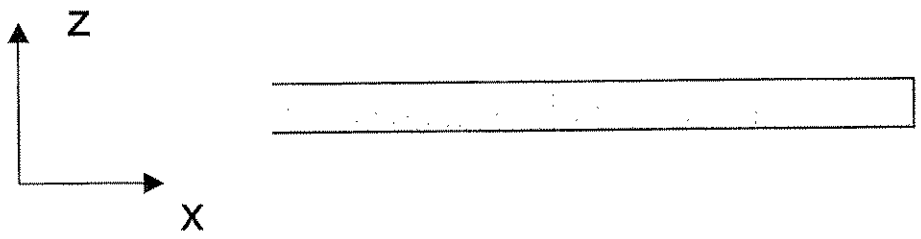
EE Qual 08, Engineering Phys.
Shan Wang

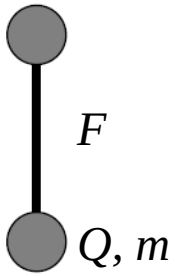
1. Write down the Maxwell equations. [2 pt]
2. Electric field is in general equivalently described by electric potential, why is magnetic field often described by both vector potential and scalar potential? [2 pt]
3. Consider a semi-infinitely long (x direction) and infinitely wide (y direction) but very thin (z direction) magnetic bar with a uniform magnetization ***M*** along the z direction. Derive the magnetic field outside the magnetic bar. [4 pt]

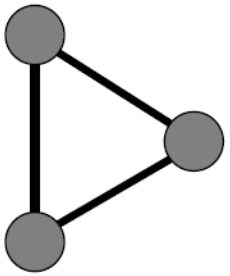


4. Sketch the scalar potential of the magnetic field above. [2 pt]

EE Qual 13, Engineering Phys.
Shan Wang

You are given a large collection of identical balls and strings. All the balls have the same electric charge, Q, and mass, m. The lengths of the strings are initially fixed at l. When two balls are placed at the ends of one string, the tensile force in the string is F. Next, three balls and three strings are placed at the vertexes and edges of an equilateral triangle.





a) What is the tensile force in each string in the latter case? [2 pt]

b) If the strings are ideally elastic with a spring constant of k and an original length of l. What is the new size of the triangle at equilibrium? [3 pt]

c) There can be many resonance modes for the triangle in (b). Find the frequency of one of the any resonance modes. [5 pt]