

## 6.rész.

## I. MELLÉKLET — Stabil izotópok táblázata (a neutronszámokkal)

Rendszám (Z)	Név	Vegyjel	Tömegszám (A)	Neutrontöbblet-(A-Z)	Összes neut.-ron(A-Z)	Előfordulási arány (%)
1	Hidrogén	H	1	-1	0	99,984
		H	2	0	1	0,016
2	Hélium	He	3	-1	1	0,000
		He	4	0	2	100,000
3	Lítium	Li	6	0	3	7,400
		Li	7	1	4	92,600
4	Berillium	Be	9	1	5	100,000
5	Bór	B	10	0	5	19,610
		B	11	1	6	80,390
6	Szén	C	12	0	6	98,900
		C	13	1	7	1,100
7	Nitrogén	N	14	0	7	99,630
		N	15	1	8	0,370
8	Oxigén	O	16	0	8	99,757
		O	17	1	9	0,039
		O	18	2	10	0,204
9	Fluor	F	19	1	10	100,000
10	Neon	Ne	20	0	10	90,920
		Ne	21	1	11	0,257
		Ne	22	2	12	8,820
11	Nátrium	Na	23	1	12	100,000
12	Magnézium	Mg	24	0	12	78,700
		Mg	25	1	13	10,130
		Mg	26	2	14	11,170
13	Alumínium	Al	27	1	14	100,000
14	Szilícium	Si	28	0	14	92,200
		Si	29	1	15	4,700
		Si	30	2	16	3,100
15	Foszfor	P	31	1	16	100,000
16	Kén	S	32	0	16	95,000
		S	33	1	17	0,760
		S	34	2	18	4,220
		S	36	4	20	0,014
17	Klór	Cl	35	1	18	75,400
		Cl	37	3	20	24,600
18	Argon	Ar	36	0	18	0,337
		Ar	38	2	20	0,063
		Ar	40	4	22	99,600
19	Kálium	K	39	1	20	93,100
		K	41	3	22	6,880
20	Kalcium	Ca	40	0	20	96,970
		Ca	42	2	22	0,640
		Ca	43	3	23	0,145
		Ca	44	4	24	2,060
		Ca	46	6	26	0,000
		Ca	48	8	28	0,185

Rendszám (Z)	Név	Vegyjel	Tömegszám (A)	Neutrontöbblet-(A-Z)	Összes neut.-ron(A-Z)	Előfordulási arány (%)
21	Szkandium	Sc	45	3	24	100,000
22	Titán	Ti	46	2	24	7,930
		Ti	47	3	25	7,280
		Ti	48	4	26	73,940
		Ti	49	5	27	5,510
		Ti	50	6	28	5,340
23	Vanádium	V	50	4	27	0,240
		V	51	5	28	99,760
24	Króm	Cr	50	2	26	4,310
		Cr	52	4	28	83,760
		Cr	53	5	29	9,550
		Cr	54	6	30	2,380
25	Mangán	Mn	55	5	30	100,000
26	Vas	Fe	54	2	28	5,820
		Fe	56	4	30	91,660
		Fe	57	5	31	2,190
		Fe	58	6	32	0,380
27	Kobalt	Co	59	5	32	100,000
28	Nikkel	Ni	58	2	30	67,880
		Ni	60	4	32	26,230
		Ni	61	5	33	1,190
		Ni	62	6	34	3,660
		Ni	64	8	36	1,080
29	Réz	Cu	63	5	34	69,090
		Cu	65	7	36	30,910
30	Cink	Zn	64	4	34	48,890
		Zn	66	6	36	27,810
		Zn	67	7	37	4,110
		Zn	68	8	38	18,570
		Zn	70	10	40	0,620
31	Gallium	Ga	69	7	38	60,400
		Ga	71	9	40	39,600
32	Germánium	Ge	70	6	38	20,520
		Ge	72	8	40	27,430
		Ge	73	9	41	7,760
		Ge	74	10	42	36,540
		Ge	76	12	44	7,760
33	Arzén	As	75	9	42	100,000
34	Szelén	Se	74	6	40	0,870
		Se	76	8	42	9,020
		Se	77	9	43	7,580
		Se	78	10	44	23,520
		Se	80	12	46	49,820
35	Bróm	Br	79	9	44	50,540
		Br	81	11	46	49,460

