

PART A: PROBLEMS (40 MARKS)

Answer questions 1 and 2 in the space provided. Answer the remaining questions on a separate sheet of paper. You may use the back of this sheet if you wish.

- {5} 1. A positive charge of $+3.2 \times 10^{-6}$ C experiences an electric force of magnitude 4.0 N, acting to the left. What is the magnitude and direction of the electric field at that point?
- {9} 2. Calculate the electric field intensity midway between two negative charges of 4.3×10^{-9} C and 8.6×10^{-9} C that are 20 cm apart. Include a diagram of the situation.

- {15} 3. Two 2.0 g spheres are attached to each end of a silk thread 1.20 m long. The spheres are given identical charges and the midpoint of the thread is then suspended from a point on the ceiling. The spheres come to rest in equilibrium, with their centres 15 cm apart.
- (a) Draw a diagram of the situation.
(b) Draw a FBD of one of the spheres.
(c) What is the magnitude of the charge on each sphere?

- {11} 4. Two small oppositely charged spheres X and Y are fixed in position, as shown, and have charges of $+40 \mu\text{C}$ and $-40 \mu\text{C}$, respectively. Determine the magnitude and direction of the net electrical field (ϵ_{net}) at point Z in the diagram given, due to the charges at points X and Y. (Hint: Z is a small positive test charge!)

