NAME Key ______________________ CLASS ______________

Chapter 22 Coulomb's Law and Electric Fields

Directions: *Write in the space provided to the left the letter of the choice that best completes each statement.*

__c__ 1. The strength of the electric field between two oppositely charged parallel plates is:
a. a maximum midway between the plates
b. a maximum near the positively charged plate
c. constant between the plates except near the edges
d. zero midway between the plates

__d. 8×10^{-5}__ 2. Two charges repel each other with a force of 2×10^{-5} N at a distance of 2 m. If the distance is decreased to 1 m, the force of repulsion in N will be:
a. 1×10^{-5} c. 5×10^{-6}
b. 4×10^{-5} d. 8×10^{-5}

__d 8×10^{-5}__ 3. In question 2, if both charges are doubled while the distance between them is restored to 2 m, the force between them in N will be:
a. 2×10^{-5} c. 6×10^{-5}
b. 4×10^{-5} d. 8×10^{-5}

__b__ 4. Coulomb's law of force between electric charges applies only to:
a. very large charges c. like charges
b. point charges d. charges very close to each other

__c__ 5. The electric field around a positive charge is best illustrated by:

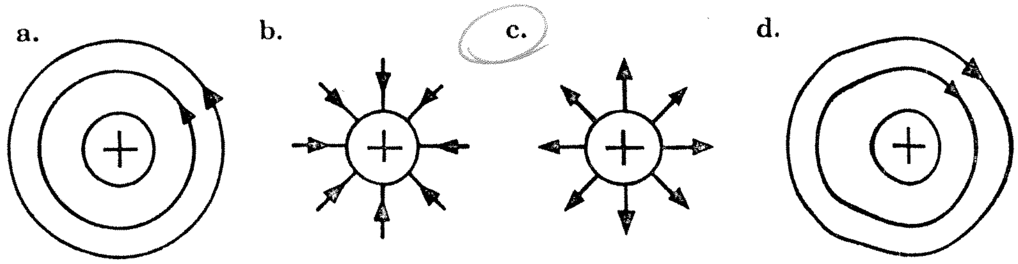


FIG. 22-1

__d__ 6. A positive charge of 2×10^{-6} C experiences a force of 0.06 N when placed at a point in an electric field. The strength of the field at that point in N/C is:
a. 0.3×10^{-4} c. 2.06×10^{-6}
b. 1.2×10^{-7} d. 3×10^{4}

__d__ 7. Which one of the following statements is *not* true of the electric field associated with a charged conductor?
a. The electric field inside the conductor is always zero.
b. The lines of force outside the conductor are always perpendicular to the conductor.
c. The lines of force outside the conductor are concentrated at those places where the charge is concentrated.
d. Each line of force forms a closed curve.

__c__ 8. The force between a positive charge of 3×10^{-6} C and a positive charge of 2×10^{-6} C when separated by a distance of 0.3 m is:
(Coulomb's constant is $9 \times 10^{9} \frac{N \cdot m^2}{C^2}$)
a. 18 N b. 36 N c. 0.6 N d. 1.8 N

9. The difference of potential between two points in an electric field is 10 volts. The work done in moving a positive charge of 2.0×10^{-4} C from the point of the lower potential to the point at the higher potential is:
   a. 5×10^{4} J
   b. 2×10^{-2} J
   c. 2×10^{-3} J
   d. 2×10^{-5} J

10. The force acting on an electron at a point in an electric field where the field strength is 160 N/C (the charge on an electron is -1.60×10^{-19} C) is:
   a. 160 N
   b. 2.56×10^{-17} N
   c. 1×10^{-21} N
   d. 10^{-17} N

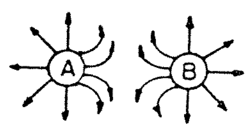
11. An electric field has a field strength of 3×10^{-14} N/C directed north. A second field has a field strength of 4×10^{-14} N/C directed east. The resultant electric field is:
   a. 7×10^{-14} N/C directed northeast
   b. 7×10^{-14} N/C directed north
   c. 5×10^{-14} N/C directed north
   d. 5×10^{-14} N/C directed northeast

12. Two large parallel metal plates are 5.0×10^{-2} m apart and have a difference of potential of 100 volts between them. The strength of the field at any point between the plates is:
   a. 2.0×10^{3} N/C
   b. 2.0 N/C
   c. 5.0×10^{-4} N/C
   d. 4.0×10^{4} N/C

13. Referring to question 12 the electric field between the two plates can be decreased by:
   a. decreasing the distance between the plates
   b. increasing the area of the plates but keeping the voltage constant
   c. increasing the voltage applied to the plates
   d. increasing the distance between the plates

14. The unit of charge in the MKS system is the
   (1) ohm
   (2) ampere
   (3) coulomb
   (4) volt

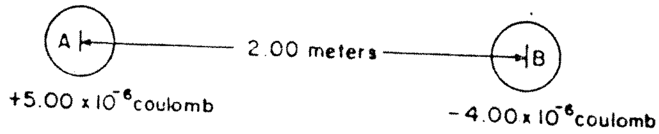
15.



