APPENDIX A PROPERTIES OF MAGNETICALLY ACTIVE NUCLEI

Isotope	Spin	Natural Abundance	Magnetic Moment μ/μ_N	Magnetogyric Ratio $\gamma/10^7$ rad s^{-1} T^{-1}	Quadrupole Moment Q/fm^2	Frequency Ratio @ 2.35 T	Reference Compound	Relative Receptivity	
								D^{Proton}	D^{Carbon}
^{1}H	1/2	99.9885	4.837353570	26.7522128	–	100.000000	Me_4Si	1	5.87×10^{3}
^{2}H	1	0.0115	1.21260077	4.106 62791	0.286	15.350609	$(CD_3)_3Si$	1.11×10^{-6}	6.52×10^{-3}
^{3}H	1/2	–	5.159714367	28.5349779	–	106.663974	$Me_4Si\text{-}t_1$	–	–
^{3}He	1/2	1.37×10^{-4}	−3.685154336	−20.3801587	–	76.179437	He(gas)	6.06×10^{-7}	3.56×10^{-3}
^{6}Li	1	7.59	1.1625637	3.9371709	−0.0808	14.716086	LiCl	6.45×10^{-4}	3.79
^{7}Li	3/2	92.41	4.20407505	10.3977013	−4.01	38.863797	LiCl	0.271	1.59×10^{3}
^{9}Be	3/2	100	−1.520136	−3.759666	5.288	14.051813	$BeSO_4$	1.39×10^{-2}	81.5
^{10}B	3	19.9	2.0792055	2.8746786	8.459	10.743658	$BF_3.Et_2O$	3.95×10^{-3}	23.2
^{11}B	3/2	80.1	3.4710308	8.5847044	4.059	32.083974	$BF_3.Et_2O$	0.132	7.77×10^{2}
^{13}C	1/2	1.07	1.216613	6.728284	–	25.145020	Me_4Si	1.70×10^{-4}	1
^{14}N	1	99.632	0.57100428	1.9337792	2.044	7.226317	CH_3NO_2	1.00×10^{-3}	5.9
^{15}N	1/2	0.368	−0.49049746	−2.71261804	–	10.136767	$MeNO_2$	3.84×10^{-6}	2.25×10^{-2}
^{17}O	5/2	0.038	−2.24077	−3.62808	−2.56	13.556457	D_2O	1.11×10^{-5}	6.50×10^{-2}
^{19}F	1/2	100	4.553333	25.18148	–	94.094011	CCl_3F	0.834	4.90×10^{3}
^{21}Ne	3/2	0.27	−0.854376	−2.11308	10.155	7.894296	Ne (gas)	6.65×10^{-6}	3.91×10^{-2}
^{23}Na	3/2	100	2.8629811	7.0808493	10.40	26.451900	NaCl	9.27×10^{-2}	5.45×10^{2}
^{25}Mg	5/2	10.00	−1.01220	−1.63887	19.94	6.121635	$MgCl_2$	2.68×10^{-4}	1.58
^{27}Al	5/2	100	4.3086865	6.9762715	14.66	26.056859	$Al(NO_3)_3$	0.207	1.22×10^{3}
^{29}Si	1/2	4.6832	−0.96179	−5.3190	–	19.867187	Me_4Si	3.68×10^{-4}	2.16
^{31}P	1/2	100	1.95999	10.8394	–	40.480742	H_3PO_4	6.65×10^{-2}	3.91×10^{2}
^{33}S	3/2	0.76	0.8311696	2.055685	−6.78	7.676000	$(NH_4)_2SO_4$	1.72×10^{-5}	0.101
^{35}Cl	3/2	75.78	1.061035	2.624198	−8.165	9.797909	NaCl	3.58×10^{-3}	21
^{37}Cl	3/2	24.22	0.8831998	2.184368	−6.435	8.155725	NaCl	6.59×10^{-4}	3.87
^{39}K	3/2	93.2581	0.50543376	1.2500608	5.85	4.666373	KCl	4.76×10^{-4}	2.79
(^{40}K)	4	0.0117	−1.4513203	−1.5542854	−7.30	5.802018	KCl	6.12×10^{-7}	3.59×10^{-3}
(^{41}K)	3/2	6.7302	0.2773961	0.68606808	7.11	2.561305	KCl	5.68×10^{-6}	3.33×10^{-2}
^{43}Ca	7/2	0.135	−1.494067	−1.803069	−4.08	6.730029	$CaCl_2$	8.68×10^{-6}	5.10×10^{-2}
^{45}Sc	7/2	100	5.3933489	6.5087973	−22.0	24.291747	$Sc(NO_3)_3$	0.302	1.78×10^{3}
^{47}Ti	5/2	7.44	−0.93294	−1.5105	30.2	5.637534	$TiCl_4$	1.56×10^{-4}	0.918
^{49}Ti	7/2	5.41	−1.25201	−1.51095	24.7	5.639037	$TiCl_4$	2.05×10^{-4}	1.2
(^{50}V)	6	0.25	3.6137570	2.6706490	21.0	9.970309	$VOCl_3$	1.39×10^{-4}	0.818
^{51}V	7/2	99.75	5.8380835	7.0455117	−5.2	26.302948	$VOCl_3$	0.383	2.25×10^{3}
^{53}Cr	3/2	9.501	−0.61263	−1.5152	−15.0	5.652496	K_2CrO_4	8.63×10^{-5}	0.507
^{55}Mn	5/2	100	4.1042437	6.645 2546	33.0	24.789218	$KMnO_4$	0.179	1.05×10^{3}
^{57}Fe	1/2	2.119	0.1569636	0.8680624	–	3.237778	$Fe(CO)_5$	7.24×10^{-7}	4.25×10^{-3}
^{59}Co	7/2	100	5.247	6.332	42.0	23.727074	$K_3[Co(CN)_6]$	0.278	1.64×10^{3}
^{61}Ni	3/2	1.1399	−0.96827	−2.3948	16.2	8.936051	$Ni(CO)_4$	4.09×10^{-5}	0.24
^{63}Cu	3/2	69.17	2.8754908	7.1117890	−22.0	26.515473	$[Cu(CH_3CN)_4][ClO_4]$	6.50×10^{-2}	3.82×10^{2}

