- 1. You are sitting on a stationary train that is emitting a 440 Hz whistle. Another train, also blowing a 440 Hz whistle, is moving towards you at 10 m/s.
 - a) What frequency do you hear emitted by the moving train?
 - b) What is the frequency of the beats that you hear?

$$f' = f\left(\frac{v}{v \mp v_s}\right)$$

- 2. The shortest pipe on an organ is approx. 7.5 cm long.
 - a) What is the fundamental frequency of the pipe if it is closed at one end?
 - b) Humans can typically hear a maximum frequency of 20,000 Hz. What is the highest harmonic of the pipe that can be heard?
- 3. Middle C on a piano is 261.63 Hz.
 - a) If this is the fundamental frequency of a 7-g piano wire that is 80 cm long, what is the tension in the wire?
 - b) If the tension of (a) drops 5% due to increasing temperature, what new frequency is sounded by the middle-C string?
- 4. Two point charges of 5μ C are separated by 10 cm.
 - a) Calculate the magnitude of the force exerted by one charge on the other.
 - b) How far apart should the charges be in order to reduce the electrostatic force to 1/25th the value calculated in (a)?

Name: _____