Rendszám (Z)	Név	Vegyjel	Tömegszám (A)	Neutrontöbbség(A-Z)	Összes neutron(A-Z)	Előfordulási arány (%)
36	Kripton	Kr	78	6	42	0,354
		Kr	80	8	44	2,278
		Kr	82	10	46	11,560
		Kr	83	11	47	11,550
		Kr	84	12	48	56,900
		Kr	86	14	50	17,370
37	Rubídium	Rb	85	11	48	72,150
		Rb	87*	13	50	27,850
38	Stroncium	Sr	84	8	46	0,560
		Sr	86	10	48	9,860
		Sr	87	11	49	7,020
		Sr	88	12	50	82,560
39	Ittrium	Y	89	11	50	100,000
40	Cirkónium	Zr	90	10	50	51,460
		Zr	91	11	51	11,230
		Zr	92	12	52	17,110
		Zr	94	14	54	17,400
		Zr	96	16	56	2,800
41	Nióbium	Nb	93	11	52	100,000
42	Molibdén	Mo	92	8	50	15,840
		Mo	94	10	52	9,040
		Mo	95	11	53	15,720
		Mo	96	12	54	16,530
		Mo	97*	13	55	9,460
		Mo	98	14	56	23,780
Mo	100	16	58	9,630		
43	Technécium	Tc*	97	11	54	
44	Ruténium	Ru	96	8	52	5,510
		Ru	98	10	54	1,870
		Ru	99	11	55	12,720
		Ru	100	12	56	12,620
		Ru	101	13	57	17,070
		Ru	102	14	58	31,610
		Ru	104	16	60	18,580
45	Ródium	Rh	103	13	58	100,000
46	Palládium	Pd	102	10	56	0,960
		Pd	104	12	58	10,970
		Pd	105	13	59	22,230
		Pd	106	14	60	27,330
		Pd	108	16	62	26,710
		Pd	110	18	64	11,810
47	Ezüst	Ag	107	13	60	51,350
		Ag	109	15	62	48,650
48	Kadmium	Cd	106	10	58	1,220
		Cd	108	12	60	0,870
		Cd	110	14	62	12,390
		Cd	111	15	63	12,750
		Cd	112	16	64	24,070
		Cd	113	17	65	12,260
		Cd	114	18	66	28,860
		Cd	116	20	68	7,580

Rendszám (Z)	Név	Vegyjel	Tömegszám (A)	Neutrontöbbség(A-Z)	Összes neutron(A-Z)	Előfordulási arány (%)		
49	Indium	In	113	15	64	4,280		
		In*	115	17	66	95,720		
50	Ón	Sn	112	12	62	0,960		
		Sn	114	14	64	0,660		
		Sn	115*	15	65	0,350		
		Sn	116	16	66	14,300		
		Sn	117	17	67	7,610		
		Sn	118	18	68	24,030		
		Sn	119	19	69	8,580		
		Sn	120	20	70	32,850		
		Sn	122	22	72	4,720		
		Sn	124	24	74	5,940		
51	Antimon	Sb	121	19	70	57,250		
		Sb	123	21	72	42,750		
52	Tellúr	Te	120	16	68	0,089		
		Te	122	18	70	2,460		
		Te	124	20	72	4,610		
		Te	125	21	73	6,990		
		Te	126	22	74	18,710		
		Te	128	24	76	31,790		
		Te	130	26	78	34,480		
		53	Jód	I	127	21	74	100,000
		54	Xenon	Xe	124	16	70	0,096
Xe	126			18	72	0,090		
Xe	128			20	74	1,919		
Xe	129			21	75	26,440		
Xe	130			22	76	4,080		
Xe	131			23	77	21,180		
Xe	132			24	78	26,890		
Xe	134			26	80	10,440		
Xe	136			28	82	8,870		
55	Cézium			Cs	133	23	78	100,000
56	Bárium	Ba	130	18	74	0,101		
		Ba	132	20	76	0,097		
		Ba	134	22	78	2,420		
		Ba	135	23	79	6,590		
		Ba	136	24	80	7,810		
		Ba	137	25	81	11,320		
Ba	138	26	82	71,660				
57	Lantán	La	138	24	81	0,089		
		La	139	25	82	99,911		
58	Cérium	Ce	136	20	78	0,193		
		Ce	138	22	80	0,250		
		Ce	140	24	82	88,480		
59	Prazeodimium	Pr	141	23	82	11,070		
		Pr	141	23	82	100,000		