^{65}Cu	3/2	30.83	3.07465	7.60435	−20.4	28.403693	$[Cu(CH_3CN)_4][ClO_4]$	3.54×10^{-2}	2.08×10^{2}
^{67}Zn	5/2	4.10	1.035556	1.676688	15.0	6.256803	$Zn(NO_3)_2$	1.18×10^{-4}	0.692
(^{69}Ga)	3/2	60.108	2.603405	6.438855	17.1	24.001354	$Ga(NO_3)_3$	4.19×10^{-2}	2.46×10^{2}
^{71}Ga	3/2	39.892	3.307871	8.181171	10.7	30.496704	$Ga(NO_3)_3$	5.71×10^{-2}	3.35×102
^{73}Ge	9/2	7.73	−0.9722881	−0.9360303	−19.6	3.488315	$(CH_3)_4Ge$	1.09×10^{-4}	0.642
^{75}As	3/2	100	1.858354	4.596163	31.4	17.122614	$NaAsF_6$	2.54×10^{-2}	1.49×10^{2}
^{77}Se	1/2	7.63	0.92677577	5.1253857	–	19.071513	Me_2Se	5.37×10^{-4}	3.15
(^{79}Br)	3/2	50.69	2.719351	6.725616	31.3	25.053980	NaBr	4.03×10^{-2}	2.37×10^{2}
^{81}Br	3/2	49.31	2.931283	7.249776	26.2	27.006518	NaBr	4.91×10^{-2}	2.88×10^{2}
^{83}Kr	9/2	11.49	−1.07311	−1.03310	25.9	3.847600	Kr(gas)	2.18×10^{-4}	1.28
(^{85}Rb)	5/2	72.17	1.6013071	2.5927050	27.6	9.654943	RbCl	7.67×10^{-3}	45
^{87}Rb	3/2	27.83	3.552582	8.786400	13.35	32.720454	RbCl	4.93×10^{-2}	2.90×10^{2}
^{87}Sr	9/2	7.00	−1.2090236	−1.1639376	33.5	4.333822	$SrCl_2$	1.90×10^{-4}	1.12
^{89}Y	1/2	100	−0.23801049	−1.3162791	–	4.900198	$Y(NO_3)_3$	1.19×10^{-4}	0.7
^{91}Zr	5/2	11.22	−1.54246	−2.49743	−17.6	9.296298	$Zr(C_5H_5)_2Cl_2$	1.07×10^{-3}	6.26
^{93}Nb	9/2	100	6.8217	6.5674	−32.0	24.476170	$K[NbCl_6]$	0.488	2.87×10^{3}
^{95}Mo	5/2	15.92	−1.0820	−1.7510	−2.2	6.516926	Na_2MoO_4	5.21×10^{-4}	3.06
(^{97}Mo)	5/2	9.55	−1.1050	−1.7880	25.5	6.653695	Na_2MoO_4	3.33×10^{-4}	1.95
^{99}Tc	9/2	-	6.2810	6.0460	−12.9	22.508326	NH_4TcO_4	–	–
^{99}Ru	5/2	12.76	−0.7588	−1.2290	7.9	4.605151	$K_4[Ru(CN)_6]$	1.44×10^{-4}	0.848
^{101}Ru	5/2	17.06	−0.8505	−1.3770	45.7	5.161369	$K_4[Ru(CN)_6]$	2.71×10^{-4}	1.59
^{103}Rh	1/2	100	−0.1531	−0.8468	–	3.186447	$Rh(acac)_3$	3.17×10^{-5}	0.186
^{105}Pd	5/2	22.33	−0.7600	−1.2300	66.0	4.576100	K_2PdCl_6	2.53×10^{-4}	1.49
