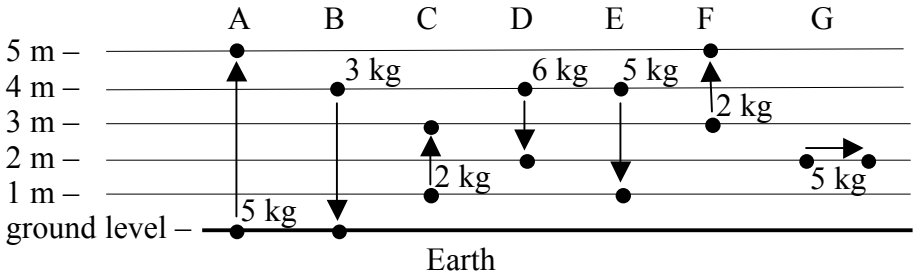
Electric Potential Model Worksheet 2:
Energy and Potential in Uniform Fields

1. Rank the change in gravitational potential energy for the following lettered objects in the Earth's gravitational field.



a. most → _____ _____ _____ _____ _____ _____ _____

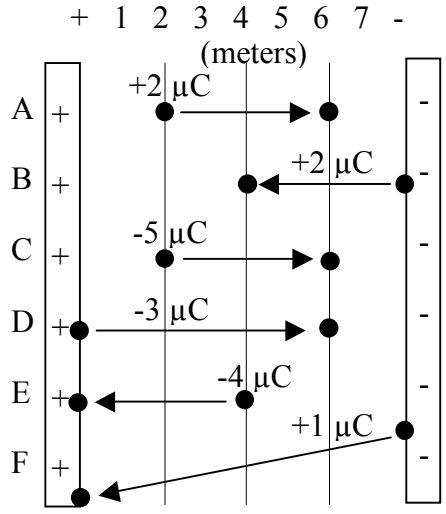
b. Explain your ranking, stating why each is greater than, less than, or equal to its neighbors.

c. Where is the energy stored? What gains or loses energy as the masses move from one place to another?

2. Rank the change in electrical potential energy for the following lettered objects in a uniform electric field between two charged walls. (Ignore gravitational effects.)

a. most → _____ _____ _____ _____ _____ _____

b. Explain your ranking, stating why each is greater than, less than, or equal to its neighbors.



c. Where is the energy stored? What gains or loses energy as the charges move from one place to another?

3. Two books, initially on the floor, are picked up and placed on a shelf 2.0 m off the floor. One, *Twenty Other Things I Like To Do With That Stuff Between My Toes*, has a mass of 1.0 kg. The other, *Why Physics Rules The Universe*, has a mass of 2.0 kg. The gravitational field strength near the surface of the Earth is approximately 10 N/kg.

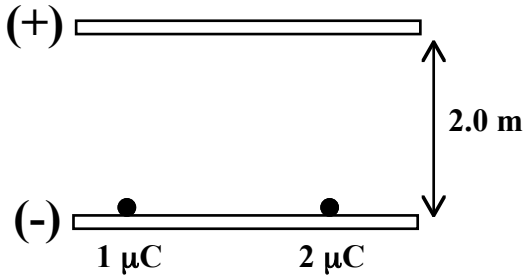
   a. Calculate the gravitational force acting on each book as it rests on the shelf. What factors determine the size of this force?

   b. Calculate the change in the system's gravitational potential energy as a result of picking each book up off the floor and placing it on the shelf. What factors determine the size of this change?

   c. What is the difference in gravitational potential (potential energy per unit mass) between the floor and the shelf? (Use data from each book to calculate this.) What factors determine the size of this difference?

   d. How does gravitational potential differ from gravitational potential energy?

4. Below are two parallel conducting plates, each carrying an equal quantity of excess charge of opposite type. The plates are separated by 2.0 m.



Between the pair of plates are two positively charged objects; the object on the left carries 1.0 μC of excess charge, the object on the right carries 2.0 μC. The electric field strength between the plates is uniform, and approximately 10 N/C. You move each charge from the negative plate to the positive plate. [For this example, neglect the effects of the gravitational field.]

a. Calculate the electrical force acting on each object when it is between the plates. What factors determine the size of this force?

b. Calculate the change in the system's electrical potential energy as a result of moving each charge from the negative plate to the positive plate. What factors determine the size of this change?

c. What is the difference in electric potential (potential energy per unit charge) between each of pairs of plates? What factors determine the size of this difference?

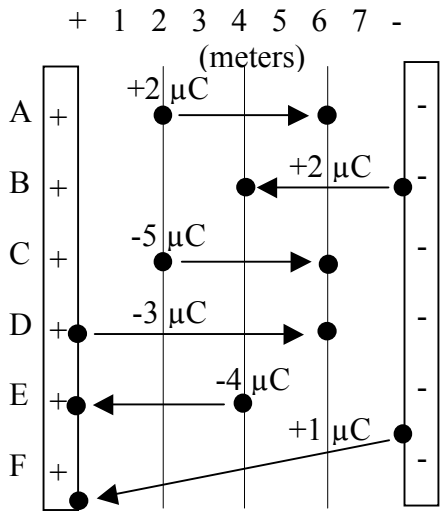
d. What is the difference in electric potential between the negative plate and a point midway between the plates?

e. How does electrical potential differ from electric potential energy?

5. Rank the electrical potential difference for the following lettered objects in a uniform electric field of 6 N/C between two charged walls. (Ignore gravitational effects.)

   a. most → _____ _____ _____ _____ _____ _____

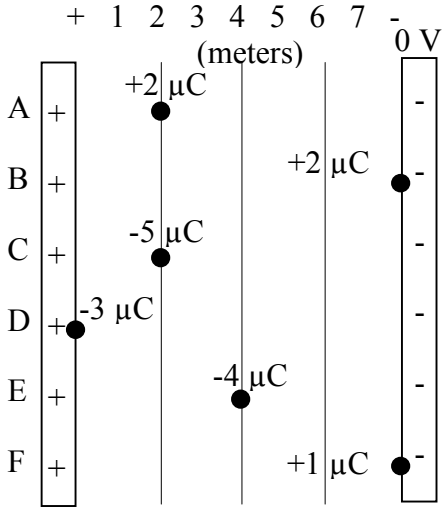
   b. Explain your ranking, stating why each is greater than, less than, or equal to its neighbors.



6. Rank the electrical potential at the positions of the lettered charges in a uniform electric field of 10 N/C between two charged walls. The negative wall potential has arbitrarily been designated as 0 Volts.

   a. most → _____ _____ _____ _____ _____ _____

   b. Explain your ranking, stating why each is greater than, less than, or equal to its neighbors.



7. The units for electric field were given as $\frac{N}{C}$. It turns out that the electric field strength can also be given in $\frac{V}{m}$. Show that these units are equivalent.