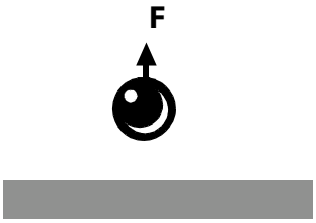
PhyzJob: Potential Energy

1. Gravitational Potential Energy

The 0.50 kg sphere to the right is immersed in a gravitational field created by a planet with a mass of 2.0×10^{20} kg and a radius of 3.0×10^{4} m.

a. What is the strength of the field at the surface of the planet?

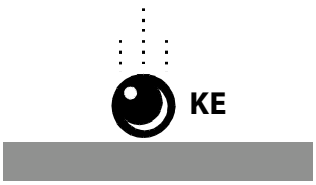
b. How much force must be exerted to lift the mass (i.e. what is the weight of the mass)?



c. How much work must be done to raise the mass 3.0 m above the surface?

d. How much gravitational potential energy does the sphere have when it's 3.0 m above the surface?

e. If the sphere were dropped, how much kinetic energy would it have right before it hit the surface?

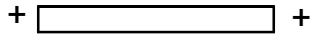


f. How fast would it be moving right before it hit?

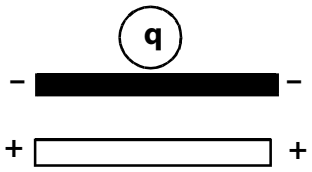
2. Electric Potential Energy

The sphere to the right has a charge of 50 nC and is immersed in an electric field created by two charged circular plates. The charge on each plate is 20 μC (top +, bottom –) and each plate's radius is 15 cm.

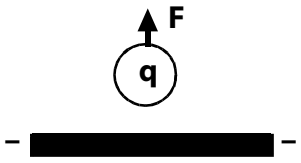
a. What is the strength of the field between the plates?



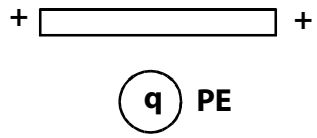
b. How much force must be exerted to lift the charge?



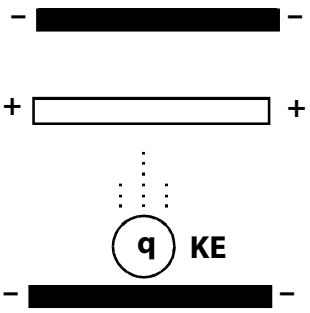
c. How much work must be done to raise the charge 2 cm away from the negative plate?



d. How much electric potential energy does the sphere have when it's 2 cm away from the negative plate?



e. If the charge were released, how much kinetic energy would it have right before it hit the negative plate?



f. If the sphere had a mass of 1.0 g, how fast would it be moving right before it hit? (Neglect gravity.)

1a. 14.8N/kg b. 7.4N c. 22.2J d. 22.2J e. 22.2J f. 9.4m/s 2a. 32MN/C b. 1.6N c. 32mJ d. 32mJ e. 32mJ f. 8.0m/s