**Practice Quiz 6** **DL #**_____ **Name** (last)________________________ (first)__________________ |___|___|___

first 3 letters last name

**Rubric Codes: 9** **Student ID:** ___________________________

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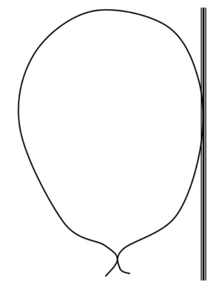
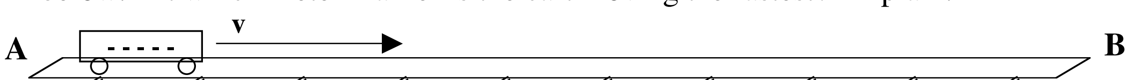
**1.** You can rub a balloon against your shirt, where it picks up extra electrons, and then hold the balloon against the wall and it will stick to the wall. Explain why the balloon sticks to wall (Remember the wall is not metal and therefore does not have "free electrons"). Include a balanced force diagram that includes the electrical force and gravitational force (assume the electrical force is twice the magnitude of the gravitational force). Draw all of the forces to scale.



**2.** A negatively charged cart moves along a frictionless track from point A to point B. The care has enough speed to make it all the way to point B. There is a non-constant electric field along the track. The field values change at each meter of the track and are known (<– Toward A or –> Toward B). This info is given below. At which meter marker is the cart moving the fastest? Explain.




| distance [m] | 1 m | 2 m | 3 m | 4 m | 5 m | 6 m | 7 m | 8 m | 9 m | 10 m |
|---|---|---|---|---|---|---|---|---|---|---|
| E field [V/m] | 150 → | 50 → | 0 | 50 ← | 100 ← | 200 ← | 100 ← | 50 ← | 0 | 100 → |

$$F_{grav} = GMm/r^2 = mg; \quad F = -dPE/dr = -\Delta PE/\Delta r;$$

$$F_{elec} = kQq/r^2 = qE; \quad E = -dV/dr = -\Delta V/\Delta r; \quad \Delta PE = q\Delta V; \; PE=-pE\cos\theta$$

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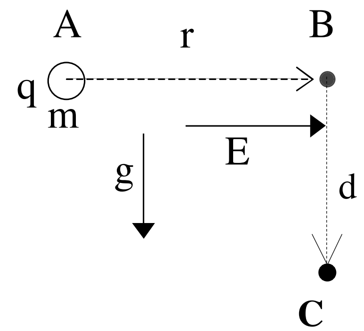
**3.** A large particle is moved in a region with both a ***uniform electric field (E)*** and a ***uniform gravitational field (g)***. The mass, m, of the particle is 3 kg. The charge, q, of the particle is -5 C. The strength of the electric field is 15 N/C. The strength of the ***vertical*** gravitational field, g, is 10 N/kg and is pointing ***straight down***. The distance, r, between A and B is 20 cm. The distance, d, between B and C is 15 cm.




a) The particle is moved horizontally from point A to point B in the ***same direction*** as a ***uniform electric field (E)*** as shown. Determine if the particle will gain, lose or have no change in **electric potential energy ($\Delta PE_{elec}$)** and **gravitational potential energy ($\Delta PE_{grav}$)** as it moves from A to B? Explain.

b) The particle is moved directly from point A to point C. Determine if the particle will gain, lose or have no change in **electric potential energy ($\Delta PE_{elec}$)** and **gravitational potential energy ($\Delta PE_{grav}$)** as it moves from A to B? Explain.

c) Calculate the magnitudes of any non-zero changes in either type of potential energy from parts a or b. Be sure to include the correct sign.

$$F_{grav} = GMm/r^2 = mg; \quad F = -dPE/dr = -\Delta PE/\Delta r;$$

$$F_{elec} = kQq/r^2 = qE; \quad E = -dV/dr = -\Delta V/\Delta r; \quad \Delta PE = q\Delta V; \quad PE = -pE\cos\theta$$

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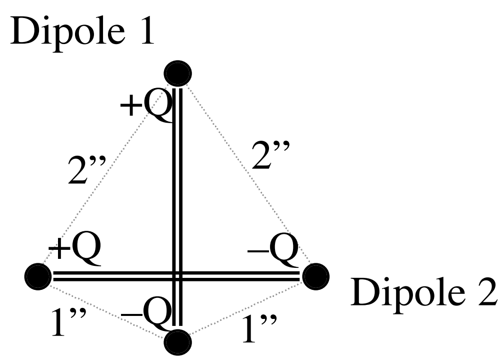
**4.** Dipole 1 is the "***source***" and Dipole 2 is the "***target***." Draw the force vectors due to the source acting on **each pole** of the ***target***. Show the forces due to ***each pole of the source*** AND the net force due to the ***entire source*** (Dipole 1). Note: The vectors should be **scaled properly** relative to each other.
FYI: The distance from negative pole of dipole 1 to the **each pole** of dipole 2 (1 inch) is approximately half of the distance from the positive pole of dipole 1 to the **each pole** of dipole 2 (2 inches).




$$F_{grav} = GMm/r^2 = mg; \quad F = -dPE/dr = -\Delta PE/\Delta r;$$

$$F_{elec} = kQq/r^2 = qE; \quad E = -dV/dr = -\Delta V/\Delta r; \quad \Delta PE = q\Delta V; \ PE=-pE\cos\theta$$