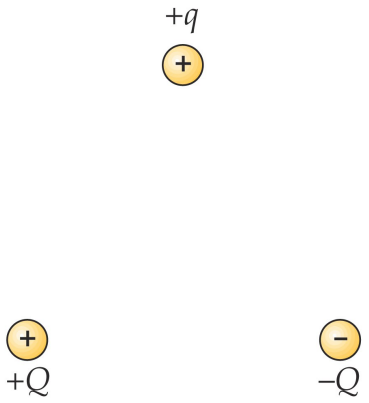
Electromagnetism I – Problem sheet 1

Problem 1. Three charges, $+q$, $+Q$ and $-Q$, are placed at the corners of an equilateral triangle as shown in the Figure.



1. Which of the following statements is true?

   The net force on the charge $+q$ due to the other two charges is:

   (a) vertically up;

   (b) vertically down;

   (c) zero;

   (d) horizontal to the left;

   (e) horizontal to the right. **[2 marks]**

2. Which of the above statements is true if the $-Q$ charge is replaced by a $+Q$ charge? **[2 marks]**

Problem 2. Two charges q_1 and q_2 are placed at the vertices of a right-angled triangle as shown in the Figure below. The value of the charge q_1 is $|q_1| = 15\mu\ C$, but its sign is not know. For the charge q_2, both the sign and the magnitude are not known. The resulting electric field $\vec{E}$ produced by the two charges at P is as shown, in the negative y direction.

1. Based on symmetry considerations, deduce the sign of the charges q_1 and q_2. **[2 marks]**
2. Evaluate the value of the charge q_2. **[2 marks]**
3. Evaluate the magnitude of the electric field $\vec{E}$ at P. **[2 marks]**