78. From the slope of the graph, we find the spring constant

$$k = \frac{\Delta F}{\Delta x} = 0.10 \text{ N/cm} = 10 \text{ N/m} .$$

(a) Equating the potential energy of the compressed spring to the kinetic energy of the cork at the moment of release, we have

$$\frac{1}{2}kx^2 = \frac{1}{2}mv^2 \implies v = x\sqrt{\frac{k}{m}}$$

which yields $v = 2.8$ m/s for $m = 0.0038$ kg and $x = 0.055$ m.

(b) The new scenario involves some potential energy at the moment of release. With $d = 0.015$ m, energy conservation becomes

$$\frac{1}{2}kx^2 = \frac{1}{2}mv^2 + \frac{1}{2}kd^2 \implies v = \sqrt{\frac{k}{m}\left(x^2 - d^2\right)}$$

which yields $v = 2.7$ m/s.