

Tutorial 1

Issued
Take to tutorials on

Thursday 7th October
Friday 8th October

See the Year 1 Notice Board for tutorial groups, tutors, locations and times of tutorials. If you have any problems with the tutorial timetable, please contact me as soon as possible!

Problems

- Two table tennis balls collide resulting in the transfer of some electrons from one ball to the other. The balls are then separated, so that their centres are 4 cm apart.
 - In which direction does the electrostatic force between the balls act?
 - If the strength of the force is 9.0 N, what is the charge on the balls? (You may assume that the charge is uniformly distributed over the surface of the spherical table tennis balls.)
 - How many electrons were transferred from one ball to the other?
- A clock face has negative point charges $-q$, $-2q$, $-3q \dots -12q$ fixed at the positions of the corresponding numerals. At what time does the hour hand point in the same direction as the electric field at the centre of the dial? You may assume that the clock's hands do not perturb the field. Try to do this problem by means of a diagram, with no calculations. (Hint, consider diametrically opposed charges.)
- An electric dipole consists of charges $+2e$ and $-2e$ separated by 0.78 nm. It is in an electric field of magnitude $3.4 \times 10^6 \text{ NC}^{-1}$. Calculate the magnitude of the torque on the dipole when the dipole moment is:
 - Parallel to the field.
 - At right angles to the field.
 - Opposite (anti-parallel) to the electric field.

In each case draw a diagram illustrating the direction of the field, the direction of the dipole and the rotation produced by the torque.