											
5491.6(1)	$\langle 21^+\rangle$										

(continued) **$^{67}_{31}$Ga**

E^* [keV]	$2J^\pi$	L (p,t)	ε (p,t)	σ (p,t) μb/sr	L (τ,d)	S_N (τ,d)	L (d,n)	$G_{\ell j}$ (d,n)	S_N (p,α)	$T_{1/2}$ or Γ_{cm}	Ref.
6380.2(1)	$\langle 25^+ \rangle$										
6390											
6589.5(5)	$\langle 27^+ \rangle$										
7618.2(10)											
7890											
7980											
7988	5^-										
8060											
8076	1^-										
8260											
8400	3^-										
8470											
8552(5)	$\langle 9^+ \rangle$										
8567(5)	$\langle 9^+ \rangle$										
8640											
8760											
8960	5^+										
9420											
9510											
9630											
10250	5^+										
10390	5^+										
10600											
10760	5^+										
				84Ro24		71Be42		70Co17			Ref.
			84Ro24			74Ze01			80Ro09		Ref.

Additional data on this isotope can be found in [91Zh28].

* For L=1 transitions two values for L+1/2 and L–1/2 are close to each other.

** Disagreement with the adopted value [83Mo26].

Parameter $\varepsilon=(2L+1)\sigma(\theta)(exp)/(9.7N\sigma(\theta)(DWUCK))$ of the (p,t) reaction is an enhancement coefficient with the normalization factor N=25.

$S_N=G_{\ell j}$ from proton transfer (τ,d) reaction were evaluated in [83Mo26] using data from [71Be42] and [74Ze01].

Values S_N for the (α,p) reaction are normalized ratios between the experimental $d\sigma/d\Omega$ and calculated by DWBA, they are spectroscopic strength of triton transfer similar to the proton spectroscopic factor if two neutrons could be considered as a J=0 pair [80Ro09].

Energy levels and branching ratios [91Bh06]. Part 2

$^{67}_{31}$Ga

E^*	$2J^\pi$		Branching ratios in percentage									
		E_f^*:	0	167	359	828	911	1082	1202	1413	1519	1555
[keV]		$2J_f^\pi$:	3^-	1^-	5^-	3^-	5^-	1^-	7^-	7^-	9^-	5^-
166.98(3)	1^-		100									
359.12(25)	5^-		100									
828.08(3)	3^-		87(7)	8.9(9)	3.8(4)							
910.93(2)	5^-		96(4)	2.1(2)	2.1(2)							
1081.62(4)	1^-		23(1)	69(2)		8.1(4)						
1202.27(2)	7^-		79(2)		21(1)							
1412.71(2)	7^-		57(2)		29(1)	3.3(3)	11(1)					
1519.17(3)	9^-				100							
1554.61(3)	5^-		43(2)	6.2(3)	46(2)		5.6(5)					
1639.41(6)	3^-		7(1)	54(2)	4.1(4)	9(1)	26(3)	0.6(1)				
1809.09(6)	3^-		23(1)	14(1)	10	25(1)	21(1)	7(1)				
1975.2(11)			100									
1978.00(5)	5,7		5.5(4)		8.3(6)	40(2)	3.3(5)		37(2)			3.8(3)
2040.90(5)	5^-		78(3)		2.9(5)	9.9(8)	5.1(6)	4.1(3)				
2073.76(3)	9^+				1(1)				58(1)		41.3(7)	
2124.46(5)	5^-		3.0(3)	46(2)	2.2(4)	32(1)			17(1)			
2141.85(8)	3^-		12(1)	41(3)	16(1)	13(1)	18(2)					
2145.4(2)	$\langle 1 \rangle$		64(10)			36(10)						
2172.13(7)	$\langle 3 \rangle^-$		74(4)		6.9(7)	19(1)						
2176.08(5)	7^-		52(4)		32(2)	5(5)	4.3(7)			5.8(7)		
2176.32(8)			12(12)	10(9)		78(31)						
2190.65(6)	9^-				2.6(5)		48(2)		21(1)	28(1)		
2262.7(19)			100									
2263.8(1)	9^-						45(2)		55(3)			
2281.94(9)	7^-		4.0(6)		55(3)		41(3)					
2374.2(3)	$3^+,7^+$						100					
2407(4)	X^-		60(20)	40(20)								
2457(1)	11^-								100			
2526.7(5)	$\langle 1^-,3^- \rangle$		100									
2597(1)	X^-									100		
2619.5(5)	X^-			13(1)		52(8)	36(4)					
2651.4(9)	7^-								x		x	
2730.6(4)	3^-		29(3)	71(8)								
2798(1)	$\langle 5^-,9^- \rangle$								100			
2862.4(1)	11^+										68(1)	
3160.7(1)			42(3)					8(1)			50(5)	
3225.0(3)	3^-		6.4(6)	42(4)	23(2)	15(2)		13(4)				
3401.5(4)	$\langle 1^-,3^- \rangle$		81(8)		19(2)							
3632.1(15)			42(14)	58(11)								
3654.6(8)	$\langle 1^-,3^- \rangle$		11(4)									
3727.8(9)	$\langle 1^-,3^- \rangle$		42(8)		58(6)							
8552(5)	$\langle 9^+ \rangle$						6(2)		8(2)	13(2)		

Energy levels and branching ratios [91Bh06]. Part 3 **$^{67}_{31}$Ga**

E^*	$2J^\pi$	Branching ratios in percentage								
	E_f^*:	1639	1809	1975.2	2073.8	2862.4	3031.8	3578	3856.0	4198.6
[keV]	$2J_f^\pi$:	3^-	3^-		9^+	11^+	13^+	15^+	17^+	$\langle 17^+\rangle$
1978.00(5)	5,7	2.3(3)								
2862.4(1)	11^+				31.6(14)					
3031.8(1)	13^+				100					
3191.1(9)	11^+				100					
3525.3(4)	9^+,13^+				x		x			
3577.9(1)	15^+					9.5(2)	90(2)			
3628.6(7)	13^+,17^+						100			
3654.6(8)	$\langle 1^-,3^-\rangle$		61(12)	28(6)						
3856.0(1)	17^+						100			
4198.6(1)	$\langle 17^+\rangle$						64(3)		36(10)	
4221.4(3)									100	
4290.5(1)	19^+							100		
4744.8(12)									100	
5491.6(1)	$\langle 21^+\rangle$								35(6)	65(8)
8552(5)	$\langle 9^+\rangle$				73(4)					
8567(5)	$\langle 9^+\rangle$				100					

Energy levels and branching ratios [91Bh06]. Part 4 **$^{67}_{31}$Ga**

E^*	$2J^\pi$	Branching ratios in percentage			
	E_f^*:	4290.5	5225.7	5491.6	6380.2
[keV]	$2J_f^\pi$:	19^+	$\langle 23^+\rangle$	$\langle 21^+\rangle$	$\langle 25^+\rangle$
5225.7(4)	$\langle 23^+\rangle$	100			
6380.2(1)	$\langle 25^+\rangle$			100	
6589.5(5)	$\langle 27^+\rangle$		100		
7618.2(10)					100

Energy levels and branching ratios [02Bu29]. **$^{68}_{31}$Ga**

E^*	J^π	L	C^2S'	σ (d,t)	σ (d,α)	I_d	$T_{1/2}$ or	Ref.
[keV]			(d,t)	μb/sr	*rel.*	(α,d)	Γ_{cm}	
0	1^+	1+3	0.09+0.44	820	609	9	67.71(9) m	94Fi01
175.017(8)	2^+	1+3	0.11+0.96	890	40	incl	≤5 ns	77Da09
320.977(10)	1^+	1	0.21	1450	66			77Da09
374.571(13)	2^+	1+3	0.30+1.39	2100	581			77Da09
375.579(11)	3^+		incl	incl	incl		≤5 ns	
496.090(16)	4^+	3	2.18	780			≤5 ns	77Da09
514.297(15)	1^+	1	0.18	1120	562			77Da09

(continued) **$^{68}_{31}$Ga**

E^* [keV]	J^π	L	C^2S' (d,t)	σ (d,t) μb/sr	σ (d,α) *rel.*	I_d (α,d)	$T_{1/2}$ or Γ_{cm}	Ref.
555.474(15)	0^+–2^+	1	0.18	1070	32			77Da09
564.524(12)	1^+,2^+	1	0.33	1980	incl			77Da09
583.788(15)	2^-			weak	58		≤5 ns	77Da09
676.045(19)	2^+,3^+	1+3	0.05+0.42	320	61			77Da09
806.157(17)	4^+	⟨3⟩	⟨0.12⟩	32	8		≤5 ns	77Da09
825.340(14)	1^+,2^+	1	0.09	430	45			77Da09
838.719(16)	1^+,2^+							
841.185(19)	2^+,3^+	1	0.92	4700	681			77Da09
876.747(18)	4^-	⟨4⟩		25	39		≤5 ns	77Da09
946.865(18)	1^+–3^+	1	0.10	455	6			77Da09
952.42(15)	⟨2,3⟩$^+$			incl	incl			
1055.948(25)	2^-						≤5 ns	
1064.115(21)				weak	44			77Da09
1101.203(21)	X^+	1+3	0.03+0.19	130	87			77Da09
1103.51(3)	5^-						≤5 ns	
1117.148(23)	0^+–2^+			2300				77Da09
1123.180(19)	1^+–3^+			incl	17			77Da09
1126(2)	X^+			incl	incl			
1210.55(4)	X^+	1	0.03	90	103			77Da09
1216.19(8)	2^+–4^+			incl	incl			
1223.45(8)	5^+				303		≤5 ns	77Da09
1225.17(3)	1^+–3^+							
1228.81(3)								
1229.87(4)	7^-	⟨3⟩	0.21	1150			62.0(14) ns	77Da09
1231.69(4)	3^-,4^-							
1239.85(4)								
1247.56(4)	5^-	⟨3⟩	0.21	50	20		≤5 ns	77Da09
1267.21(3)	1^+–3^+	1	0.02		138			77Da09
1275(3)				77				
1287.00(5)	2^+–4^+	1+3	0.05+0.21		201	71		77Da09
1296.40(4)	2^-–4^-			215	incl	incl		
1317(3)		1	0.07	235	incl			77Da09
1323.24(4)	6^-			incl	117		≤5 ns	77Da09
1336(3)	X^+	1+3	0.1+0.17	335	29			77Da09
1344(5)								
1350.48(13)								
1419(4)	X^+	1	0.11	340	182			77Da09
1442.48(11)								
1461(4)								
1489.17(9)								
1493.82(4)	⟨5,6⟩$^-$				68		≤5 ns	77Da09
1510(3)					503			77Da09
1523.21(7)								
1539.44(11)								
1548.25(11)					38			77Da09

