Year 11 Physics

Electric Fields Assignment ***SOLUTIONS***

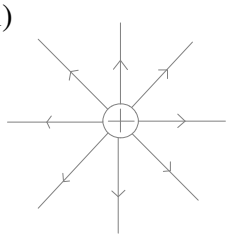
1.

a) A place where a charged object experiences a force. /2

b) A line representing the force a positive charge would feel. The arrow shows the direction of the force it feels. /2

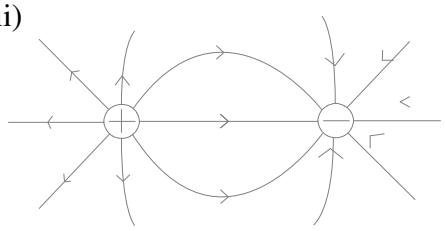
c)

i)



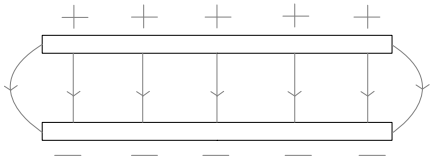
/1

ii)



/2

iii)



/2

2.

a) $q_1 = +4.1\times10^{-6}\text{C} \qquad r = 2.0\times10^{-2}\text{m} \qquad E$=?

$$E = k\frac{q_1}{r^2}$$

$$= 9\times10^9 \times \frac{4.1\times10^{-6}}{\left(2\times10^{-2}\right)^2}$$

$$= 9.2\times10^7\ \text{NC}^{-1}$$

The electric field strength at P due to q_1 is $9.2\times10^7\ \text{NC}^{-1}$ (2 s.f.) away from q_1 /3

b) $q_1 = -1.2\times10^{-6}\text{C} \qquad r = 3.1\times10^{-2}\text{m} \qquad E$=?

$$E = k\frac{q_2}{r^2}$$

$$= 9\times10^9 \times \frac{1.2\times10^{-6}}{\left(3.1\times10^{-2}\right)^2}$$

$$= 1.1\times10^7\ \text{NC}^{-1}$$

The electric field strength at P due to q_2 is $1.1\times10^7\ \text{NC}^{-1}$ (2 s.f.) away from q_1 /3

c) The electric field strengths are in the same direction so they add together.
So the total electric field strength at P is
$9.2\times10^7 + 1.1\times10^7 = 1.0\times10^8\ \text{NC}^{-1}$ (2 s.f.) away from q_1

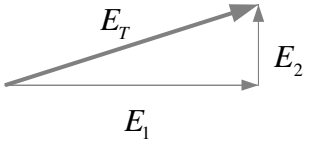
/3

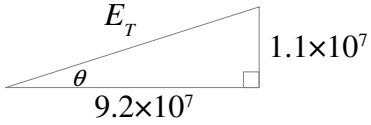
3.

a) There is none /1

b) On the outside, and concentrated on the point. /2

[Bonus question]





$$E_T = \sqrt{\left(9.2\times10^7\right)^2 + \left(1.1\times10^7\right)^2} = 9.3\times10^7\ \text{NC}^{-1}$$

$$\theta = \tan^{-1}\left(\frac{1.1\times10^7}{9.2\times10^7}\right) = 6.8°$$

E_T is 9.3 x $10^7\ \text{NC}^{-1}$ at 6.8° up from right

/3

TOTAL /24