

17. The acceleration is

$$a = \frac{F}{M} = \frac{(\mu \cos \theta) (dB/dz)}{M},$$

where M is the mass of a silver atom, μ is its magnetic dipole moment, B is the magnetic field, and θ is the angle between the dipole moment and the magnetic field. We take the moment and the field to be parallel ($\cos \theta = 1$) and use the data given in Sample Problem 41-1 to obtain

$$a = \frac{(9.27 \times 10^{-24} \text{ J/T})(1.4 \times 10^3 \text{ T/m})}{1.8 \times 10^{-25} \text{ kg}} = 7.21 \times 10^4 \text{ m/s}^2.$$