(continued) **$^{68}_{31}$Ga**

E^* [keV]	J^π	L	C^2S' (d,t)	σ (d,t) μb/sr	σ (d,α) *rel.*	I_d (α,d)	$T_{1/2}$ or Γ_{cm}	Ref.
1570.48(10)					160			77Da09
1590(4)					25	19		94Fi01
1617(4)						incl		
1646(5)					40			77Da09
1656.61(8)					101			77Da09
1687.73(4)	4^-–6^-							
1706(5)					33			77Da09
1721(5)					35			77Da09
1735(5)					56			77Da09
1742.38(7)								
1798.21(10)					95			77Da09
1857.29(6)	5^-–7^-							
1913(4)								
1945.99(7)								
1973.18(24)								
2028(4)								
2039(5)								
2075(4)								
2088.06(13)	$\langle 6 \rangle$						$\leq$5 ns	
2102.97(6)	8^-						$\leq$5 ns	
2141(5)								
2179(5)								
2284.68(11)	$\langle 7,8 \rangle$						$\leq$5 ns	
2396.78(11)	$9^{\langle - \rangle}$						$\leq$5 ns	
2611.85(11)	8						$\leq$5 ns	
2896.09(15)	9^+					226	$\leq$5 ns	94Fi01
2953.2(7)	$\langle 8,9 \rangle$					incl	$\leq$5 ns	
3817.58(15)	$\langle 9^+ \rangle$						$\leq$5 ns	
3853.1(11)								
3919.0(7)								
3965.01(18)	11^+						$\leq$5 ns	
4646.2(7)	$\langle 11^+ \rangle$							
5167.1(8)	$\langle 13^+ \rangle$							
6591.1(13)	$\langle 15^+ \rangle$							
7725.2(17)	$\langle 17^+ \rangle$							
			77Da09	77Da09	77Da09	94Fi01		Ref.

Additional data on this isotope can be found in [93Ti04, 93Ti03].

Values σ (d,α) are relative strengths of the levels if the 20°, 35° and 50° spectra are summed [77Da09].

For the (α,d) reaction approximate values of the deuteron yield I_d in units counts per channel are from [94Fi01].

Energy levels and branching ratios [02Bu29]. Part 2

$^{68}_{31}$Ga

E^*	J^π		Branching ratios in percentage									
		E_f^*:	0	175	321	375	376	496	514	555	564.5	583.8
[keV]		J_f^π:	1^+	2^+	1^+	2^+	3^+	4^+	1^+		1^+,2^+	2^-
175.017(8)	2^+		100									
320.977(10)	1^+		95(5)	5.1(3)								
374.571(13)	2^+		97(5)	2.9(2)								
375.579(11)	3^+		31(2)	69(3)								
496.090(16)	4^+			4.4(12)			96(5)					
514.297(15)	1^+		16(3)	80(4)	0.9(1)	2.7(2)						
555.474(15)	0^+–2^+		38(2)	56(8)	5.7(3)							
564.524(12)	1^+,2^+		80(4)	10.8(6)	4.5(2)	3.8(2)	0.7(1)					
583.788(15)	2^-		98(5)	1.3(1)	0.48(7)							
676.045(19)	2^+,3^+		3.5(3)	88(4)			8.2(5)					
806.157(17)	4^+			11(1)			40(2)	49(3)				
825.340(14)	1^+,2^+		76(4)	3.7(2)	8.5(5)	3.4(3)	6.4(4)				1.8(3)	
838.719(16)	1^+,2^+		10.8(6)	15.4(9)	62(3)	9.5(5)				2.2(2)		
841.185(19)	2^+,3^+		15.4(8)			56(3)	11(2)	8(1)			10(1)	
876.747(18)	4^-						34(11)	13.1(8)				53(3)
946.865(18)	1^+–3^+		1(1)	0.8(3)	10.0(5)	77(4)	5.9(14)		3.5(3)		2(1)	
952.42(15)	$\langle 2,3\rangle^+$				45(22)			55				
1055.948(25)	2^-											100
1064.115(21)			2.5(5)	84(4)			11(1)					
1101.203(21)	X^+		8(1)	75(4)		8(1)					2.9(6)	
1103.51(3)	5^-						2.7(4)	87(7)				
1117.148(23)	0^+–2^+			2.4(4)	8.7(7)				87(4)			
1123.180(19)	1^+–3^+		43(2)	2.2(4)	7.8(6)	12.6(7)	7.4(7)		24(1)			
1210.55(4)	X^+			13(1)			74(4)				13(2)	
1216.19(8)	2^+–4^+			44(5)			37(19)	19(5)				
1223.45(8)	5^+						5.3(7)	76(8)				
1225.17(3)	1^+–3^+		11.9(9)	39(2)	4.7(6)	35(2)	4(2)				5.3(6)	
1228.81(3)			70(3)	8.7(8)	12.9(8)					8.7(8)		
1229.87(4)	7^-							1.6(5)				
1231.69(4)	3^-,4^-						11(3)	18(8)				33(5)
1239.85(4)			69(3)		18.8(11)				12.6(11)			
1267.21(3)	1^+–3^+		6.9(9)	9(1)	23(2)	14(1)			4.8(9)		33(2)	5(3)
1287.00(5)	2^+–4^+			91(5)				9(4)				
1296.40(4)	2^-–4^-						18(2)					28(4)
1442.48(11)							70(5)					
1489.17(9)							74(4)	13.4(13)				
1493.82(4)	$\langle 5,6\rangle^-$						18.4(16)	82(5)				
1548.25(11)								57(9)				
1656.61(8)				57(5)			20(2)	23(2)				
1798.21(10)							22(5)	78(7)				

Energy levels and branching ratios [02Bu29]. Part 3 **$^{68}_{31}$Ga**

E^*	J^π		Branching ratios in percentage										
		E_f^*:	676.0	806.2	825.3	838.7	876.7	1055.9	1064.1	1103.5	1216.2	1223.4	1229.9
[keV]		J_f^π:	2^+,3^+	4^+	1^+,2^+	1^+,2^+	4^-	2^-		5^-	2^+,3,4^+	5^+	7^-
946.865(18)	1^+–3^+		0.9(2)										
1064.115(21)					3.0(5)								
1101.203(21)	X^+				6(5)								
1103.51(3)	5^-			8.7(4)			1.22(8)						
1117.148(23)	0^+–2^+					1.7(4)							
1123.180(19)	1^+–3^+				2.1(9)	0.9(6)							
1223.45(8)	5^+			18.6(10)									
1229.87(4)	7^-									98(5)			
1231.69(4)	3^-,4^-						24(8)			14(3)			
1247.56(4)	5^-						100						
1267.21(3)	1^+–3^+				4.3(9)								
1296.40(4)	2^-–4^-						54(6)						
1323.24(4)	6^-						7.7(5)			92(5)			
1350.48(13)										100			
1442.48(11)										30(5)			
1489.17(9)									12.4(10)				
1523.21(7)										100			
1539.44(11)							100						
1548.25(11)											43(7)		
1687.73(4)	4^-–6^-						9.1(10)			50(5)			18.0(10)
1742.38(7)								87(9)		13(4)			
1945.99(7)										49(6)			51(5)
2088.06(13)	$\langle 6 \rangle$											100	
2284.68(11)	$\langle 7,8 \rangle$												100
2396.78(11)	$9^{\langle - \rangle}$												100
2896.09(15)	9^+												x
2953.2(7)	$\langle 8,9 \rangle$												100

Energy levels and branching ratios [02Bu29]. Part 4 **$^{68}_{31}$Ga**

E^*	J^π		Branching ratios in percentage										
		E_f^*:	1247.6	1296.4	1323.2	2396.8	2896.1	2953.2	3817.6	3965.0	4646.2	5167.1	6591.1
[keV]		J_f^π:	5^-	2^-,3,4^-	6^-	$9^{\langle - \rangle}$	9^+	$\langle 8,9 \rangle$	$\langle 9^+ \rangle$	11^+	$\langle 11^+ \rangle$	$\langle 13^+ \rangle$	$\langle 15^+ \rangle$
1323.24(4)	6^-		≤16										
1570.48(10)				100									
1687.73(4)	4^-–6^-		19(1)		3.8(8)								
1857.29(6)	5^-–7^-				100								
1973.18(24)					100								
2102.97(6)	8^-				100								
2611.85(11)	8				100								
2896.09(15)	9^+					x							
3817.58(15)	$\langle 9^+ \rangle$					x	x	x					

