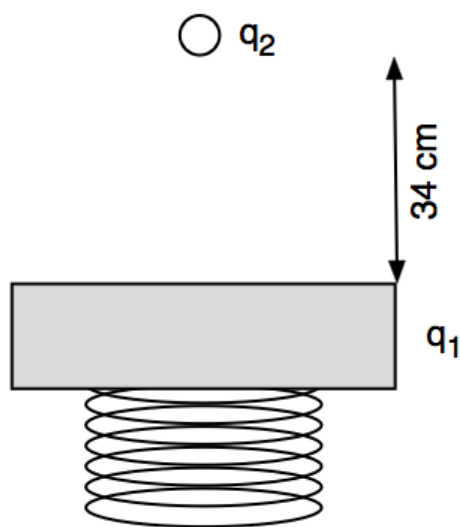


Physics 10164 – Spring 2019 Exam 1B

Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work even if you get the right answer. Clearly indicate your answer with a circle or a box and remember to include correct units and significant figures.

1. (35 pts) A 220-gram block with charge $q_1 = +15 \mu\text{C}$ is at rest on a spring that has a spring constant $k_s = 24 \text{ N/m}$. The spring is compressed 3.5 cm from its equilibrium position. What is the charge on q_2 , which is fixed in place 34 cm above the block? Only gravity, spring force and electric force are relevant. Treat the block as a point charge when finding electric force.



2. (35 pts) A ball with charge $-38\ \mu\text{C}$ and mass 23 grams is dropped from rest at a height 1.7 meters above the ground. The ball moves down toward the ground and has a speed of 4.3 m/s the instant before it hits the ground. Assume gravity and the electric force are the only relevant forces.

- a) What is the magnitude and direction of the uniform electric field through which the ball moves?
- b) If the voltage and ground level is exactly 0.0 Volts, what is the voltage at the ball's initial position?

3. (30 pts) For the arrangement shown below, assume charge q_2 has a mass of 75 grams, and you can assume the only relevant force is the electric force.

- a) How much work would be done by the electric force if charge q_2 moved from its location shown to location X?
- b) If charge q_2 starts at rest and is free to move from its position shown below, how fast is q_2 moving when it is only 17 cm away from charge q_1 ?

