Short Answers: 1. The container acts like a stopped pipe whose length decreases as the water level rises. From \( f_n = \frac{nv}{4L} \), as \( L \) decreases the frequency increases.
   2. For a material undergoing a temperature change \( \Delta T \), the volume expands as \( \Delta V = \beta V_0 \Delta T \). The metal lid has a higher \( \beta \) than the glass jar, so it loosens the seal. If both were metal, the \( \beta \)s would be equal and so would the volume change; no it would not work.
   3. (b), (c) and (e)
   4. (b)
   5. (d)

Problem 1: (a) \( T = 44.0 \) N
   (b) \( V = 4.3 \times 10^{-3} \) m\(^3\)

Problem 2: (a) \( t = 1.50 \) s
   (b) \( h = 5.05 \) m

Problem 3: \(|\vec{v}| = 1.35 \) m/s, \( \theta = 71.7^\circ \) above the \( \hat{x} \)-axis

Problem 4: (a) \( a_{\tan} = 68.7 \) m/s\(^2\)
   (b) \( F = 1.06 \) N

Problem 5: (a) \( T = 5 \) N
   (b) \( F_{\text{nail}} = 113 \) N upwards

Problem 6: \( T = 27.0^\circ\text{C} \)

Problem 7: (a) \( W = -144 \) kJ
   (b) \( Q = -289 \) kJ
   (c) out of the gas

Problem 8: (a) \( v = 7.67 \) m/s
   (b) \( v = 6.48 \) m/s
   (c) with slippage \( K_{\text{tot}} = 58.8 \) J, without slippage \( K_{\text{tot}} = 58.8 \) J.

Bonus: Stopping distance on snowy day = 251.4 m (I hit it)
   (a) \( v_f' = 13.9 \) m/s
   (b) \( \mu'_{sk} \geq 0.243 \)