(continued) **$^{68}_{31}$Ga**

E^*	J^π	Branching ratios in percentage										
	E_f^*:	1247.6	1296.4	1323.2	2396.8	2896.1	2953.2	3817.6	3965.0	4646.2	5167.1	6591.1
[keV]	J_f^π:	5^-	2^-,3,4^-	6^-	$9^{\langle-\rangle}$	9^+	$\langle 8,9\rangle$	$\langle 9^+\rangle$	11^+	$\langle 11^+\rangle$	$\langle 13^+\rangle$	$\langle 15^+\rangle$
3853.1(11)						x						
3919.0(7)					x	x	x					
3965.01(18)	11^+					100						
4646.2(7)	$\langle 11^+\rangle$							x	x			
5167.1(8)	$\langle 13^+\rangle$								x	x		
6591.1(13)	$\langle 15^+\rangle$										x	
7725.2(17)	$\langle 17^+\rangle$											x

Energy levels and branching ratios [00Bh05]. **$^{69}_{31}$Ga**

E^*	$2J^\pi$	L	C^2S'	L	C^2S'	L	C^2S	L	ε	σ (p,t)	S_N	$T_{1/2}$ or	Ref.
[keV]			(d,n)		(τ,d)		(d,τ)		(p,t)	μb/sr	(p,α)	Γ_{cm}	
0.0	3^-	1	1.62	1	1.55(39)	1	1.63	0	2.4	895	1.78	Stable	70Co17
318.69(2)	1^-	1	1.20	1	1.27(32)	1	0.49	2	0.28	18.8	1.02	<70 ps	80Ro09
574.21(2)	5^-	3	4.62	3	4.5(11)	3	1.14			0.75	3.1	1.7(7) ps	70Co17
872.13(2)	3^-	1	0.30	1	0.34(8)	1	0.58	0	0.20	69.5	0.32	0.26(2) ps	70Co17
1028.58(4)	$\langle 1\rangle^-$	1	0.17	1	0.14(4)	1	0.10	2	0.22	13.9	0.06	1.2(10) ps	70Co17
1107.03(4)	5^-					3	0.10	2	0.70	42.8		0.23(2) ps	78Ro14
1134(15)													
1336.69(3)	7^-	3	0.42	$\langle 3\rangle$	<0.65	3	0.49	2	1.60	79.9		1.1(3) ps	70Co17
1488.14(4)	7^-	$\langle 0,3\rangle$	0.03,0.41			3	0.24	2	1.13	64.5		2.0(+12-5) ps	70Co17
1525.76(4)	3^-							0	0.04	17.7		≥0.55 ps	84Ro24
1723.70(4)	5^-	3	0.90	3	0.70(18)	3	0.22	$\langle 2\rangle$	0.08	4	0.54	0.15(+12-6) ps	92Ra05
1764.77(4)	9^-							4	<0.36	1.3		0.83(14) ps	84Ro24
1891.63(6)	3^-					1	0.145	2	0.34	20.8	0.11	21(2) fs	78Ro14
1924.23(4)	7^-					3	0.23			2.1		≥0.62 ps	78Ro14
1972.39(5)	$9^{\langle+\rangle}$	4	4.94	4		4	0.26			16		≥2.8 ps	70Co17
1973.10(9)	$\langle 1\rangle^-$	1	0.20	1		1	0.03	2	0.30	incl	5.82	97(28) fs	70Co17
2007.65(5)	3^-,5^-			$\langle 1\rangle$	≤0.05							0.41(4) ps	74Ri08
2023.84(9)	5^-			3	1.36(34)			2	0.24	14.4	0.75	0.17(2) ps	74Ri08
2045.22(8)	5^-							2	0.16	8.2		111(14) fs	84Ro24
2198(3)													
2219.27(19)				0	0.03(1)							≥0.21 ps	74Ri08
2250.98(10)	$\langle 1,3\rangle^-$					$\langle 1\rangle$	0.04	2	0.19	8.9		0.10(4) ps	78Ro14
2319.54(20)	$\langle 5^+,7^+\rangle$							$\langle 3\rangle$	0.15	7.9		1.04(21) ps	84Ro24
2353.29(24)	5							$\langle 2+4\rangle$		2.4		≥0.17 ps	84Ro24
2423.32(7)													
2428.68(21)	5^-,7^-					3	1.4	4	0.9	2.6		≥0.9 ps	78Ro14
2458.83(11)	$7^{\langle-\rangle}$					$\langle 3\rangle$	0.2			0.7		0.15(6) ps	78Ro14
2485.7(1)	$5^{\langle+\rangle}$			2	0.14(4)			$\langle 3\rangle$	0.09	3.7		70(30) fs	74Ri08
2529.80(9)	$\langle 3\rangle^-$			1	0.04(1)			$\langle 0+3\rangle$		2.0		76(21) fs	74Ri08

(continued) **$^{69}_{31}$Ga**

E^* [keV]	$2J^\pi$	L	C^2S' (d,n)	L	C^2S' (τ,d)	L	C^2S (d,τ)	L	ε (p,t)	σ (p,t) μb/sr	S_N (p,α)	$T_{1/2}$ or Γ_{cm}	Ref.
2564.4(7)						3	0.16						92Ra05
2572.54(21)	$\langle 9^+\rangle$			4	1.32(33)			0	0.06	25.2			74Ri08
2600(5)	X^-							4	1.6	5.6			84Ro24
2614(5)	X^-							2	0.07	2.9			84Ro24
2660.3(18)	3^-			1	0.13(3)			2	0.22	11.5			74Ri08
2668.3(1)	11											$\geq$1.7 ps	
2680(3)	5^-,7^-					3	0.10						92Ra05
2718.0(1)	$13^{\langle+\rangle}$									4.0		$\geq$1.4 ps	
2749(5)	X^-			1	0.04(1)			2	0.11	3.9			74Ri08
2766(3)										2.4			
2795.0(5)	$\langle 7\rangle^-$			1	0.04(1)			2	0.18	7.6			74Ri08
2847(3)	X^+							3	0.12	6.0			84Ro24
2861(4)													
2932(15)	3^+,5^+	2	0.11	2	0.15(4)								74Ri08
2965(3)	X^-							4	2.3	10.8			84Ro24
2978.8(22)	X^-							2	0.19	8.2			84Ro24
2995(5)										2.0			
3052(3)	3^-,7^-							2+4	0.1+2.2	10.6			
3077(4)	5^+			2	0.21(5)								74Ri08
3098(5)	X^-	$\langle 1,3\rangle$						4	5.4	18.6			84Ro24
3118.4(2)	11^-									2.8		0.24(5) ps	
3135(5)										3.3			
3192(5)	$X^{\langle-\rangle}$							$\langle 2\rangle$	0.16	9.6			84Ro24
3205(4)	$\langle 3^-\rangle$							$\langle 0\rangle$	0.04	12.5			84Ro24
3211(5)										3.5			
3242.4(1)	13^-							4	7.6	23.2		0.49(3) ps	84Ro24
3283(6)	3^-							0	0.006	2.7			84Ro24
3299(5)	X^-							2	0.075	2.8			84Ro24
3319(6)	7			2	0.07(2)			2	0.15	5.8			74Ri08
3328(5)	X^-							2	0.135	4.7			84Ro24
3358(30)	3^+,5^+			2	0.11(3)								74Ri08
3371(5)	3^-							0	0.008	3.9			84Ro24
3389.3(1)	$\langle 15^+\rangle$											1.9(10) ps	
3490(5)	X^-							4	2.4	7.7			84Ro24
3542.8(1)	$11^{\langle+\rangle}$											0.42(7) ps	
3578(5)	X^-							2	0.105	4.2			84Ro24
3634.0(1)	$17^{\langle+\rangle}$											1.4(7) ps	
3655(5)	X^-							2	0.37	20.1			84Ro24
3693(5)								0+2	0.005+0.1	6.3			84Ro24
3722.3(1)	$\langle 11,13\rangle$											1.6(3) ps	
3757(5)	3^-			1	0.04(1)			0	0.03	9.2			74Ri08
3786.1(1)	$\langle 15\rangle$											1.04(21) ps	
3795(5)				0	0.01			$\langle 2\rangle$	0.12	7.1			74Ri08
3881(5)	X^-							2	0.26	11			84Ro24
3928(5)	$X^{\langle-\rangle}$							$\langle 2\rangle$	0.18	7			84Ro24

(continued) **$^{69}_{31}$Ga**

E^* [keV]	$2J^\pi$	L	C^2S' (d,n)	L	C^2S' (τ,d)	L	C^2S (d,τ)	L	ε (p,t)	σ (p,t) μb/sr	S_N (p,α)	$T_{1/2}$ or Γ_{cm}	Ref.
3950(5)	$X^{\langle-\rangle}$							$\langle2\rangle$	0.11	5.7			84Ro24
3966(5)	$X^{\langle-\rangle}$							0+2	0.005+0.2	10			84Ro24
3993(5)	1^-,3^-			1	0.07(2)					8			74Ri08
4032(5)	X^-							2	0.25	8.2			84Ro24
4078.2(1)	$\langle15\rangle^-$											0.55(10) ps	
4106(5)				0	0.02(1)			$\langle2\rangle$	0.11				74Ri08
4160(5)				0	0.03(1)			4	2.4	6.5			74Ri08
4191(5)				0	0.02(1)			$\langle4\rangle$	1.9	6.6			74Ri08
4251(5)	3^-			$\langle0\rangle$	0.02(1)			0	0.04	14.3			74Ri08
4291(5)				$\langle0\rangle$	0.04(1)			$\langle2\rangle$	0.2	7.9			74Ri08
4430(30)													
4528.1(1)	$\langle17,19\rangle$											$\geq$2.8 ps	
4533(30)	$\langle1^+\rangle$			$\langle0\rangle$	0.016(4)								74Ri08
4830(30)	1^+			0	0.028(7)								74Ri08
6874(2)	1											<10 fs	
7306.9(7)	5^+											4.3(8) fs	
9808.6(6)												0.015(7) as	
10242.8(7)													
10246.8(7)													
10251.8(7)													
10581	$\langle3^-\rangle$											0.91 as	
10592												0.18 as	
10615	3^-											0.015 as	
10650	$\langle5^+\rangle$											0.015 as	
10681	$\langle5^+\rangle$											0.18 as	
10692	$\langle5^+\rangle$											0.18 as	
10711	$\langle5^+\rangle$											0.18 as	
11399	5^+											0.015 as	
11478	1^+											0.0076 as	
11596	$\langle1^-\rangle$											0.015 as	
12023	1^+											0.011 as	
12172	5^+											0.015 as	
12325	5^+											0.015 as	
12429	1^+											0.091 as	
			70Co17		74Ri08		78Ro14		84Ro24	84Ro24			Ref.
							92Ra05				80Ro09		Ref.