(^{107}Ag)	1/2	51.839	−0.19689893	−1.0889181	–	4.047819	$AgNO_3$	3.50×10^{-5}	0.205
^{109}Ag	1/2	48.161	−0.22636279	−1.2518634	–	4.653533	$AgNO_3$	4.94×10^{-5}	0.290
(^{111}Cd)	1/2	12.80	−1.0303729	−5.6983131	–	21.215480	Me_2Cd	1.24×10^{-3}	7.27
^{113}Cd	1/2	12.22	−1.0778568	−5.9609155	–	22.193175	Me_2Cd	1.35×10^{-3}	7.94
(^{113}In)	9/2	4.29	6.1124	5.8845	79.9	21.865755	$In(NO_3)_3$	1.51×10^{-2}	88.50
^{115}In	9/2	95.71	6.1256	5.8972	81.0	21.912629	$In(NO_3)_3$	0.338	1.98×10^{3}
(^{115}Sn)	1/2	0.34	−1.5915	−8.8013	–	32.718749	Me_4Sn	1.21×10^{-4}	0.711
(^{117}Sn)	1/2	7.68	−1.73385	−9.58879	–	35.632259	Me_4Sn	3.54×10^{-3}	20.8
^{119}Sn	1/2	8.59	−1.81394	−10.0317	–	37.290632	Me_4Sn	4.53×10^{-3}	26.6
^{121}Sb	5/2	57.21	3.9796	6.4435	−36.0	23.930577	$KSbCl_6$	9.33×10^{-2}	5.48×10^{2}
(^{123}Sb)	7/2	42.79	2.8912	3.4892	−49.0	12.959217	$KSbCl_6$	1.99×10^{-2}	1.17×10^{2}
(^{123}Te)	1/2	0.89	−1.276431	−7.059098	–	26.169742	Me_2Te	1.64×10^{-4}	0.961
^{125}Te	1/2	7.07	−1.5389360	−8.5108404	–	31.549769	Me_2Te	2.28×10^{-3}	13.40
^{127}I	5/2	100	3.328710	5.389573	−71.0	20.007486	KI	9.54×10^{-2}	5.60×10^{2}
^{129}Xe	1/2	26.44	−1.347494	−7.452103	–	27.810186	$XeOF_4$	5.72×10^{-3}	33.60
^{131}Xe	3/2	21.18	0.8931899	2.209076	−11.4	8.243921	$XeOF_4$	5.96×10^{-4}	3.50
^{133}Cs	7/2	100	2.9277407	3.5332539	−0.343	13.116142	$CsNO_3$	4.84×10^{-2}	2.84×10^{2}
(^{135}Ba)	3/2	6.592	1.08178	2.67550	16.0	9.934457	$BaCl_2$	3.30×10^{-4}	1.93
^{137}Ba	3/2	11.232	1.21013	2.99295	24.5	11.112928	$BaCl_2$	7.87×10^{-4}	4.62
^{138}La	5	0.09	4.068095	3.557239	45.0	13.19430	$LaCl_3$	8.46×10^{-5}	0.497
^{139}La	7/2	99.91	3.155677	3.8083318	20.0	14.125641	$LaCl_3$	6.05×10^{-2}	3.56×10^{2}
^{141}Pr	5/2	100	5.0587	8.1907	−5.89	30.62	–	–	–
^{143}Nd	7/2	12.2	−1.208	−1.4570	−63.0	5.45	–	–	–