Two charged spheres are shown in the diagram. Which polarities will produce the electric field shown?
   (1) *A* and *B* both negative
   (2) *A* and *B* both positive
   (3) *A* positive and *B* negative
   (4) *A* negative and *B* positive

16. When an object is brought near the knob of a positively charged electroscope, the leaves of the electroscope initially diverge. The charge on the object
   (1) must be zero
   (2) must be positive
   (3) must be negative
   (4) cannot be determined

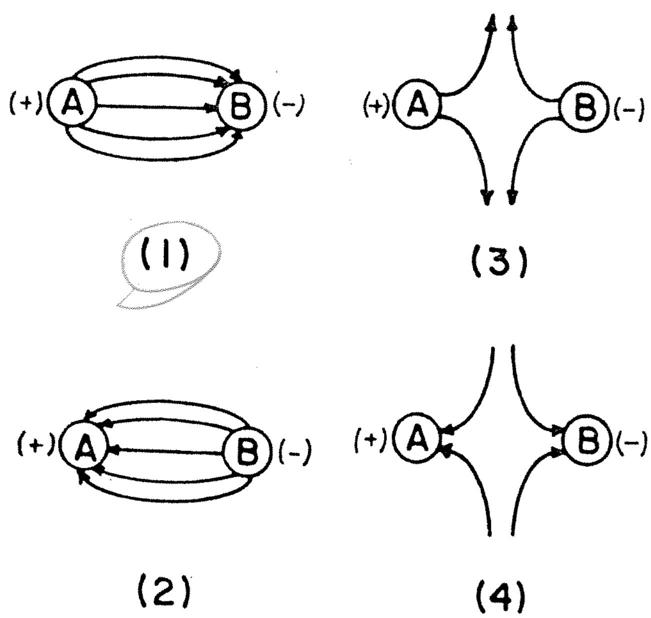
Directions: Base your answers to questions 19 through 20 on the diagram below which represents two small, charged conducting spheres, identical in size, located 2.00 meters apart.



17. What is the net combined charge on both spheres?
(1) $+1.00 \times 10^{-6}$ coulomb
(2) -1.00×10^{-6} coulomb
(3) $+9.00 \times 10^{-6}$ coulomb
(4) -9.00×10^{-6} coulomb

18. The force between these spheres is
(1) 1.80×10^{-2} newton
(2) 3.60×10^{-2} newton
(3) 4.50×10^{-2} newton
(4) 9.00×10^{-2} newton

19. Which diagram best represents the electric field between the two spheres?

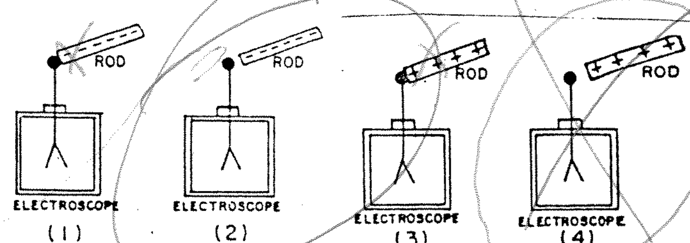


Directions: Base your answers to questions on the additional information below.

A conductor is connected between spheres *A* and *B* and then removed after charge has transferred.

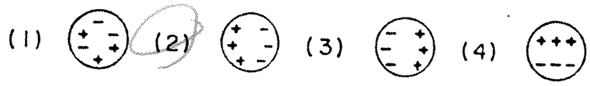
20. During the period the conductor was attached, what was the direction of the flow of the charged particles?
(1) Protons flowed from *A* to *B*, only.
(2) Electrons flowed from *B* to *A*, only.
(3) Protons flowed from *A* to *B* as electrons flowed from *B* to *A*.
(4) Protons flowed from *B* to *A* as electrons flowed from *A* to *B*.

21. Which diagram shows the leaves of the electroscope charged negatively by induction?



22. An uncharged metal sphere is placed midway between spheres *A* and *B* represented in the diagram below.

Which diagram best represents the arrangement of the charges in the uncharged sphere?



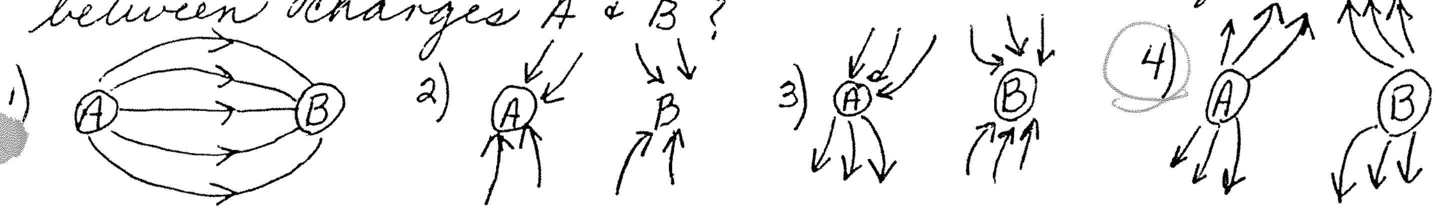
Answer the next 5 questions on the diagram below.

$F_E = \frac{kq_1q_2}{r^2} = \frac{8.99 \times 10\ N \cdot m^2/C^2 (2 \times 10^{-6} C)(2 \times 10^{-6} C)}{(3m)^2} = .004 Nt$

X ($\bullet$) $Q = 2 \times 10^{-6}$ coul. A Y $Q = 2 \times 10^{-6}$ coul. B

$\cdot \longrightarrow$ 1.5 m $\longleftarrow | \longleftarrow$ 1.5 m $\longrightarrow \cdot$

23. Which diagram best illustrates an electric field between charges A & B?



24. The magnitude of the force of sphere A on sphere B is 1) 1.2×10^{-2} nt 2) 2×10^{3} nt 3) 4.4×10^{-13} nt 4) 4.0×10^{-3} nt

25. If another small sphere with a charge of $+2 \times 10^{-6}$ coulomb is placed at point Y, the net force on this sphere will be
1) 0 nt 2) 40 nt 3) 80 nt 4) 240 nt

Bonus:
1) If a positive charge is placed at point X the direction of the net force on the charge will be 1) into the page 2) out of the page 3) toward the left 4) toward the right
2) If sphere A is moved toward sphere B the electric field intensity at point X will 1) decrease 2) increase 3) remain the same

$F_E = \frac{kq_1q_2}{r^2}$