

29. The solutions to parts (a) and (b) have been combined here. The free-body diagram is shown below, with the tension of the string \vec{T} , the force of gravity $m\vec{g}$, and the force of the air \vec{F} . Our coordinate system is shown. The x component of the net force is $T \sin \theta - F$ and the y component is $T \cos \theta - mg$, where $\theta = 37^\circ$.

Since the sphere is motionless the net force on it is zero. We answer the questions in the reverse order. Solving $T \cos \theta - mg = 0$ for the tension, we obtain $T = mg / \cos \theta = (3.0 \times 10^{-4})(9.8) / \cos 37^\circ = 3.7 \times 10^{-3} \text{ N}$. Solving $T \sin \theta - F = 0$ for the force of the air: $F = T \sin \theta = (3.7 \times 10^{-3}) \sin 37^\circ = 2.2 \times 10^{-3} \text{ N}$.

