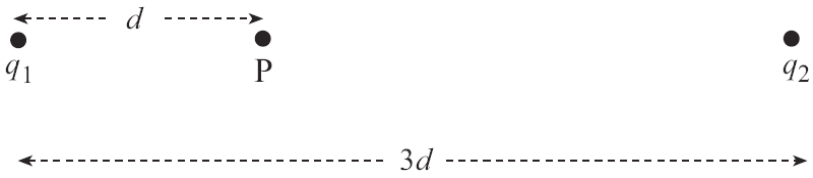
Electric Fields Assignment NAME_____

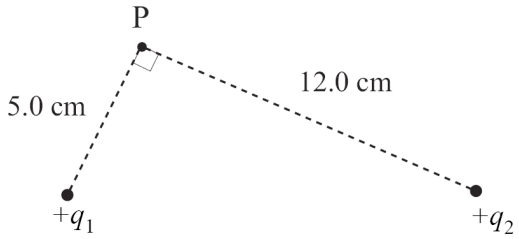
1. Two point charges, q_1 and q_2, are separated by a distance $3d$ in a vacuum, as shown in the diagram below. Point P is situated on a line between q_1 and q_2, at a distance d from q_1.



a) Write an expression in terms of q_1 and d for the electric field at point P due to point charge q_1. /1

b) The strength of the electric field at point P is zero. Calculate the ratio $q_1 : q_2$ of the point charges. /3

c) If q_1 is +1.0 C and the charges are now rearranged as shown below:



Calculate the magnitude and direction of electric field strength at point P due to q_1 and q_2. /7

2. Explain how the electric forces are consistent with Newton's third law. /2

3. You have committed an electric crime and are charged with 2.31 mC. As punishment you are placed in an electric field and feel a force of 462N.

Calculate the magnitude of the electric field strength at the point which you are placed. /2

4. Using Coulomb's law, derive the expression $E = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}$ for the magnitude of the electric field at a distance r from a point charge q. /3

5.

a) Sketch the electric field produced by a hollow spherical charged conductor. /2

b) Explain why there is no electric field inside the conductor. /2

6. Sketch the electric field that results when a solid uncharged conducting sphere is placed in the region between two oppositely charged finite parallel plates. Include any field in and around the plates. /3

7. Explain why the air in the vicinity of a charged sharp point may be ionised. /3

8. Explain why the component of the electric field parallel to a conducting surface will always be zero. /2

TOTAL /30