Atomszám(Z)	Név	Vegyjel	Tömegszám(A)	Neutronok szám(N)	Protonok szám(Z)	Előfordulási arány (%)
60	Neodímium	Nd	142	22	82	27,110
		Nd	143	23	83	12,170
		Nd	144	24	84	23,850
		Nd	145*	25	85	8,300
		Nd	146	26	86	17,220
		Nd	148	28	88	5,730
		Nd	150	30	90	5,620
61	Promécium	Pm*	145	23	84	
62	Szamárium	Sm	144	20	82	3,090
		Sm	147	23	85	14,970
		Sm	148	24	86	11,240
		Sm	149	25	87	13,830
		Sm	150	26	88	7,440
		Sm	152	28	90	26,720
		Sm	154	30	92	22,710
63	Európium	Eu	151	25	88	47,820
		Eu	153	27	90	52,180
64	Gadólínium	Gd	152	24	88	0,200
		Gd	154	26	90	2,150
		Gd	155	27	91	14,730
		Gd	156	28	92	20,470
		Gd	157	29	93	15,680
		Gd	158	30	94	24,870
		Gd	160	32	96	21,900
65	Terbium	Tb	159	29	94	100,000
66	Diszprózium	Dy	156	24	90	0,052
		Dy	158	26	92	0,090
		Dy	160	28	94	2,294
		Dy	161	29	95	18,880
		Dy	162	30	96	25,530
		Dy	163	31	97	24,970
		Dy	164	32	98	28,180
67	Holmium	Ho	165	31	98	100,000
68	Erbium	Er	162	26	94	0,136
		Er	164	28	96	1,560
		Er	166	30	98	33,410
		Er	167	31	99	22,940
		Er	168	32	100	27,070
		Er	170	34	102	14,880
69	Túlium	Tu	169	31	100	100,000
70	Itterbium	Yb	168	28	98	0,135
		Yb	170	30	100	3,030
		Yb	171	31	101	14,340
		Yb	172	32	102	21,820
		Yb	173	33	103	16,130
		Yb	174	34	104	31,840
		Yb	176	36	106	12,730
71	Lutécium	Lu	175	33	104	97,410
		Lu	176	34	105	2,590