Additional data on this isotope can be found in [93Vi07, 92Ra05].

Abundance: 60.108(9) %.

C^2S' values for the proton transfer reaction (d,n) and (τ,d) [70Co17, 74Ri08] are close to $G_{\ell j}$ in [74Ze01]; proton pickup parameter C^2S [78Ro14] and two-neutron transfer parameter ε from (t,p) reaction [84Ro24] are given at right.

Values S_N for the (α,p) reaction are normalized ratios between experimental $d\sigma/d\Omega$ and calculated by DWBA, they are spectroscopic strength of triton transfer similar to the proton spectroscopic factor if two neutrons could be considered as a J=0 pair [80Ro09].

Energy levels and branching ratios [00Bh05]. Part 2

$^{69}_{31}$Ga

E^*	$2J^\pi$		Branching ratios in percentage									
		E_f^*:	0.0	319	574	872	1107	1337	1488	1526	1764.77	1891.63
[keV]		$2J_f^\pi$:	3^-	1^-	5^-	3^-	5^-	7^-	7^-	3^-	9^-	3^-
318.69(2)	1^-		100									
574.21(2)	5^-		100	0.19(5)								
872.13(2)	3^-		94(8)	5.5(4)	0.20(6)							
1028.58(4)	$\langle 1\rangle^-$		38(2)	62(3)	$\leq$2.7							
1107.03(4)	5^-		97	0.92(8)	0.73(6)	0.99(8)						
1336.69(3)	7^-		95(8)		4.9(5)							
1488.14(4)	7^-		50(3)		31(7)	6(1)	13(7)					
1525.76(4)	3^-		35(3)	52(4)	3.8(5)		9.5(9)					
1723.70(4)	5^-		43(3)	15(3)	29(3)	4(1)	9					
1764.77(4)	9^-				100							
1891.63(6)	3^-		67(5)	32(3)	0.4(2)							
1924.23(4)	7^-		12(1)		26(3)	35(3)	2.9(3)	24(2)				
1972.39(5)	$9^{\langle+\rangle}$				5.4(13)			76(5)	18(2)			
1973.10(9)	$\langle 1\rangle^-$		67	33								
2007.65(5)	3^-,5^-		81(6)			19(2)						
2023.84(9)	5^-		86(6)		7.5(6)	6.9(11)						
2045.22(8)	5^-		35(3)		34(4)	31(4)						
2219.27(19)			29	71								
2250.98(10)	$\langle 1,3\rangle^-$		62(5)	38(4)								
2319.54(20)	$\langle 5^+,7^+\rangle$						100					
2353.29(24)	5		31		21	27	21					
2423.32(7)			21(4)		34(4)				31(5)	13(4)		
2428.68(21)	5^-,7^-						100					
2458.83(11)	$7^{\langle-\rangle}$				100							
2485.7(1)	$5^{\langle+\rangle}$		100									
2529.80(9)	$\langle 3\rangle^-$		76			24						
2572.54(21)	$\langle 9^+\rangle$							100				
2660.3(18)	3^-			100								
2668.3(1)	11							68	32			
3118.4(2)	11^-										59	
3242.4(1)	13^-										100	
6874(2)	1		21(4)	43(9)		17(3)				4.2(9)		2.1(4)
7306.9(7)	5^+		53(8)		3.7(5)	3.1(5)			6.1(9)			0.8(1)
9808.6(6)			50	x		22				28		
10242.8(7)									13			
10246.8(7)									18			
10251.8(7)									15			

Energy levels and branching ratios [00Bh05]. Part 3 **$^{69}_{31}$Ga**

E^*	$2J^\pi$	Branching ratios in percentage									
	E_f^*:	1924.23	1972.39	1973.10	2198	2353.29	2428.68	2458.83	2485.7	2564.4	2660.3
[keV]	$2J_f^\pi$:	7^-	$9^{\langle+\rangle}$	$\langle1\rangle^-$		5	5^-,7^-	$7^{\langle-\rangle}$	$5^{\langle+\rangle}$		3^-
2718.0(1)	$13^{\langle+\rangle}$		100								
2795.0(5)	$\langle7\rangle^-$		100								
3118.4(2)	11^-		41								
6874(2)	1			5(1)				3.1(6)		2.1(4)	3.1(6)
7306.9(7)	5^+	0.10(2)			0.51(7)	1.3(2)	1.0(2)	2.0(3)	2.0(3)		4.3(6)
10242.8(7)				65						22	
10246.8(7)				68						14	
10251.8(7)				58						27	

Energy levels and branching ratios [00Bh05]. Part 4 **$^{69}_{31}$Ga**

E^*	$2J^\pi$	Branching ratios in percentage									
	E_f^*:	2668.29	2718.01	2766	2795.0	2847	2861	2965	2978.8	3052	3077
[keV]	$2J_f^\pi$:	11	$13^{\langle+\rangle}$		$\langle7\rangle^-$	X^+		X^-	X^-	3^-,7^-	5^+
3389.3(1)	$\langle15^+\rangle$		100								
3542.8(1)	$11^{\langle+\rangle}$		100								
3634.0(1)	$17^{\langle+\rangle}$		100								
3722.3(1)	$\langle11,13\rangle$		89								
3786.1(1)	$\langle15\rangle$	100									
7306.9(7)	5^+			0.61(9)	2.0(3)	0.41(6)	0.8(1)	0.41(6)	1.2(2)	3.7(5)	3.4(5)

Energy levels and branching ratios [00Bh05]. Part 5 **$^{69}_{31}$Ga**

E^*	$2J^\pi$	Branching ratios in percentage								
	E_f^*:	3205	3211	3242.43	3283	3319	3389.35	3633.97	4078.19
[keV]	$2J_f^\pi$:	$\langle3^-\rangle$		13^-	3^-	7	$\langle15^+\rangle$	$17^{\langle+\rangle}$	$\langle15\rangle^-$
3722.3(1)	$\langle11,13\rangle$						11		
4078.2(1)	$\langle15\rangle^-$			87				13	
4528.1(1)	$\langle17,19\rangle$								100
7306.9(7)	5^+	2.2(3)	2.2(3)		1.0(2)	4.2(6)			

Energy levels and branching ratios [93Bh01]. **$^{70}_{31}$Ga**

E^* [keV]	J^π	L	C^2S' (d,p)	S_N (d,p)	σ (d,p) μb/sr	L	C^2S' (d,t)	$T_{1/2}$ or Γ_{cm}	Ref.
0.0	1^+	1	0.34	0.38	1700	1+3	0.30+0.2	21.14(3) m	75Do02
508.2(1)	2^+	1	0.57	0.52	2400	1+3	0.50+0.5	<4 ns	75Do02
651.1(1)	1^+,2^+	1+3	0.10+0.15	0.13	540	1+3	0.18+0.2		75Do02
690.9(1)	2^-							<4 ns	
879.1(1)	4^-	2+4	0.07+1.00	1.4	450	2+4	0.02+0.1	22.7(5) ns	75Do02
901.4(1)	X^+	3	0.41	0.7	225	3	1.38	<1.4 ns	75Do02
995.5(1)	2^+	1+3	0.09+0.05			1+3	0.37+0.4		75Do02
1002.6(10)									
1009.2(10)									
1009.4(2)	1^+–3^+	1+3				1	0.10		75Do02
1014.9(1)	1^+–3^+	1+3				1	incl		75Do02
1023.9(1)	2^+,3^+	1+3				1+3	0.09+1.0		75Do02
1034.2(2)	$\langle 6\rangle^-$	4	4.14	2.7	900	4	0.50	<4 ns	75Do02
1086.3(2)								24(4) ps	
1101.5(2)	2^-–4^-	2+4	0.05+0.57	0.1+0.6	225+180				75Do02
1135.4(1)	1,2								
1140.4(1)	1,2								
1180.6(2)	5							<4 ns	
1203.8(2)	2^+					1	0.03	>0.2 ps	75Do02
1234.5(2)	$\langle 6\rangle^-$	4	2.45	1.9	600	4	0.33	<4 ns	75Do02
1244.6(1)	2^+							>0.5 ps	
1253.5(2)	3^-,4^-	2+4	0.13+0.54	0.15	630				75Do02
1258.7(2)	1^+–4^+				incl				
1262.8(1)						1	0.02		75Do02
1306.3(2)	$\langle 3\rangle^+$	$\langle 2\rangle$	0.1	0.1	400	1	0.11		75Do02
1307.0(4)				incl			incl		
1312.1(3)	1^+,2^+					1	incl	0.17(+5-3) ps	
1325(3)	X^-	2	0.06	0.05	220				75Do02
1336.6(2)	2^-	2	0.05	incl	incl				75Do02
1359.4(2)	2^+	1+3	0.02+0.03			1	0.11		75Do02
1371.7(2)	$\langle 7^-\rangle$							<4 ns	
1413.2(3)									
1446.0(2)	1^+,2^+	1+3	0.02+0.04			1	0.11	0.27(+56-9) ps	75Do02
1456.5(2)	1^+,2^+	1+3	0.05+0.06	0.08	360	1	0.23		75Do02
1501.2(5)	1^+,2^+					1	0.03		75Do02
1518.3(3)	1^+,2^+	1+3	0.01+0.03			1+3	0.2+0.06		75Do02
1523.6(1)								<4 ns	
1533.5(1)	2^+	1	0.07	0.07	330	1+3	0.1+0.03		75Do02
1539.0(2)	$\langle 6,8^-\rangle$			incl	incl			<4 ns	
1554.3(5)	2^+	1+3	0.11+0.08	0.16	720	1	0.63		75Do02
1598(5)									
1621.2(4)	1^-,2^-	2	0.21	0.16	630	2+4	0.03+0.1		75Do02
1633.6(2)	1,2,3								
1646(2)	2^-–4^-	2+4	0.04+0.38						75Do02
1661(2)	X^-	4	0.68						75Do02

