

Appendix A

Everything you ever wanted to know about Rubidium

Property	symbol	Value
cooling transition		$5S_{1/2}, F=2 \rightarrow 5P_{3/2}, F=3$
nuclear spin	I	$3/2$
wavelength in vacuum	λ	780.23 nm
mass	m_{Rb}	$1.44 \times 10^{-25} \text{ kg}$
lifetime of upper state	τ_n	27 ns
natural linewidth	$\Gamma/2\pi$	5.9 MHz
absorption cross section	σ_{abs}	$290.7 \times 10^{-15} \text{ m}^2$
saturation intensity(stretched transition)	I_{sat}	1.6 mW/cm^2
recoil temperature	T_{rec}	180 nK
recoil velocity	v_{rec}	0.59 cm/s
ground hyperfine splitting	ω_{hf}	6834.68261090434(3) MHz
$ 1, -1\rangle$ s-wave scattering length	a_{11}	100.44 a_0
$ 1, -1\rangle/ 2, 1\rangle$ s-wave scattering length	a_{12}	98.09 a_0
$ 2, 1\rangle$ s-wave scattering length	a_{22}	95.47 a_0

Table A.1: Properties of ^{87}Rb

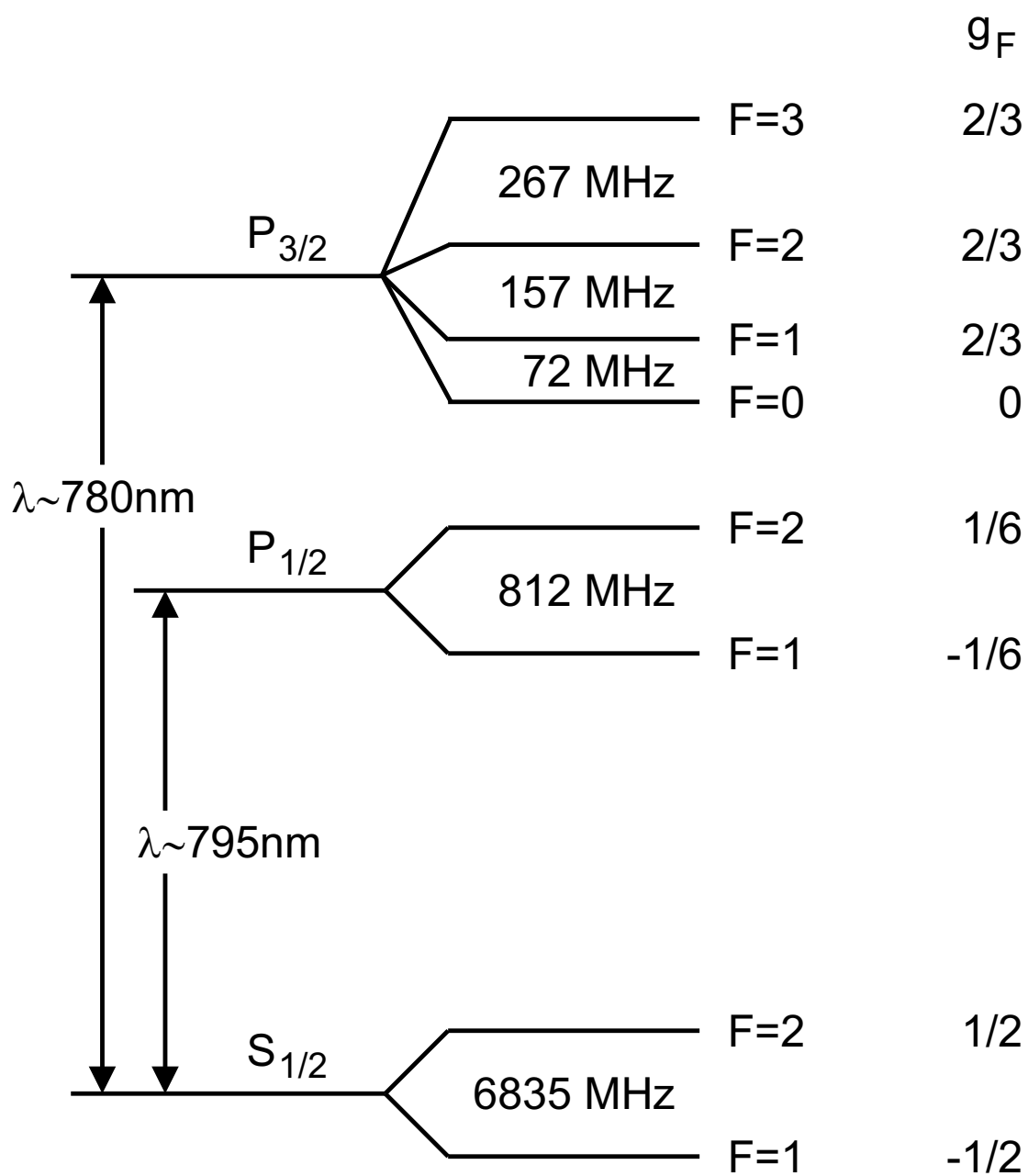


Figure A.1: Energy level diagram for ^{87}Rb showing Landé g factors for each state.