(Continued)

APPENDIX A PROPERTIES OF MAGNETICALLY ACTIVE NUCLEI *(continued)*

Isotope	Spin	Natural Abundance	Magnetic Moment μ/μ_N	Magnetogyric Ratio $\gamma/10^7$ rad s^{-1} T^{-1}	Quadrupole Moment Q/fm^2	Frequency Ratio @ 2.35 T	Reference Compound	Relative Receptivity	
								D^{Proton}	D^{Carbon}
^{145}Nd	7/2	8.3	−0.7440	−0.8980	−33.0	3.36	–	–	–
^{147}Sm	7/2	14.99	−0.9239	−1.1150	−25.9	4.17	–	–	–
^{149}Sm	7/2	13.82	−0.7616	−0.9192	7.4	3.44	–	–	–
^{151}Eu	5/2	47.81	4.1078	6.6510	90.3	24.86	–	–	–
^{153}Eu	5/2	52.19	1.8139	2.9369	241.2	10.98	–	–	–
^{155}Gd	3/2	14.80	−0.33208	−0.82132	127.0	3.07	–	–	–
^{157}Gd	3/2	15.65	−0.4354	−1.0769	135.0	4.03	–	–	–
^{159}Tb	3/2	100	2.6000	6.4310	143.2	24.04	–	–	–
^{161}Dy	5/2	18.91	−0.5683	−0.9201	250.7	3.44	–	–	–
^{163}Dy	5/2	24.90	0.7958	1.2890	264.8	4.82	–	–	–
^{165}Ho	7/2	100	4.7320	5.7100	358.0	21.34	–	–	–
^{167}Er	7/2	22.93	−0.63935	−0.77157	356.5	2.88	–	–	–
^{169}Tm	1/2	100	−0.4011	−2.2180	–	8.29	–	–	–
^{171}Yb	1/2	14.28	0.85506	4.7288	–	17.499306	–	–	–
^{173}Yb	5/2	16.13	−0.80446	−1.3025	280.0	4.821	–	–	–
^{175}Lu	7/2	97.41	2.5316	3.0552	349.0	11.404	–	–	–
^{176}Lu	7	2.59	3.3880	2.16844	497.0	8.131	–	–	–
^{177}Hf	7/2	18.60	0.8997	1.0860	336.5	4.007	–	2.61×10^{-4}	1.54
^{179}Hf	9/2	13.62	−0.7085	−0.6821	379.3	2.517	–	7.45×10^{-5}	0.438
^{181}Ta	7/2	99.988	2.6879	3.2438	317.0	11.989600	$KTaCl_6$	3.74×10^{-2}	2.20×10^{2}
^{183}W	1/2	14.31	0.20400919	1.1282403	–	4.166387	Na_2WO_4	1.07×10^{-5}	6.31×10^{-2}
(^{185}Re)	5/2	37.4	3.7710	6.1057	218.0	22.524600	$KReO_4$	5.19×10^{-2}	3.05×10^{2}
^{187}Re	5/2	62.6	3.8096	6.1682	207.0	22.751600	$KReO_4$	8.95×10^{-2}	5.26×10^{2}
^{187}Os	1/2	1.96	0.1119804	0.6192895	–	2.282331	OsO_4	2.43×10^{-7}	1.43×10^{-3}
^{189}Os	3/2	16.15	0.851970	2.10713	85.6	7.765400	OsO_4	3.95×10^{-4}	2.32
(^{191}Ir)	3/2	37.3	0.1946	0.4812	81.6	−1.718	-	1.09×10^{-5}	6.38×10^{-2}
^{193}Ir	3/2	62.7	0.2113	0.5227	75.1	−1.871	-	2.34×10^{-5}	0.137
^{195}Pt	1/2	33.832	1.0557	5.8385	–	21.496784	Na_2PtCl_6	3.51×10^{-3}	20.7
^{199}Hg	1/2	16.87	0.87621937	4.8457916	–	17.910822	Me_2Hg	1.00×10^{-3}	5.89
^{197}Au	3/2	100	0.191271	0.473060	54.7	−1.729	-	2.77×10^{-5}	0.162
^{201}Hg	3/2	13.18	−0.7232483	−1.788769	38.6	6.611583	$(CH_3)_2Hg$	1.97×10^{-4}	1.16
(^{203}Tl)	1/2	29.524	2.80983305	15.5393338	–	57.123200	$Tl(NO_3)_3$	5.79×10^{-2}	3.40×10^{2}
^{205}Tl	1/2	70.476	2.8374709	15.6921808	–	57.683838	$Tl(NO_3)_3$	0.142	8.36×10^{2}
^{207}Pb	1/2	22.1	1.00906	5.58046	–	20.920599	Me_4Pb	2.01×10^{-3}	11.8
^{209}Bi	9/2	100	4.5444	4.3750	−51.6	16.069288	$Bi(NO_3)_2$	0.144	8.48×10^{2}
^{235}U	7/2	0.72	−0.4300	−0.5200	493.6	1.8414	–	–	–

Nuclei in parentheses are consider to be not the most favorable of the element concerned for NMR

Adapted from Harris, R.K., Becker, E.D., Cabral de Menezes, S.M., Goodfellow, R., and Granger, P. (2001). NMR nomenclature. Nuclear spin properties and conventions for chemical shifts