

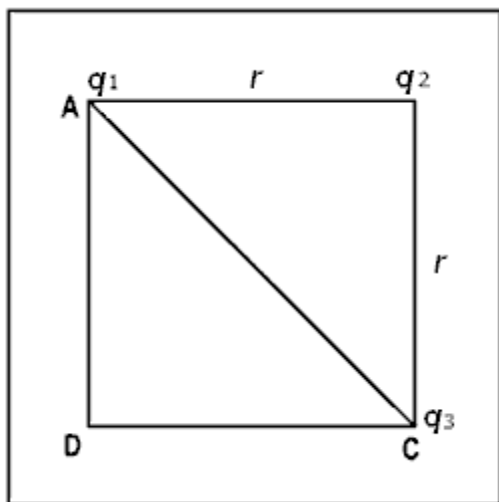
Chapter 20 Problems

Multiple Choice

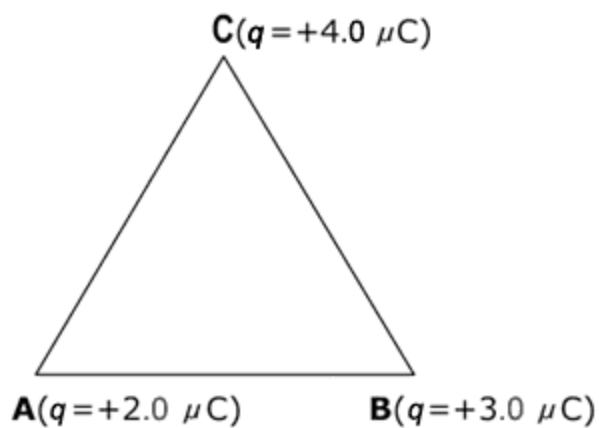
Identify the choice that best completes the statement or answers the question.

- _____ 1. Which of the following statements is true about electric forces?
- Electric forces cause objects to only attract each other.
 - Electric forces cause objects to only repel each other.
 - Electric forces cause objects to repel or attract each other.
 - Electric forces have no effect on each other.
- _____ 2. Three rods of different materials P, Q, and R, are charged by various methods. When the rods are brought near each other, the rods P and Q repel each other, while the rods P and R attract each other. Which of the following could be the signs of the charges on the rods?
- | | Rod P | Rod Q | Rod R |
|----|-------|-------|-------|
| a. | - | + | - |
| b. | - | + | - |
| c. | - | - | + |
| d. | - | - | - |
- _____ 3. Which of the following materials is the best conductor of electricity?
- Wet skin
 - Glass
 - Dry air
 - Rubber
- _____ 4. When two bodies are charged, the total charge before and after charging remains the same because of:
- quantization of charges
 - conservation of charges
 - law of induction
 - Coulomb's law
- _____ 5. When a conducting sphere is charged positively, initially the charge is deposited on the left side. However, due to the sphere's conducting nature, the charge spreads uniformly throughout the surface of the sphere. Charge is uniformly distributed because:
- charged atoms at the location of charge distribute throughout the surface.
 - excess protons move from the location of charge to rest.
 - excess electrons within the sphere move toward excess protons.
 - excess charge within the sphere moves out into the ground from the surface.
- _____ 6. The distance between two charges q_a and q_b is r , and the force between them is F . What is the force between them if the distance between them is doubled?
- $F/4$
 - $4F$
 - $9F$
 - $F/9$
- _____ 7. Charging by _____ charges a neutral body by touching it with a charged body; whereas charging by _____ charges an object without touching it with a charged body.
- conduction, induction
 - induction, conduction
 - force, conduction
 - force, induction
- _____ 8. Electric forces can be either repulsive or attractive, whereas gravitational force is always:
- attractive
 - repulsive
 - both a and b
 - neither a nor b

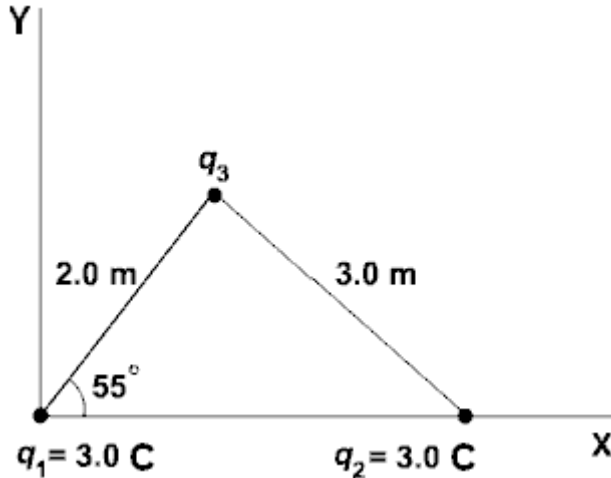
20. Three equal charges are placed at three corners of a square as shown in the diagram. The force exerted by q_1 on q_2 is represented by F_{12} and the force exerted by q_1 on q_3 is represented by F_{13} . Determine the ratio of the magnitude between F_{12} and F_{13} .