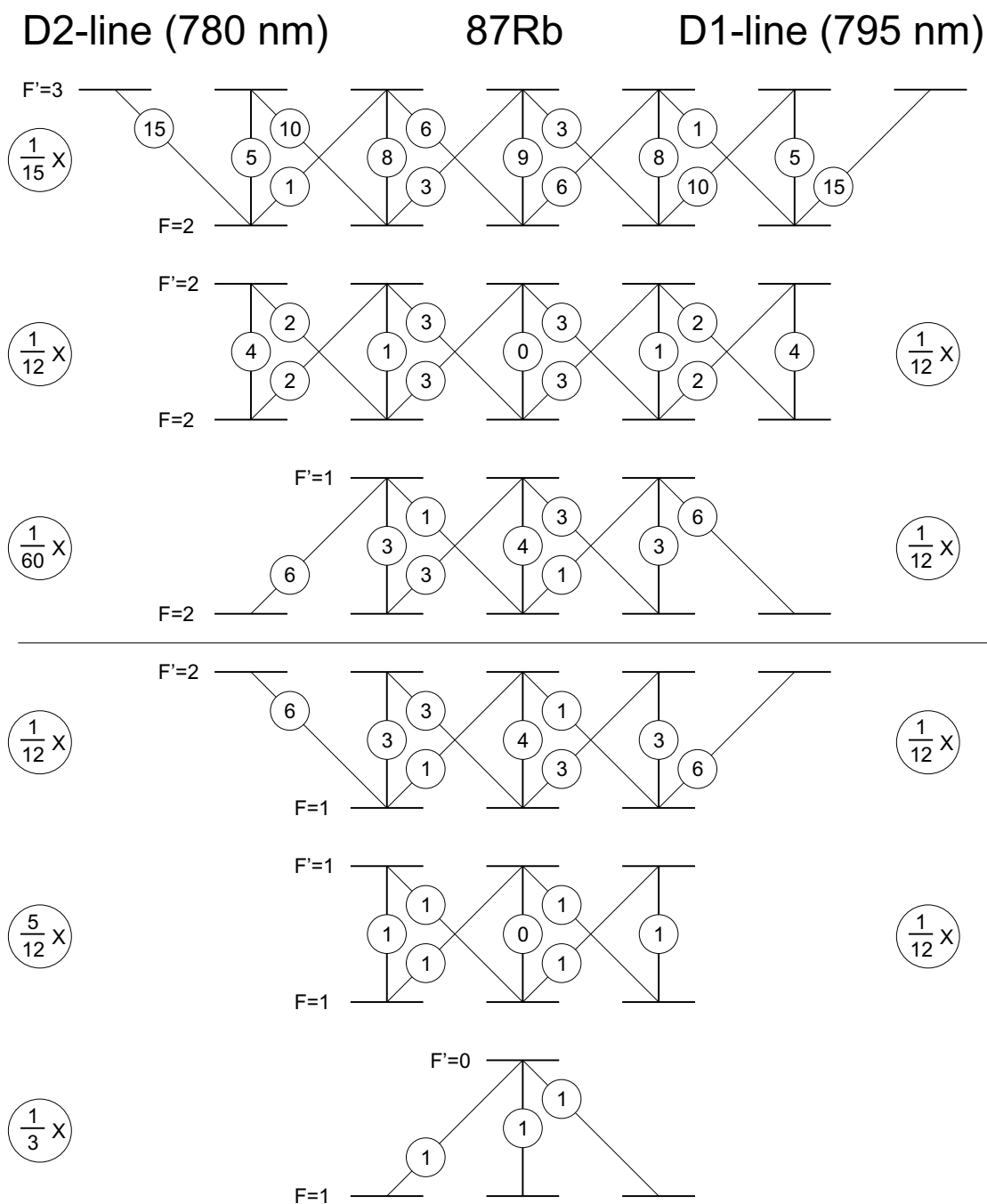


Figure A.2: Branching ratios for ⁸⁷Rb. Multiply by the circled number in the left(right) column to get the branching ratio for the D2(D1) line.