3 Fig. 3.1 shows two positive point charges q_1 and q_2 affixed to positions X and Y respectively, on a circular nylon frame centred at point O. The circular frame has a radius *r.*

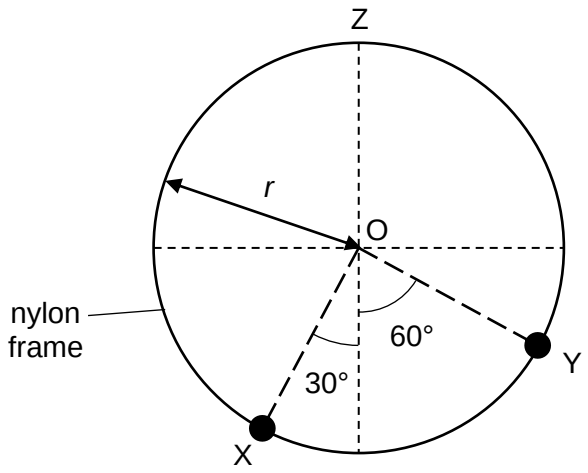

Fig. 3.1

At point O, the direction of the net electric field strength is directed upwards along OZ.

(a) (i) Show that the ratio $\frac{q_1}{q_2}$ is 1.7.

[1]

(ii) Hence, sketch in Fig. 3.2 the variation of electric field strength with distance along the straight line XY.

Fig. 3.2

[2]

(b) Given that $r = 0.50$ m and $q_2 = 200$ nC, determine the

(i) magnitude of electric field strength at O,

electric field strength = …… V m^{-1} [2]

(ii) total electric potential at O,

electric potential = …… V [1]

(iii) the work done in moving an additional third charge $q_3 = -2q_2$ from infinity to point O.

work done = ……eV [2]

[Total: 8]