FACULTY OF INDUSTRIAL SCIENCES & TECHNOLOGY
MATERIAL TECHNOLOGY PROGRAMME

ELECTRICITY, MAGNETISM & OPTICS

by Muhammad Hafiz bin Mazwir

CH03: ELECTRIC POTENTIAL

1. An electron is moving away from a chloride ion (Cl^-). When the electron is 1 nm away from the chloride ion, it is moving at a speed of 4.50×10^5 m/s. Calculate the speed of the electron when it is 2 nm away from the ion.

2. On the Cartesian coordinate, a proton is placed at (0, 0) and an electron is placed at (a, 0).
   (i) Calculate the work that must be done by an external force to bring another electron from infinity to ($2a$, 0).
   (ii) Find the total potential energy of the system with all the three particles.

3. An electric dipole consists of one proton and one electron placed 4.0 mm apart as shown in figure 3.1. Calculate the electric potential at points a and b.

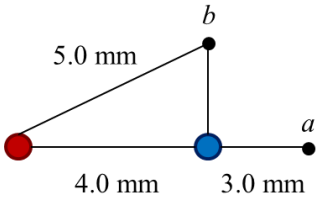

Figure 3.1

4. An electron moves straight for a distance of 0.50 mm in an electric field. The electric field is uniform along this line with magnitude 2.5×10^{-2} V/m.
   (i) Calculate the force on the electron.
   (ii) Find the work done on it by the electric field.
   (iii) Determine the potential difference between the starting and ending point.

5. A solid conducting sphere of radius R has a total charge q. Find the electric potential everywhere, both outside and inside the sphere. Compare it with the electric field, and sketch both graphs of V and E against r