(continued) **$^{70}_{31}$Ga**

E^* [keV]	J^π	L	C^2S' (d,p)	S_N (d,p)	σ (d,p) μb/sr	L	C^2S' (d,t)	$T_{1/2}$ or Γ_{cm}	Ref.
1687.8(2)	6^-	4	0.79	0.5	170			<4 ns	75Do02
1692.5(1)									
1722(1)	1^+–3^+	1+3	0.03+0.06			1	0.2		75Do02
1725.4(10)									
1726.5(11)									
1735.5(11)		2	0.15	0.11	450	1	0.14		75Do02
1794.2(8)	1^+–3^+	1+3	0.01+0.02			1	0.03		75Do02
1807.4(10)									
1824.1(9)		2+4	0.04+0.17	0.03	150	1	0.06		75Do02
1846.5(21)									
1866.0(17)									
1877(3)									
1906.7(17)	X^+					1	0.06		75Do02
1914(2)	1^-,2^-	0	0.08						75Do02
1930.3(17)	X^+					1	0.08		75Do02
1937.5(21)	X^+					1	0.04		75Do02
1970.5(11)	X^+					1	0.12		75Do02
1984.5(11)									
2016.5(21)	X^-	2	0.21	0.12	500				75Do02
2026.5(21)									
2074.5(11)									
2093(4)									
2100(3)	X^+	1		0.06	270				73Yn01
2116.3(15)									
2127(3)									
2142.8(15)	X^-	2		0.08	360				73Yn01
2164.4(10)									
2189.8(15)									
2213.8(15)									
2232.3(15)									
2254.5(21)									
2300(3)	X^+	1		0.03	160				73Yn01
2319.6(10)									
2351.2(10)									
2374(5)									
2390(1)									
2409.8(10)									
2430.5(11)									
2446(3)	X^-	2		0.14	590				73Yn01
2464.5(10)									
2477.5(11)									
2520.5(11)	X^-	2		0.07	320				73Yn01
2548.5(21)									
2571.5(11)	X^-	2		0.15	680				73Yn01
2601.6(2)	$\langle 8 \rangle$							<4 ns	

(continued) **$^{70}_{31}$Ga**

E^* [keV]	J^π	L	C^2S' (d,p)	S_N (d,p)	σ (d,p) μb/sr	L	C^2S' (d,t)	$T_{1/2}$ or Γ_{cm}	Ref.
2624.5(21)									
2651.7(11)	X^-	2		0.11	500			<4 ns	73Yn01
2654.5(11)									
2682(5)									
2698.0(17)									
2702(5)									
2726(5)									
2886.4(2)	$\langle 9\rangle$							<4 ns	
			75Do02	73Yn01	73Yn01		75Do02		Ref.

Additional data on this isotope can be found in [00Fa20].
$C^2S'=(1/4)(2J+1)S_l$ with $S_l=\Sigma S_{lj}$ is given for the (d,p) reaction [75Do02].

Energy levels and branching ratios [93Bh01]. Part 2 **$^{70}_{31}$Ga**

E^* [keV]	J^π	E_f^*: J_f^π:	0.0 1^+	508 2^+	651 $1^+,2^+$	691 2^-	879 4^-	901.4 X^+	1023.9 $2^+,3^+$	1034.2 $\langle 6\rangle^-$	1140.4 1,2	1234.5 $\langle 6\rangle^-$	1371.7 $\langle 7^-\rangle$	2601.6 $\langle 8\rangle$
			Branching ratios in percentage											
508.2(1)	2^+		100											
651.1(1)	$1^+,2^+$		100											
690.9(1)	2^-		100											
879.1(1)	4^-					100								
901.4(1)	X^+		10(2)	90(8)										
995.5(1)	2^+		31(5)	46(4)	23(6)									
1002.6(10)			100											
1009.2(10)			100											
1009.4(2)	1^+–3^+		19			81								
1014.9(1)	1^+–3^+		69		31									
1023.9(1)	$2^+,3^+$		9(3)	91(18)										
1034.2(2)	$\langle 6\rangle^-$						100							
1086.3(2)								100						
1101.5(2)	2^-–4^-					100								
1135.4(1)	1,2		87(14)			13(1)								
1140.4(1)	1,2		72(12)	28(2)										
1180.6(2)	5						70			30				
1203.8(2)	2^+		100											
1234.5(2)	$\langle 6\rangle^-$						6			94(8)				
1244.6(1)	2^+		100											
1253.5(2)	$3^-,4^-$					25(2)	75(5)							
1258.7(2)	1^+–4^+				42				58(8)					
1262.8(1)			100											
1306.3(2)	$\langle 3\rangle^+$			60(7)			40(4)							
1307.0(4)			100											

(continued) **$^{70}_{31}$Ga**

E^*	J^π		Branching ratios in percentage											
		E_f^*:	0.0	508	651	691	879	901.4	1023.9	1034.2	1140.4	1234.5	1371.7	2601.6
[keV]		J_f^π:	1^+	2^+	$1^+,2^+$	2^-	4^-	X^+	$2^+,3^+$	$\langle 6\rangle^-$	1,2	$\langle 6\rangle^-$	$\langle 7^-\rangle$	$\langle 8\rangle$
1312.1(3)	$1^+,2^+$		100											
1336.6(2)	2^-		8(4)			92(8)								
1359.4(2)	2^+		47(6)	53(7)	x									
1371.7(2)	$\langle 7^-\rangle$									9		91		
1413.2(3)				100										
1446.0(2)	$1^+,2^+$		90(9)		2(2)	8(2)								
1456.5(2)	$1^+,2^+$		43(3)	6(3)				40(4)	11(3)					
1501.2(5)	$1^+,2^+$		100											
1518.3(3)	$1^+,2^+$		73(7)		27(4)									
1523.6(1)												100		
1533.5(1)	2^+		47(4)		19(4)						34(5)			
1539.0(2)	$\langle 6,8^-\rangle$											70	30	
1554.3(5)	2^+		33(4)	67(7)										
1621.2(4)	$1^-,2^-$		51(5)		47(5)	2(2)								
1633.6(2)	1,2,3		15(3)	54(5)	31(4)									
1687.8(2)	6^-												100	
1725.4(10)			100											
1794.2(8)	1^+–3^+		100											
1807.4(10)			100											
1824.1(9)			100											
1866.0(17)			100											
1906.7(17)	X^+		100											
1930.3(17)	X^+		100											
2116.3(15)			100											
2142.8(15)	X^-		100											
2164.4(10)			100											
2189.8(15)			100											
2213.8(15)			100											
2232.3(15)			100											
2319.6(10)			100											
2351.2(10)			100											
2409.8(10)			100											
2464.5(10)			100											
2601.6(2)	$\langle 8\rangle$												100	
2651.7(11)	X^-												100	
2698.0(17)			100											
2886.4(2)	$\langle 9\rangle$													100

