

15. The magnitude of the spin angular momentum is $S = \sqrt{s(s+1)}\hbar = (\sqrt{3}/2)\hbar$, where $s = \frac{1}{2}$ is used. The z component is either $S_z = \hbar/2$ or $-\hbar/2$. If $S_z = +\hbar/2$, the angle θ between the spin angular momentum vector and the positive z axis is

$$\theta = \cos^{-1} \left(\frac{S_z}{S} \right) = \cos^{-1} \left(\frac{1}{\sqrt{3}} \right) = 54.7^\circ .$$

If $S_z = -\hbar/2$, the angle is $\theta = 180^\circ - 54.7^\circ = 125.3^\circ$.