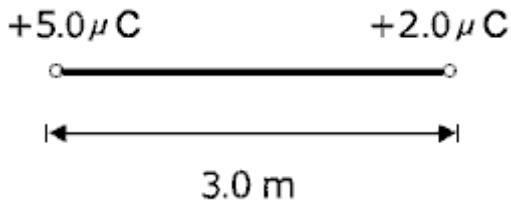
21. The charges $+2.0 \mu\text{C}$, $+3.0 \mu\text{C}$, and $+4.0 \mu\text{C}$ are placed at points A, B, and C of an equilateral triangle with each side of 0.20 m . Determine the force on the charge $+4.0 \mu\text{C}$ placed at the point C.



22. Three charges, q_1 , q_2 , and q_3 , are placed as shown in the diagram. The magnitude of charges q_1 and q_2 is 3.0 C each. The magnitude of the charge q_3 is 1.0 C . The distance between q_1 and q_3 is 2.0 m . The distance between q_2 and q_3 is 3.0 m . The vector from q_1 to q_3 has an angle of 55° . Determine the net force on charge q_3 .

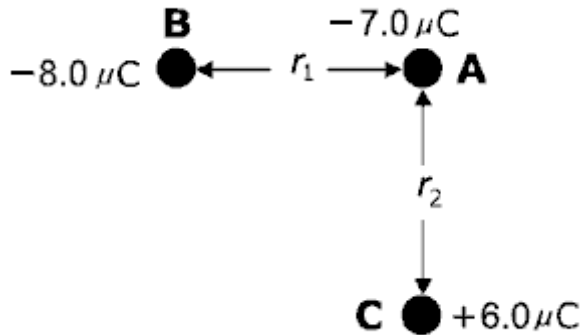


23. Two charges $+5.0 \mu\text{C}$ and $+2.0 \mu\text{C}$ are placed at a distance of 3.0 m from each other as shown in the diagram. Where would you put a positive charge of $+1.0 \mu\text{C}$ in the diagram so that the net electrostatic force on it is zero?

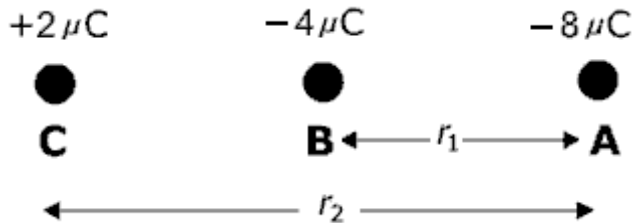


24. There are two balloons of charges $+3.37 \mu\text{C}$ and $-8.21 \mu\text{C}$. The distance between the two balloons is 2.00 m . Determine the force between the two balloons.

25. Charges A and B are placed on the x -axis. Another charges C is placed below A. The magnitude of charge A is $-7.0 \mu\text{C}$ and that of charge B is $-8.0 \mu\text{C}$. The magnitude of the charge C is $+6.0 \mu\text{C}$. The distance between A and B is 14.0 cm and the distance between B and C is 20.0 cm . What is the net force on charge A?



26. Three charges A, B, and C, are placed on the x -axis as shown in the diagram. The charge on C is $+2 \mu\text{C}$, the charge on B is $-4 \mu\text{C}$, and the charge on A is $-8 \mu\text{C}$. The distance between A and B, r_1 , is 15 cm . The distance between A and C, r_2 , is 18 cm . Determine the net force on A.



27. Three charges A, B, and C are placed on the x -axis as shown in the diagram. The charge of C is $+3.00 \mu\text{C}$, the charge on B is $-3.00 \mu\text{C}$, and the charge on A is $-5.00 \mu\text{C}$. The distance between A and B is 12.0 cm and distance between A and C is 20.0 cm . Determine the net force on A.