Energy levels and branching ratios [93Bh02]. **$^{71}_{31}$Ga**

E^* [keV]	$2J^\pi$	S_N (α,p)	L (t,p)	σ (t,p) μb/sr	L (τ,d)	$G_{\ell j}$ (τ,d)	L	C^2S' (τ,d)	L	C^2S (d,τ)	L (d,t)	C^2S (d,t)	$T_{1/2}$ or Γ_{cm}	Ref.
0.0	3^-	1.95	0	1024	1	2.1	1	1.88	1	2.14	1	0.33	Stable	80Ro09
390.02(3)	1^-	0.22		<3.5	1	0.21	1	1.61	1	0.04			>2.8 ps	74Ri08
487.284(25)	5^-	2.7			3	3.3	3	3.18(50)	3	1.14			>23 ps	74Ri08
511.522(23)	3^-	0.08	0	23	1	0.4	1	0.40(4)	1	0.21	1	0.5	1.5(7) ps	74Ri08
714											1	0.17		
910.11(4)	3^-		$\langle 0\rangle$	67.1						<0.01	3	1.5	0.24(16) ps	78Ro14
964.655(25)	5^-		2	96					3	0.20	1,3	0.7	1.4(3) ps	78Ro14
1107.40(3)	7^-												0.52(12) ps	
1109.31(20)	1^-	1.05	$\langle 2\rangle$	17.7	1	1.1	1	1.41,1.23	1	0.39			0.095(12) ps	74Ri08
1394.99(4)	7^-		2	96.4					3	0.5,0.9			0.76(5) ps	79Ve01
1475.92(4)	5^-	0.86							3	0.1,0.2			>0.48 ps	80Ro09
1493.67(5)	9^+	3.3	$\langle 3\rangle$	12.3	4	5.3	4	0.09	4	0.24			154(15) ps	74Ri08
1498.36(5)	$5,7^{\langle -\rangle}$													
1631.19(4)	3^-		0	129			1	0.05,0.06		weak			0.15(+12-6) ps	74Ri08
1702.2(6)	1^+						0	0.098						74Ri08
1719.68(4)	$\langle 5\rangle^-$	1.4	$\langle 2\rangle$	19.5	3	0.9							0.10(+5-2) ps	80Ro09
1752.42(4)	3^-												0.26(+24-10) ps	
1905.24(4)	5^-		2	55.3					3	1.6			0.24(+11-6) ps	78Ro14
1941.63(6)	$\langle 3^+\rangle$		$\langle 3\rangle$	23.0										79Ve01
1995(7)	$5^-,7^-$								3	0.4,0.7				78Ro14
2064.62(19)	$1^-,3^-$		2	55.3										79Ve01
2134.06(4)	$5^-,7^-$		2	77.9										79Ve01
2191(3)	$5^-,7$		2	20.0	3	0.9	3	1.8,1.1						74Ri08
2247.16(5)	7^+		3	44.0									0.021(+6-5) ps	79Ve01
2294.42(23)	1^-			58.4										79Ve01
2327(3)	$1^-,3^-$		$\langle 2\rangle$	31	1	0.2	1	0.22,0.19						74Ri08
2396(3)	X^-		2	68.1			1	0.09,0.07						74Ri08
2421(3)	X^-		2	61			1	0.09.0.08						74Ri08
2450.52(12)	7^+		3	64.1										79Ve01
2488.28(19)	$7^+,9^+$		3	108										79Ve01
2529(10)	$1^-,3^-$		$\langle 4\rangle$	70.8	1	0.5	1	0.14,0.1						74Ri08
2551(10)	X^+		3	63.5										79Ve01
2600.7(10)	7^+–11^+													
2614(10)	X^+		3	27.7										79Ve01
2658(10)	X^-		2	31.7										79Ve01
2720.17(8)	7,9		3	54.9										79Ve01
2723(10)	X^+													
2747(10)	X^-		2	39.3										79Ve01
2805.02(13)	$7^+,9^+$													
2812(10)			$\langle 4\rangle$	92										79Ve01
2815.94(10)	$7^+,9^+$												0.19(+13-6) ps	
2852(30)														
2932(10)			$\langle 3\rangle$	128										79Ve01
2967(30)	$\langle 3^+,5^+\rangle$						$\langle 2\rangle$	0.18						74Ri08
2974(10)			$\langle 4\rangle$	105	3	0.7								79Ve01

(continued) **$^{71}_{31}$Ga**

E^* [keV]	$2J^\pi$	S_N (α,p)	L (t,p)	σ (t,p) μb/sr	L (τ,d)	$G_{\ell j}$ (τ,d)	L	C^2S' (τ,d)	L	C^2S (d,τ)	L (d,t)	C^2S (d,t)	$T_{1/2}$ or Γ_{cm}	Ref.
3016(30)														
3153(30)	3^+,5^+						2	0.11						74Ri08
3227(30)	1^-,3^-						1	0.1,0.08						74Ri08
3438(30)														
3506(30)														
3607(30)	3^+,5^+						2	0.16						74Ri08
3683														
3749(30)	3^+,5^+						2	0.18						74Ri08
3813(30)	1^+						0	0.052						74Ri08
3863(30)														
4060(30)														
4130(30)	1^+						0	0.032						74Ri08
4211(30)	1^+						0	0.030						74Ri08
4278(30)														
4382(30)														
4487(30)														
4644(30)	1^+						0	0.026						74Ri08
4692(30)														
4813(30)	$\langle 3^+,5^+\rangle$						$\langle 2\rangle$	0.09						74Ri08
5221(30)	1^+						0	0.050						74Ri08
11598(11)	1^-												20(5) keV	
11679(4)	$\langle 3^+\rangle$												2.0(2) keV	
11710(4)	$\langle 3^+\rangle$												7.0(7) keV	
11736(4)	$\langle 3^+\rangle$												0.50(5) keV	
11748(4)	$\langle 3^+\rangle$												4.0(4) keV	
11893(11)													23(5) keV	
12075(11)													34(5) keV	
12272(11)	3^-												39(4) keV	
12461(11)	5^+												15(2) keV	
12870	5^+												19(1) keV	
13020(11)	3^-												11(1) keV	
13223(11)	1^+												42(2) keV	
13275(11)	5^+												38(1) keV	
13781(11)	5^+												35(5) keV	
13926(11)	1^+												55(15) keV	
		80Ro09		79Ve01		74Ze01		74Ri08		78Ro14		73Yn01		Ref.

Additional data on this isotope can be found in [93Vi07, 76Ve05].

Abundance: 39.892(9) %.

Values S_N for the (α,p) reaction are normalized ratios between experimental $d\sigma/d\Omega$ and calculated by DWBA, they are spectroscopic strength of triton transfer similar to the proton spectroscopic factor if two neutrons could be considered as a J=0 pair [80Ro09].

Cross section of two-neutron transfer reaction (t,p) are from [79Ve01]; S_N from one-neutron transfer reaction (d,t) [73Yn01] are given at right, after parameters of proton transfer and pickup reactions (τ,d) and (d,τ) [74Ri08, 78Ro14]; results of another measurements of (τ,d) reaction [74Ze01] are given in Supplement.

Energy levels and branching ratios [93Bh02]. Part 2

$^{71}_{31}$Ga

E^*	$2J^\pi$		Branching ratios in percentage										
		E_f^*:	0.0	390	487	511	910	964.6	1107	1395	1475.92	1493.67	1498.36
[keV]		$2J_f^\pi$:	3^-	1^-	5^-	3^-	3^-	5^-	7^-	7^-	5^-	9^+	$5,7^{\langle-\rangle}$
390.02(3)	1^-		100										
487.284(25)	5^-		100										
511.522(23)	3^-		91(6)	8.8(6)									
910.11(4)	3^-		91(7)	0.9(1)	0.45(4)	7.1(7)							
964.655(25)	5^-		75(8)	1.9(1)	4.0	19(2)							
1107.40(3)	7^-		2.2(3)		62(3)	30(2)		6.0(6)					
1109.31(20)	1^-		100										
1394.99(4)	7^-		56(6)		19(4)	7(1)		18(2)					
1475.92(4)	5^-		24(2)	1.4(2)	48(4)	18(11)	8(1)		1				
1493.67(5)	9^+		≤0.05		0.8(2)			0.05(2)	99	0.066(7)			
1498.36(5)	$5,7^{\langle-\rangle}$				93(9)		6.9(7)						
1631.19(4)	3^-		9.3(8)	0.8(1)	2.0(2)	53(5)	13(2)	22(2)					
1702.2(6)	1^+		58(6)			42(6)							
1719.68(4)	$\langle5\rangle^-$		43(11)		32(4)	25(4)							
1752.42(4)	3^-			20(2)	56(7)			24(2)					
1905.24(4)	5^-		44(8)		40(4)			12(2)	4				
1941.63(6)	$\langle3^+\rangle$				8			77(46)		15			
2064.62(19)	$1^-,3^-$		64(9)			36(4)							
2134.06(4)	$5^-,7^-$		16(3)		24(3)			26(3)	29(3)				5
2247.16(5)	7^+				14(1)			4.0(4)	3.0(4)		30(3)	48(4)	
2294.42(23)	1^-		11(1)	74(7)			15(1)						
2450.52(12)	7^+				0.9(2)			7.1(7)	7.0(9)		54(6)	30(3)	1.6(2)
2488.28(19)	$7^+,9^+$		1.2(3)		0.9(3)				90(9)			7.4(9)	
2600.7(10)	7^+–11^+								≤7			100	
2720.17(8)	7,9								13(3)		67(9)	20(3)	
2805.02(13)	$7^+,9^+$				19(3)			14(1)	1.4(3)	1.9(6)		30(3)	33(3)
2815.94(10)	$7^+,9^+$						1.3(1)		25(3)		3.1(6)	70(8)	

Energy levels and branching ratios [89Ki02].

$^{72}_{31}$Ga

E^*	J^π	L	S_N	σ (d,p)	L	C^2S	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
									E_f^*:	0	16.4	119.7	128.8	161.5
[keV]			(d,p)	μb/sr		(d,τ)	Γ_{cm}		J_f^π:	3^-	2^-	$\langle0^+\rangle$	1,2	1^+
0	3^-				1+3		14.10(2) h	87Ro01						
16.44(4)	2^-				3	0.18	39.2(7) ns	87Ro01		100				
119.66(5)	$\langle0^+\rangle$						39.7(1) ms				100			
128.79(6)	1,2									5(1)	95(4)			
161.53(5)	1^+	1	0.06	330			0.59(3) ns	73Yn01			99(10)	1.0(1)		
165.51(4)	4^-–6^-				1	0.21		87Ro01		100				
197.94(4)	X^-				3	0.08		87Ro01		78(8)	22(2)			
208.45(5)	1^+	1	0.04	230			<0.19 ns	73Yn01			68(1)	15.6(6)	12.6(6)	4.2(6)
228.86(5)	$3^-,4^-$				1	0.055(5)		87Ro01		35(3)	65(7)			

(continued)

