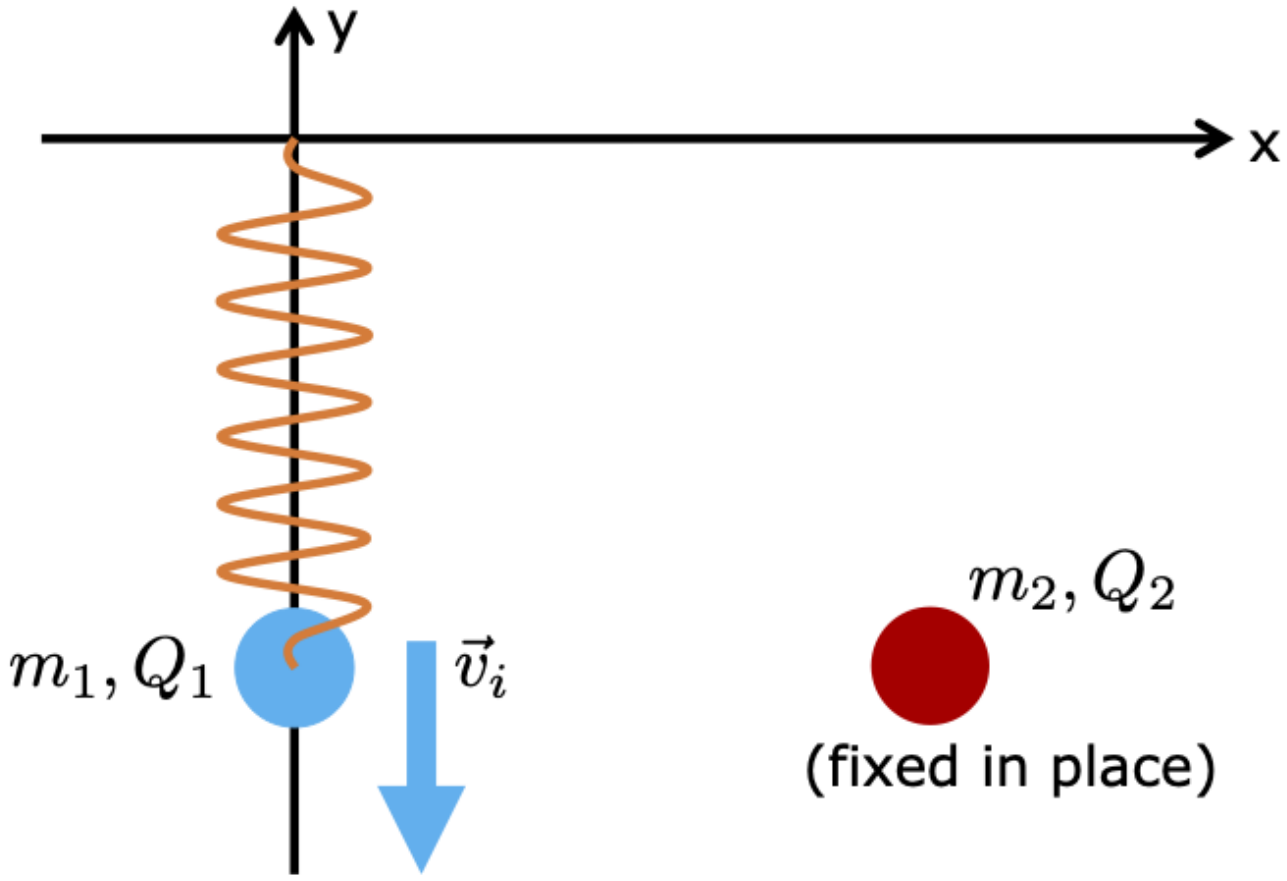
Physics 2211 GPS Week 5

A spring with relaxed length $L_0 = 20$ cm and stiffness $k = 100$ N/m is hanging vertically down with its fixed end at the origin. The moving end of the spring is attached to a ball that has mass $m_1 = 5$ kg and **negative** electric charge $Q_1 = -1 \times 10^{-4}$ C. At $t = 0$ (shown in the diagram), the ball is moving downwards with speed $v = 1$ m/s and the spring is stretched to a length $L = 30$ cm.

A second ball with the same mass ($m = 5$ kg) but with **positive** electric charge $Q = 1 \times 10^{-4}$ C is fixed, motionless and unable to move, at position $r_2 =< 45, -30, 0 >$ cm.



1. Take ball 1 alone to be the system. Draw a force diagram that shows ALL the forces acting on this system.

2. What is the (vector) force acting on ball 1 **due to the Earth**?

3. What is the (vector) force acting on ball 1 due to the **mass** of ball 2?

4. What is the (vector) force acting on ball 1 due to the **electric charge** of ball 2?

5. What is the (vector) force acting on ball 1 **due to the spring**?

6. What is the **net force** acting on ball 1?

7. Determine the **velocity** of ball 1 at $t = 0.1$ seconds.

8. Determine the **position** of ball 1 at $t = 0.1$ seconds.

9. What is the **new net force** acting on ball 1 at $t = 0.1$ seconds?

10. Find the **new position** of ball 1 at $t = 0.2$ seconds.