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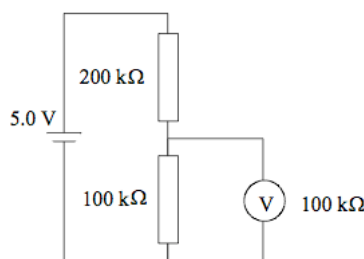
Date _____

Mr Rawson



Fields and Forces I

1. In the diagram, the voltmeter V has a resistance of $100\text{ k}\Omega$ and is connected such as to measure the potential difference across the $100\text{ k}\Omega$ resistor. The battery has an emf of 5.0 V and negligible internal resistance.



The reading on the voltmeter will be

- (a) 4.0 V
 - (b) 2.5 V
 - (c) 1.0 V
 - (d) Zero
2. Plate 1 and Plate 2 are a pair of charged, parallel metal plates with a potential difference between them. The work done in taking a given charge from one plate to the other is W .

Plate 1

Plate 2

If the separation of the plates is doubled and the potential difference is kept the same, the work required to take the same amount of charge from one plate to the other is

- (a) W
- (b) $\frac{W}{2}$
- (c) $2W$
- (d) $4W$

3. An alpha particle is fired at a thin piece of gold foil and as a result passes close to a gold nucleus. As it approaches the gold nucleus, which one of the following is true about the potential energy and the magnitude of the momentum of the alpha particle?

	Potential Energy	Momentum
(a)	decreases	unchanged
(b)	increases	decreases
(c)	decreases	decreases
(d)	increases	unchanged

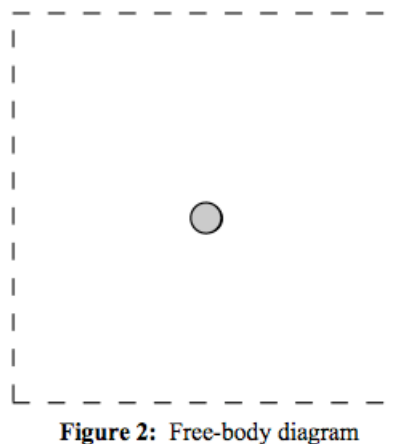
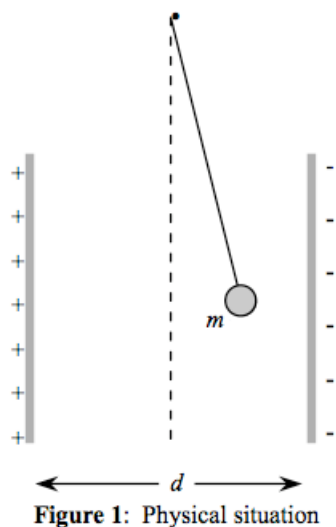
4. Two positive charges P and Q are fixed at the points shown. The charge of P is greater than that of Q. M is the mid point between the charges.



The electric field due to the two charges will be zero at a point, other than infinity, that is

- (a) to the left of P
- (b) between P and M
- (c) between M and Q
- (d) to the right of Q

5. A light metal-coated pith ball of mass m is suspended between two vertical plates as shown. A potential difference V is applied between the plates, which are a distance d apart. When the ball is charged, the string hangs at an angle to the vertical as shown.



- (a) Sketch the electric field lines due to the plates alone in Figure 1
- (b) What is the sign of the charge on the ball?
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- (c) Draw a free body diagram in Figure 2, for the pith ball hanging at an angle. Label each force.
- (d) By considering the work done in moving a charge between the plates, show that the electric field E between the plates is given by $E = \frac{V}{d}$. Show all steps.
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- (e) The mass of the ball is 40 milligrams, the applied potential difference is 480 V, and the separation is 6 cm. If the string hangs at an angle of 20° to the vertical, determine the charge on the pith ball.
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- (f) An arrangement like this can serve as a charge-measuring device. How would you make the device more sensitive, to measure smaller charges than that above? State two changes you could make to the set up.
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