$^{72}_{31}$Ga

E^* [keV]	J^π	L	S_N (d,p)	σ (d,p) μb/sr	L	C^2S (d,τ)	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage				
									E_f^*:	0	16.4	119.7	128.8	161.5
									J_f^π:	3^-	2^-	$\langle 0^+ \rangle$	1,2	1^+
248.94(4)	3^-,4^-	4	2.75	870	1	0.105(5)		87Ro01		100				
271.90(13)	4^-				1	0.30(2)		87Ro01						
282.57(5)											36(3)	21(4)	32(3)	11(2)
330.06(9)	3^-,4^-	4	0.38	120	1	0.10(1)		87Ro01			59(12)	≤53		
385(4)	X^-				1	0.047		87Ro01						
392.53(5)														5(1)
400(3)	4^-–6^-	4	2.66	840	1	0.49(3)		87Ro01						
408.14(8)										41(9)				29(6)
512.97(5)												71(6)	4.5(9)	
514.73(11)											[100]			
544(4)	X^-				3	0.08		87Ro01						
555(4)	4^-–6^-				1	0.05		87Ro01						
564.34(7)					[3]	0.26		87Ro01		11(2)	14(3)	40(8)		≤24
600.76(6)	0^+–3^+	1	0.08	420				73Yn01						59(13)
619.64(5)	X^-				3	0.505(5)		87Ro01		≤11	20(5)			
636.04(12)	3^-,4^-	4	0.41	130	1	0.075(5)		87Ro01						
650.34(7)														100
684(3)	0^+–3^+	1	0.05	300										
709(3)	4^-–6^-	4	0.65	210	1	0.02		87Ro01						
737.7(1)					1	0.04		87Ro01				[64]	[36]	
741.3(1)	$\langle 3,4 \rangle^-$	2	0.09	360				73Yn01						[27]
760(4)	X^-				3	0.235(15)		87Ro01						
799(2)														
828(2)	X^-				3	0.46		87Ro01						
850(4)	X^-				1	[0.1]		87Ro01						
857(2)	0^+–3^+	1	0.2	1140				73Yn01						
870(2)														
877(2)														
894(2)	3^-,4^-				1	0.065(5)		87Ro01						
900(3)	X^+	3	0.7	270				73Yn01						
919(2)														
945(2)														
979(2)	0^+–3^+	1	0.03	160				73Yn01						
1003(2)														
1022(2)														
1033(2)														
1051(2)														
1060(2)	0^+–3^+	1	0.02	90				73Yn01						
1077(2)														
1084(6)	X^-				1	0.02		87Ro01						
1116(2)														
1130(2)	X^-				1	0.03		87Ro01						
1144(6)	X^-				1	0.04		87Ro01						
1150(2)	0^+–3^+	1	0.04	230				73Yn01						
1181(2)														

(continued) **$^{72}_{31}$Ga**

E^* [keV]	J^π	L	S_N (d,p)	σ (d,p) μb/sr	L	C^2S (d,τ)	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage				
									E_f^*: 0	16.4	119.7	128.8	161.5
									J_f^π: 3^-	2^-	$\langle 0^+ \rangle$	1,2	1^+
1187(1)													
1201(2)													
1206(2)													
1217(2)	X^-				3	[0.2]		87Ro01					
1238(2)													
1249(2)	X^-				3	0.155(15)		87Ro01					
1263(2)	3^-,4^-	2	0.15	600	1	0.095(5)		87Ro01					
1286(2)													
1297(2)													
1324(2)													
1338(3)													
1360(2)	X^-				1+3	0.02		87Ro01					
1380(3)	0^-–4^-	2	0.03	130	1	0.006		87Ro01					
1396(2)													
1428(2)													
1435(3)		3	1.7	600				73Yn01					
1442(2)													
1466(2)													
1473(2)													
1489(2)					1	0.04		87Ro01					
1505(2)													
1516(2)													
1533(2)													
1558(3)	3^-,4^-	2	0.1	390	1	0.055(5)		87Ro01					
1592(3)	1^-,2^-	0	0.03	160				73Yn01					
1613(2)													
1626(6)	X^-				1	0.02		87Ro01					
1630(2)	1^-,2^-	0	0.03	180				73Yn01					
1653(2)													
1681(2)		3	1.1	450				73Yn01					
1691(6)	X^-				3	0.33(4)		87Ro01					
1714(2)													
1728(2)													
1750(2)	X^-	2	0.06	240	3	0.45(5)		87Ro01					
1759(2)													
1777(2)	0^-–4^-	2	0.06	240				73Yn01					
1791(2)													
1802(2)	1^-,2^-	0	0.04	240				73Yn01					
1816(2)	X^-				3	0.22		87Ro01					
1834(2)													
1842(2)													
1856(2)													
1870(2)													
1882(2)													
1898(2)													

(continued) **$^{72}_{31}$Ga**

E^*	J^π	L	S_N	σ (d,p)	L	C^2S	$T_{1/2}$ or	Ref.	Branching ratios in percentage				
									E_f^*:	0	16.4	119.7	128.8	161.5
[keV]			(d,p)	μb/sr		(d,τ)	Γ_{cm}		J_f^π:	3^-	2^-	$\langle 0^+ \rangle$	1,2	1^+
1913(3)					3	0.22(4)		87Ro01						
1918(2)														
1925(2)														
1942(2)														
1977(2)														
1989(3)														
2007(2)														
2018(2)														
2024(2)														
2043(2)														
2056(3)														
2073(3)														
			73Yn01			94Ch45		Ref.						
						87Ro01		Ref.						

Additional data on this isotope can be found in [04Mi10].

Peak cross section σ (d,p) and $S_N = d\sigma/d\Omega_{exp}/d\sigma/d\Omega_{DWBA}$ from neutron transfer deuteron stripping reaction measured at angular range from 10 to 135° [73Yn01].

Values C^2S for proton pickup reaction (d,τ) from [87Ro01] were evaluated in [94Ch45].

Energy levels and branching ratios [89Ki02]. Part 2 **$^{72}_{31}$Ga**

E^*	J^π					Branching ratios in percentage					
		E_f^*:	165.5	197.9	208.4	228.9	248.9	271.9	282.6	330.1
[keV]		J_f^π:		X^-	1^+	3^-,4^-	3^-,4^-	4^-		3^-,4^-
271.90(13)	4^-		100							
330.06(9)	3^-,4^-			41(9)						
392.53(5)				46(5)	42(4)				7(1)	
408.14(8)				≤53				29(6)		
512.97(5)							24(4)			
564.34(7)					7(2)		28(6)			
600.76(6)	0^+–3^+			≤75			16(3)		25(6)	
619.64(5)	X^-				≤40	80(9)				
741.3(1)	$\langle 3,4 \rangle^-$				[13]				[60]	

Energy levels and branching ratios [04Si08].

$^{73}_{31}$Ga

E^* [keV]	$2J^\pi$	σ (α,p) arb.u	S_N (α,p)	L (t,p)	σ (t,p) μb/sr	L	C^2S (d,τ)	$T_{1/2}$ or Γ_{cm}	Ref.
0	3^-	1.63	1.47	0	264.3	1	1.33	4.86(3) h	79Ve01 78Ro14
198(3)	5^-,7^-	0.72	2.2			3	1.06 1.87		78Ro14 80Ro09
217.9(2)	3^-	0.54	0.51	0	248.4	1	0.07		79Ve01 78Ro14
495.8(2)	5^-,7^-	⟨0.04⟩	⟨0.1⟩	2	55.0	3	0.18,0.32		79Ve01 78Ro14
911.0(2)	3^-	0.67	0.69	0	323.8	1	0.04		79Ve01 78Ro14
956(3)	5^-,7^-	0.06		2	77.2	3	0.50,0.89		79Ve01 78Ro14
1117(3)	1^-,3^-	0.91	0.86	⟨2⟩	20.5	1	0.35,0.43		79Ve01 78Ro14
1235(3)	⟨9^+⟩	1.39	3.45		<3.7	⟨4⟩	0.37		79Ve01 78Ro14
1396(3)	⟨5–11⟩$^-$			4	13.0				
1528(3)	5^-,7^-				≈10	3	1.79,3.15		79Ve01 78Ro14
1578(3)	⟨5^-⟩	0.31	1.1		18.2				
1618(3)	5^-,7^-				<6.3	3	0.50,0.91		79Ve01 78Ro14
1692.4(4)	⟨1–7^-⟩								
1700(3)	⟨1–7⟩$^-$			2	76.6				
1771(3)	⟨5,7⟩$^-$			2	55.5	⟨3⟩	0.21,0.36		79Ve01 78Ro14
1800(3)	⟨3^-⟩	0.18		⟨0⟩	13.9				
1924.3(5)	⟨1–7⟩$^-$	0.23	0.9	2	34.4				80Ro09
1952(3)	⟨1–7⟩$^-$	incl	incl	2	66.7				
2001(3)	⟨1–7⟩$^-$			2	132				
2067(3)	⟨3–9⟩$^+$			3	38.6				
2108.5(4)	3^-			0	42.0				
2160(3)	⟨1–7⟩$^-$			2	26.4				
2221(3)	⟨1–7⟩$^-$			2	46.5				
2277(3)	⟨5–11⟩$^-$			4	23.8				
2380(3)	⟨5–11⟩$^-$			4	55.2				
2411(3)	⟨1–7⟩$^{\langle-\rangle}$			⟨2⟩	44.9				
2467(3)	⟨3–9⟩$^{\langle+\rangle}$			⟨3⟩	35.2				
2498(3)	⟨3–9⟩$^+$			3	60.3				
2582(6)	⟨1–7⟩$^-$			2	53.9				
2726(6)	⟨5^-,7^-⟩			⟨2+4⟩	112				
2989(2)	⟨1–7^-⟩								
		80Ro09	80Ro09		79Ve01		78Ro14		Ref.

Cross sections of three- and two-nucleon transfer reactions (α,p) and (t,p) are from [80Ro09] and [79Ve01].