Atomszám(Z)	Név	Vegyjel	Tömegszám(A)	Neutronok szám(N)	Protonok szám(Z)	Előfordulási arány (%)
72	Hafnium	Hf	174	30	102	0,180
		Hf	176	32	104	5,300
		Hf	177	33	105	18,500
		Hf	178	34	106	27,140
		Hf	179	35	107	13,750
		Hf	180	36	108	35,240
		Hf	180	36	108	35,240
73	Tantál	Ta	180	34	107	0,012
		Ta	181	35	108	99,988
74	Volfrám	W	180	32	106	0,135
		W	182	34	108	26,410
		W	183	35	109	14,400
		W	184	36	110	30,640
		W	186	38	112	28,410
75	Rénium	Re	185	35	110	37,070
		Re*	187	37	112	62,930
76	Ozmium	Os	184	32	108	0,018
		Os	186	34	110	1,590
		Os	187*	35	111	1,640
		Os	188	36	112	13,300
		Os	189	37	113	16,100
		Os	190	38	114	26,400
77	Iridium	Ir	191	37	114	37,300
		Ir	193	39	116	62,700
		Ir	193	39	116	62,700
		Ir	193	39	116	62,700
		Ir	193	39	116	62,700
78	Platina	Pt	190	34	112	0,013
		Pt	192	36	114	0,780
		Pt	194	38	116	32,900
		Pt	195	39	117	33,800
		Pt	196	40	118	25,300
		Pt	198	42	120	7,210
79	Arany	Au	197	39	118	100,000
80	Higany	Hg	196	36	116	0,146
		Hg	198	38	118	10,020
		Hg	199	39	119	16,840
		Hg	200	40	120	23,130
		Hg	201	41	121	13,220
		Hg	202	42	122	29,800
81	Tallium	Tl	203	41	122	29,500
		Tl	205	43	124	70,500
		Tl	205	43	124	70,500
82	Ólom	Pb	204	40	122	1,480
		Pb	206	42	124	23,600
		Pb	207	43	125	22,600
		Pb	208	44	126	52,300
83	Bizmut	Bi	209	43	126	100,000
84	Polónium	Po	210	42	126	
85	Asztácium	At	215	45	130	
		At	216	46	131	
		At	218	48	133	
86	Radon	Rn	222	50	136	



