**Problem Set 12 Electric Potential (Due 06/05/2025 before class)**

**Late homework will NOT be accepted, unless you have notified the course instructor 3 days BEFORE deadline.**

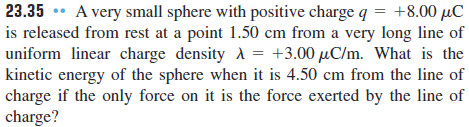
**Part I (60%)**

A diagram of a point

Description automatically generated with medium confidence

**文本

AI 生成的内容可能不正确。**

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**Part II (40%)**

1. Determine the electric potential at 0.001 m from a charge of 2pC
2. To continue the previous question, if a second charge (-2pC) was the same distance from the point of interest as the first charge, find the total electric potential at that point.
3. To continue the previous question, if the second charge was closer to the point of interest would the total potential be positive of negative?
4. Two charges are located on corners of a rectangle with a height of 0.05 m and a width of 0.15 m. The first charge (q1 = -5×10-6 C) is located at the upper left hand corner, while the second charge (q2 = +2.0 ×10-6 C) is at the lower right hand corner. Determine the electric potential at the upper right hand corner of the rectangle.
5. Two charged particles are held in place on the x-axis of a coordinate system. Charge q1 (5 C) is at the origin. Charge q2 (3 C) is at x = 1 m. A relatively small positive test charge (q = 0.01 C, m = 0.001 kg) is released from rest at x = 0.5 m. Will the test charge move to the right or the left? Additionally, use the concepts of electric potential and electric potential energy to determine the speed of the test particle after it moves 0.1 m.

For questions 6-7: A charge q is distributed uniformly throughout a spherical volume of radius R.

1. Setting V = 0 at infinity, derive the potential at a distance r from the center, where r < R,
2. What is the potential difference between a point of the surface and the sphere’s center?.
3. What are the charge and the charge density on the surface of a conducting sphere of radius 0.15 m whose potential is 200 V (with V = 0 at infinity)?
4. An empty hollow metal sphere has a potential of +400 V with respect to ground (defined to be at V = 0) and has a charge of 5.0 × 109 C. Find the electric potential at the center of the sphere
5. What is the excess charge on a conducting sphere of radius R = 0.15 m if the potential of the sphere is 1500 V and V = 0 at infinity?