

1. Very small metal spheres A and B are on glass stands placed 0.3 m apart as in Fig. 1.

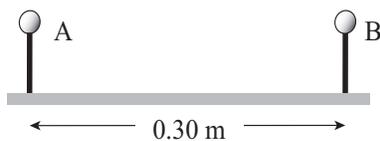


Figure 1:

- (a) Initially, A has  $5 \mu\text{C}$  and B has  $-1 \mu\text{C}$ . What is the force acting on A due to B? Compute its magnitude and draw its direction in the figure with an arrow.  
 (b) Then, after A and B are connected with a conducting wire, they are again isolated as before without moving them. What is the force acting on A due to B? Compute its magnitude and draw its direction in the figure with an arrow.

1. Very small metal spheres A and B are with glass handles as in Fig. 2. Initially, A has no net charge and B has a net charge  $Q$ . After the metal spheres are connected, they are separated and placed as in the right-lower figure.

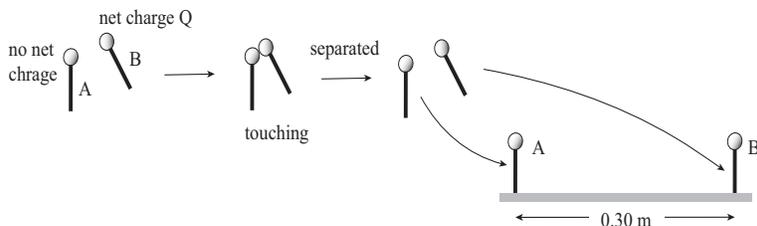


Figure 2:

The magnitude of the force acting on charge at A is 10 N. What is the original net charge  $Q$  on B before touching with A.

2. On the  $xy$ -plane a cart is displaced by a displacement vector  $(1, 1.5)$  m first from the origin, and is then further displaced from the last end point by another displacement vector  $(-3, 5)$  m. What is the total displacement distance of the cart?

3. At the corners of an equilateral triangle of edge length 3 m are the following charges: A:  $2 \mu\text{C}$ , B:  $1 \mu\text{C}$ , C:  $-1 \mu\text{C}$ .

(a) What is the force on charge B due to charge A? Compute the magnitude and indicate its direction clearly in the figure 3.

(b) What is the total force acting on A. Compute the magnitude and indicate its direction clearly in the figure 3.

(c) What is the sum of all the forces acting on all charges?

4. Look at the configuration of three charges in the figure 4. A and C have  $2 \mu\text{C}$  and B  $-2 \mu\text{C}$ .

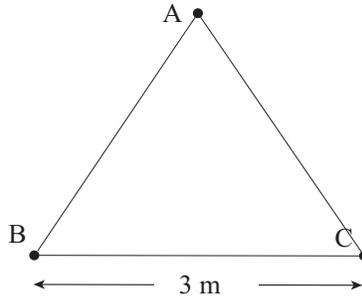


Figure 3:

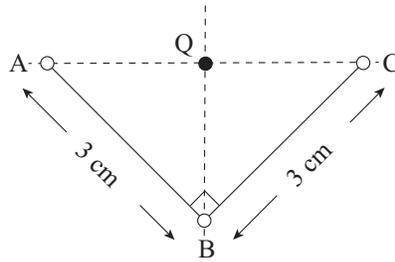


Figure 4:

- (a) What is the total force acting on  $B$  from the other charges? Compute the magnitude and indicate its direction in the figure 4.
- (b)  $Q$  is the point equidistant from all three points  $A$ - $C$  and on the line connecting  $A$  and  $C$ . What is the total force acting on a  $2 \mu\text{C}$  charge placed at  $Q$ ? Compute the magnitude and indicate its direction in the figure 4.

5. On a line are two points  $A$  and  $B$  as shown in the figure (Fig. 5). At  $A$  is charge  $-3 \mu\text{C}$ , and at  $B$  charge  $-5 \mu\text{C}$ . There is some unknown charge at  $Q$ .

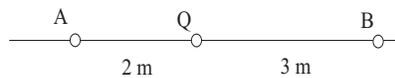


Figure 5:

- (a) The force on the charge at  $A$  due to that at  $Q$  is  $25 \text{ N}$  to the left. Compute the charge at  $Q$ .
- (b) There is no net force on the charge at  $Q$ . What is the charge at  $B$ ?