Values S_N for the (α,p) reaction are normalized ratios between the experimental $d\sigma/d\Omega$ and calculated by DWBA, they are spectroscopic strength of triton transfer similar to the proton spectroscopic factor if two neutrons could be considered as a J=0 pair [80Ro09].

Spectroscopic factors of the proton pickup (d,^{3}He) reaction are from [78Ro14].

Energy levels and branching ratios [04Si08]. Part 2 **$^{73}_{31}$Ga**

E^*	$2J^\pi$	Branching ratios in percentage				
		E_f^*:	0	218	496	911
[keV]		$2J_f^\pi$:	3^-	3^-	$5^-,7^-$	3^-
217.9(2)	3^-		100			
495.8(2)	$5^-,7^-$		94(5)	6.1(8)		
911.0(2)	3^-		80(3)	16(1)	4.2(5)	
956(3)	$5^-,7^-$					100
1692.4(4)	$\langle 1–7^-\rangle$		62(9)	38(9)		
1924.3(5)	$\langle 1–7\rangle^-$		86(7)		14(3)	
2108.5(4)	3^-		30(2)		38(2)	32(2)
2989(2)	$\langle 1–7^-\rangle$		55(8)	45(8)		

Energy levels and branching ratios [99Fa05]. **$^{75}_{31}$Ga**

E^*	$2J^\pi$	L	C^2S	$T_{1/2}$ or	Ref.	Branching ratios in percentage				
						E_f^*:	0.0	22.4	178	229	432
[keV]			(d,τ)	Γ_{cm}		$2J_f^\pi$:	$\langle 3\rangle^-$	$\langle 1^-\rangle$	$\langle 3\rangle^-$	$5^-,7^-$	$\langle 5^-\rangle$
0.0	$\langle 3\rangle^-$	1	1.10	126(2) s	78Ro14						
22.42(5)	$\langle 1^-\rangle$						100				
178.36(5)	$\langle 3\rangle^-$	1	0.06	<4 ns	78Ro14		3.3(8)	97(4)			
228.63(4)	$5^-,7^-$	3	2.44,1.35	<2 ns	78Ro14		100				
432.18(3)	$\langle 5^-\rangle$						70(4)	25(2)	5(1)		
606.42(4)	$\langle 5^-\rangle$						40(2)	2.4(2)	6(1)	31(2)	21(2)
881.63(4)	$5^-,7^-$	3	0.39,0.69		78Ro14		36(5)			37(2)	21(1)
1167(7)	$5^-,7^-$	3	0.10,0.18		78Ro14						
1256(7)	$1^-,3^-$	1	0.40,0.32		78Ro14						
1273.93(6)	$\langle 5,7,9^-\rangle$									6(1)	94(4)
1392.79(23)	$\langle 5,7,9\rangle$									100	
1507.73(11)	$\langle 7^+,9^+\rangle$	4	0.25		78Ro14						
1509.56(5)	$\langle 5\rangle$							6.5(7)			
1544.97(5)	$5^-,7^-$	3	0.10,0.17		78Ro14		23(2)		28(2)	38(2)	11(1)
1621.87(19)	$5^-,7^-$	3	0.43,0.73		78Ro14				37(3)		63(5)
1655.27(14)										100	
1865.22(13)	$\langle 5,7,9^-\rangle$									23(3)	23(3)
1935(7)	$1^-,3^-$	1	0.11,0.09		78Ro14						
1969(7)											
2015.46(16)	$5^-,7^-$	3	2.7,5.1		78Ro14					100	
2083(7)											
2233.66(7)	$\langle 5,7,9^-\rangle$										49(3)
2257.56(6)	$\langle 5,7,9^-\rangle$										32(2)
2272.79(8)	$\langle 5,7^-\rangle$								72(4)	12(1)	
2369.15(17)	$\langle 5,7,9^-\rangle$										
2413.59(8)	$\langle 5\rangle$							14.1(9)		23(1)	46(3)
2436.65(21)	$\langle 5,7,9^-\rangle$										
2505.6(4)	$\langle 5,7,9\rangle$									100	

(continued) **$^{75}_{31}$Ga**

E^*	$2J^\pi$	L	C^2S	$T_{1/2}$ or	Ref.	Branching ratios in percentage				
					E^*_f:	0.0	22.4	178	229	432
[keV]			(d,τ)	Γ_{cm}	$2J^\pi_f$:	$\langle 3\rangle^-$	$\langle 1^-\rangle$	$\langle 3\rangle^-$	5^-,7^-	$\langle 5^-\rangle$
2556.63(13)									41(4)	35(2)
2563.77(21)	$\langle 5,7,9\rangle$									
2599.33(9)	$\langle 5^+,7^+\rangle$									
2602.14(15)	$\langle 5,7,9\rangle$									
2634.52(11)	$\langle 5^+\rangle$					12.0(9)		67(3)		
2639.74(16)										
2736.26(15)	$\langle 5,7,9^-\rangle$									
2738.84(15)	$\langle 5,7,9\rangle$									
2812.3(3)	$\langle 5,7^-\rangle$					85(4)			15(6)	
2864.90(10)	$\langle 5^+,7^+\rangle$									
2868.8(3)	$\langle 5,7,9\rangle$								79(6)	
2877.39(25)	$\langle 5,7,9^-\rangle$									52(4)
2913.76(19)	$\langle 5,7,9^-\rangle$									56(4)
2955.08(25)	$\langle 5,7,9^-\rangle$									
2998.84(12)	$\langle 5,7,9^+\rangle$									
3105.46(17)	$\langle 5,7,9\rangle$								26(4)	
3194.94(8)	$\langle 5^+$–$9^+\rangle$									
3208.98(21)	$\langle 5,7,9\rangle$									
			78Ro14		Ref.					

Calculated shell-model trends in proton occupancies and experimental values [78Ro14] (in parentheses) were given in [82Ko10]: a rapid transfer of about 1.5 protons from the p-orbit to the f5/2-orbit is seen between N=38 and N=44 from the occupancies in p- and f-orbits 3.8(2.95)–3.6(2.87)–3.1(1.87)–2.0 (1.65) and 0.2(1.24)–0.3(1.34)–0.8(2.20)–2.0(2.40).

Energy levels and branching ratios [99Fa05]. Part 2 **$^{75}_{31}$Ga**

E^*	$2J^\pi$	Branching ratios in percentage									
	E^*_f:	606	882	1274	1392.8	1507.7	1509.6	1545.0	1655.3	1865.2	2015.5
[keV]	$2J^\pi_f$:	$\langle 5^-\rangle$	5^-,7^-		$\langle 5,7,9\rangle$	$\langle 7^+,9^+\rangle$	$\langle 5\rangle$	5^-,7^-			5^-,7^-
881.63(4)	5^-,7^-	6(1)									
1507.73(11)	$\langle 7^+,9^+\rangle$	100									
1509.56(5)	$\langle 5\rangle$		93(6)								
1865.22(13)	$\langle 5,7,9^-\rangle$	54(4)									
2233.66(7)	$\langle 5,7,9^-\rangle$						32(2)	19(2)			
2257.56(6)	$\langle 5,7,9^-\rangle$	15(1)					28(2)	25(2)			
2272.79(8)	$\langle 5,7^-\rangle$	16(1)									
2369.15(17)	$\langle 5,7,9^-\rangle$	69(6)						31(3)			
2413.59(8)	$\langle 5\rangle$			17(1)							
2436.65(21)	$\langle 5,7,9^-\rangle$	100									
2556.63(13)									24(6)		
2563.77(21)	$\langle 5,7,9\rangle$						100				
2599.33(9)	$\langle 5^+,7^+\rangle$	57(4)	43(2)								

(continued) **$^{75}_{31}$Ga**

E^*	$2J^\pi$	Branching ratios in percentage									
	E_f^*:	606	882	1274	1392.8	1507.7	1509.6	1545.0	1655.3	1865.2	2015.5
[keV]	$2J_f^\pi$:	$\langle 5^- \rangle$	$5^-,7^-$		$\langle 5,7,9 \rangle$	$\langle 7^+,9^+ \rangle$	$\langle 5 \rangle$	$5^-,7^-$			$5^-,7^-$
2602.14(15)	$\langle 5,7,9 \rangle$					100					
2634.52(11)	$\langle 5^+ \rangle$	11(1)	10(1)								
2639.74(16)		58(5)									42(3)
2736.26(15)	$\langle 5,7,9^- \rangle$	44(4)					29(3)				
2738.84(15)	$\langle 5,7,9 \rangle$					100					
2864.90(10)	$\langle 5^+,7^+ \rangle$	64(3)					10(3)			26(3)	
2868.8(3)	$\langle 5,7,9 \rangle$						21(6)				
2877.39(25)	$\langle 5,7,9^- \rangle$	48(6)									
2913.76(19)	$\langle 5,7,9^- \rangle$			44(4)							
2955.08(25)	$\langle 5,7,9^- \rangle$	53(5)					47(5)				
2998.84(12)	$\langle 5,7,9^+ \rangle$						42(6)				
3105.46(17)	$\langle 5,7,9 \rangle$		52(4)		22(4)						
3194.94(8)	$\langle 5^+–9^+ \rangle$						31(2)				
3208.98(21)	$\langle 5,7,9 \rangle$						100				

Energy levels and branching ratios [99Fa05]. Part 3 **$^{75}_{31}$Ga**

E^*	$2J^\pi$	Branching ratios in percentage			
	E_f^*:	2233.7	2257.6		2272.8
[keV]	$2J_f^\pi$:				$\langle 5,7^- \rangle$
2736.26(15)	$\langle 5,7,9^- \rangle$	27(3)			
2998.84(12)	$\langle 5,7,9^+ \rangle$				58(6)
3194.94(8)	$\langle 5^+–9^+ \rangle$		69(3)		