4. MELLÉKLET — Atommag táblázat (részlet)

O (8)	13 $\beta^+$	S (16)	30 $\beta^+$	Ti (22)	43 $\beta^+$	Ni (28)	56 K	As (33)	68 $\beta^+$	Kr (36)	74 $\beta^+$					
	14 $\beta^+$		31 $\beta^+$		44 $\beta^+, K$		57 $\beta^+$		69 $\beta^+$		75 $\beta^+$					
	15 $\beta^+$		32 stabil		45 $\beta^+, K$		58 stabil		70 $\beta^+, K$		76 K					
	16 stabil		33 stabil		46 stabil		59 K		71 $\beta^+, K$		77 $\beta^+, K$					
	17 stabil		34 stabil		47 stabil		60 stabil		72 $\beta^+$		78 stabil					
	18 stabil		35 $\beta^-$		48 stabil		61 stabil		73 K		79 $\beta^+, K$					
	19 $\beta^-$		36 stabil		49 stabil		62 stabil		74 $\beta^+, \beta^-$		80 stabil					
	20 $\beta^-$		37 $\beta^-$		50 stabil		63 $\beta^-$		75 stabil		81 K					
F (9)	17 $\beta^+$	Cl (17)	38 $\beta^-$	V (23)	47 $\beta^-$	Cu (29)	58 $\beta^+$	Se (34)	70 $\beta^+$	Rb (37)	79 $\beta^-$					
	18 $\beta^+$		32 $\beta^-$		48 $\beta^+, K$		59 $\beta^+$		71 $\beta^+$		80 $\beta^-$					
	19 stabil		33 $\beta^+$		49 K		60 $\beta^+$		72 K		81 $\beta^-$					
	20 $\beta^-$		34 $\beta^+$		50 stabil		61 $\beta^+$		73 $\beta^+, K$		82 stabil					
	21 $\beta^-$		35 stabil		51 stabil		62 $\beta^+$		74 stabil		83 stabil					
22 $\beta^-$	36 $\beta^+, K$		52 $\beta^-$	63 stabil	75 K		84 stabil									
Ne (10)	18 $\beta^+$		Ar (18)	37 stabil	Cr (24)		53 $\beta^-$		Zn (30)		64 $\beta^+, \beta^-, K$	Br (35)	76 $\beta^+, K$	Sr (38)	82 $\beta^-$	
	19 $\beta^+$			38 $\beta^-$			54 $\beta^-$				65 stabil		77 stabil		83 $\beta^-$	
	20 stabil			39 $\beta^-$			55 $\beta^-$				66 $\beta^-$		78 stabil		84 $\beta^-$	
	21 stabil			40 $\beta^-$			56 $\beta^-$				67 $\beta^-$		79 $\beta^-$		85 $\beta^-$	
	22 stabil	35 $\beta^+$		57 $\beta^-$		68 $\beta^-$	80 stabil	86 $\beta^-$								
23 $\beta^-$	36 stabil	58 $\beta^-$		69 $\beta^-$		81 $\beta^-$	87 $\beta^-$									
Na (11)	20 $\beta^+$	K (19)		37 $\beta^+$		Mn (25)	50 $\beta^+$	Ga (31)		64 $\beta^+$	Ge (32)		65 $\beta^+$		Y (39)	88 $\beta^-$
	21 $\beta^+$			38 $\beta^+$			51 $\beta^+$			65 $\beta^+, K$			66 $\beta^+$			89 $\beta^-$
	22 $\beta^+$			39 stabil			52 $\beta^+, K$			66 stabil			67 K			90 $\beta^-$
	23 stabil			40 $\beta^+, K$			53 K			67 stabil			68 $\beta^+$			91 $\beta^-$
	24 $\beta^-$		41 stabil	54 K	68 stabil		69 stabil		92 $\beta^-$							
Mg (12)	23 $\beta^+$		Ca (20)	39 stabil	Fe (26)		54 stabil		Ge (32)	69 stabil		As (33)	70 stabil	Kr (36)		93 $\beta^-$
	24 stabil			40 $\beta^+, K$			55 K			70 stabil			71 $\beta^-$			94 $\beta^-$
	25 stabil			41 stabil			56 $\beta^-$			71 $\beta^-$			72 $\beta^-$			95 $\beta^-$
	26 stabil			42 $\beta^-$			57 $\beta^-$			72 $\beta^-$			73 $\beta^-$			
	27 $\beta^-$			43 $\beta^-$			58 $\beta^-$			73 $\beta^-$			74 $\beta^-$			
Al (13)	24 $\beta^+, \alpha$	Sc (21)		44 $\beta^-$		Co (27)	54 $\beta^+$	Ni (28)		56 K	Cu (29)		58 $\beta^+$		Zn (30)	60 $\beta^+$
	25 $\beta^+$			40 stabil			55 $\beta^+$			57 K			59 $\beta^+$			61 $\beta^+$
	26 $\beta^+$			41 K			56 stabil			58 $\beta^+, K$			60 $\beta^+$			62 K
	27 stabil			42 stabil			57 stabil			59 stabil			61 $\beta^-$			63 $\beta^+$
	28 $\beta^-$			43 stabil			58 stabil			60 $\beta^-$			62 $\beta^+$			64 stabil
Si (14)	26 $\beta^+$		Ti (22)	43 $\beta^-$	V (23)		47 $\beta^-$		Cr (24)	48 $\beta^+, K$		Mn (25)	50 $\beta^+$	Fe (26)		52 $\beta^+$
	27 $\beta^+$			44 stabil			48 $\beta^+, K$			49 K			51 stabil			53 K
	28 stabil			45 $\beta^-$			49 K			52 $\beta^+, K$			53 K			54 K
	29 stabil			46 stabil			50 stabil			53 K			54 K			55 stabil
	30 stabil			47 $\beta^-$			51 stabil			54 K			55 stabil			56 $\beta^-$
P (15)	28 $\beta^+$	Cr (24)		48 stabil		Mn (25)	52 $\beta^+$	Fe (26)		53 $\beta^+$	Co (27)		54 $\beta^+$		Ni (28)	55 $\beta^+$
	29 $\beta^+$			49 $\beta^-$			53 $\beta^+$			54 stabil			55 K			56 stabil
	30 $\beta^+$			40 stabil			54 stabil			55 K			56 stabil			57 stabil
	31 stabil			41 K			55 K			56 stabil			57 stabil			58 stabil
	32 $\beta^-$			42 stabil			56 stabil			57 stabil			58 stabil			59 stabil

