FACULTY OF INDUSTRIAL SCIENCES & TECHNOLOGY
MATERIAL TECHNOLOGY PROGRAMME

ELECTRICITY, MAGNETISM & OPTICS
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CH01: ELECTRIC CHARGE & ELECTRIC FIELD

1. A small object has charge of -5.27×10^{-9} C. Calculate the amount of excess electrons on the object.

2. Two balls hanging freely from the ceiling are electrically attracted to each other. Determine whether the balls are charged, and if they are, determine the charge sign.

3. All objects with mass, no matter how small the mass is, are attracted to each other due to gravitational force. An α-particle is the nucleus of a helium atom (^4_2He). Compare the magnitude of the electric repulsion between two α particles with that of the gravitational attraction between them. Determine whether the two α particles will be attracted together due to gravity or repelled due to the electrostatic force.

4. Two charged objects are placed on the *x*-axis of Cartesian coordinate system. The first object carries charge of -3.7 µC and is located at origin (0, 0), while the second object carries charge of 6.8 µC at (4.5, 0).
   (i) Calculate the electrostatic force exerted on the second object by the first one.
   (ii) Another object with charge 1.2 µC is placed at (3.3, 0). Determine the electrostatic force exerted on the third charge.
   (Tip: Do not forget to include the direction of the force!)

5. An α-particle is placed at the origin of the Cartesian coordinate system, (0, 0). Find the electric field at points:
   (i) (0, 6)
   (ii) (3, 0)
   (iii) (3, 6) *(Tip: Do not forget to include the direction of the electric field!)*