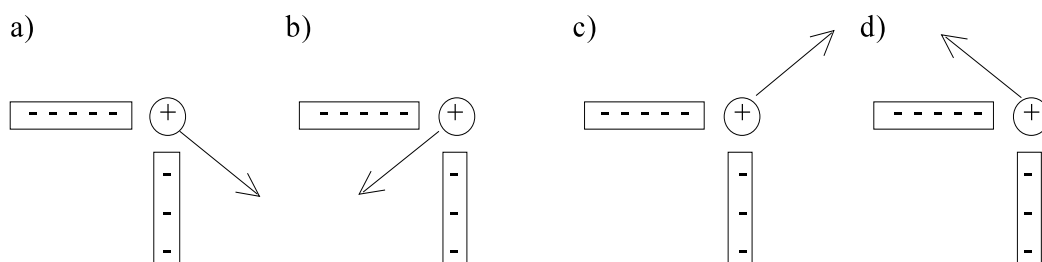


Physics 3204
Assignment 2: Electrostatics

Name: _____

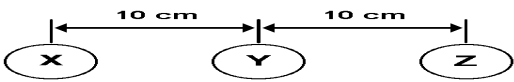
- 1 A metal sphere has a deficit of 1.0×10^{10} electrons. What is the charge on the sphere?
 A $-1.6 \times 10^{-7} \text{ C}$
 B $1.6 \times 10^{-7} \text{ C}$
 C $1.6 \times 10^{-9} \text{ C}$
 D $6.2 \times 10^8 \text{ C}$
- 2 The electric force between two charged objects is 0.24 N. What will be the new electric force if one object is made three times larger, the other is made four times smaller and the distance is decreased by a factor of two?
 A 0.24 N
 B 0.36 N
 C 0.72 N
 D 11.5 N
- 3 Consider three identical metal spheres, A, B, and C. Sphere A carries a charge of $-2.0 \mu\text{C}$; sphere B carries a charge of $-6.0 \mu\text{C}$; and sphere C carries a charge of $+5.0 \mu\text{C}$. Spheres A and B are touched together and then separated. Spheres B and C are then touched and separated. Does sphere C end up with an excess or a deficiency of electrons and how many electrons is it?
 A deficiency, 3.12×10^{12}
 B excess, 3.12×10^{12}
 C excess, 1.87×10^{12}
 D deficiency, 6.24×10^{12}
- 4 Two identical conducting spheres carry charges of $+5.0 \text{ mC}$ and -1.0 mC , respectively. The centres of the spheres are initially separated by a distance L . The two spheres are brought together so that they are in contact. The spheres are then returned to their original separation L . What is the ratio of the magnitude of the force on either charge after the spheres are touched to that before they were touched?
 A $4/5$
 B $9/5$
 C $5/1$
 D $4/9$
- 5 Sphere #1 has a charge of $+2q$ while sphere #2 has a charge of $+4q$. If the spheres are allowed to touch and are then moved to their original positions, by what factor will the new force be different from the original force?
 A $F_2/F_1 = 0.9$
 B $F_2/F_1 = 1.1$
 C $F_2/F_1 = 1.5$
 D $F_2/F_1 = 2.0$
- 6 Two point charges have charges of p units and w units respectively. The electrostatic force between the charges is $1.0 \times 10^{-3} \text{ N}$. If the distance remains unchanged but the charges are changed to $2p$ units and $w/2$ units, what will be the new force?
 A $1.0 \times 10^{-3} \text{ N}$
 B $2.0 \times 10^{-3} \text{ N}$
 C $3.0 \times 10^{-3} \text{ N}$
 D $4.0 \times 10^{-3} \text{ N}$

- 7 In which direction will the positively charged ball shown below move? The rods are equally charged.

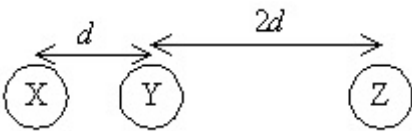


- 8 Two spheres with equal charges of $4.0 \times 10^{-7} \text{ C}$ exert an electrostatic force on each other of $9.0 \times 10^{-3} \text{ N}$. What is the distance between the spheres?
- A 0.16 m
 - B 0.40 m
 - C 2.5 m
 - D 6.3 m

- 9 The accompanying diagram represents charged spheres X, Y, and Z which are evenly spaced as shown. Spheres X and Y have identical charges. Sphere Z has a charge equal in magnitude but opposite in sign. If the electric force of X on Y is 4.0 N, what is the magnitude of the net electric force exerted on sphere Y?
- A 0
 - B 2.0 N
 - C 4.0 N
 - D 8.0 N

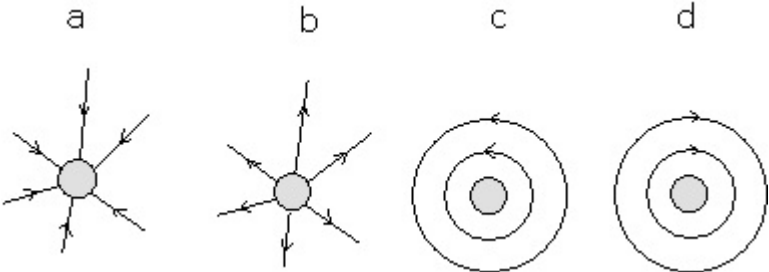


- 10 If there is no net force on Y because X and Z attract Y equally, how do the charges on X and Z compare?
- A X is 2 times less than the charge on Z
 - B X is 4 times less than the charge on Z.
 - C Y is greater than the charge on either X or Z.
 - D Y is less than the charge on either X or Z.

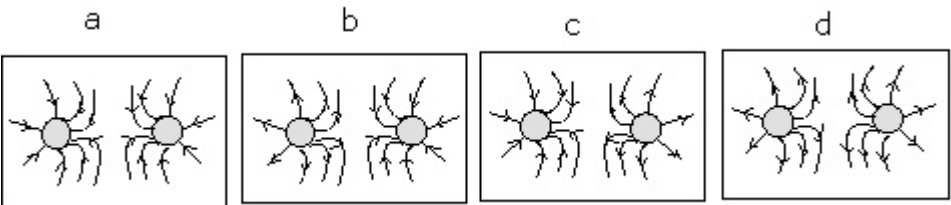


- 11 What is the correct representation of the electric field of a positive point charge?
- A Equally spaced clockwise concentric circles.
 - B Equally spaced counterclockwise concentric circles.
 - C Straight lines radiating out from the point charge.
 - D Straight lines radiating toward the point charge.
- 12 Which one of the following statements is true concerning the strength of the electric field between two oppositely charged parallel plates?
- A It is zero midway between the plates.
 - B It is a maximum midway between the plates.
 - C It is a maximum near the negatively charged plate.
 - D It is constant between the plates except near the edges.

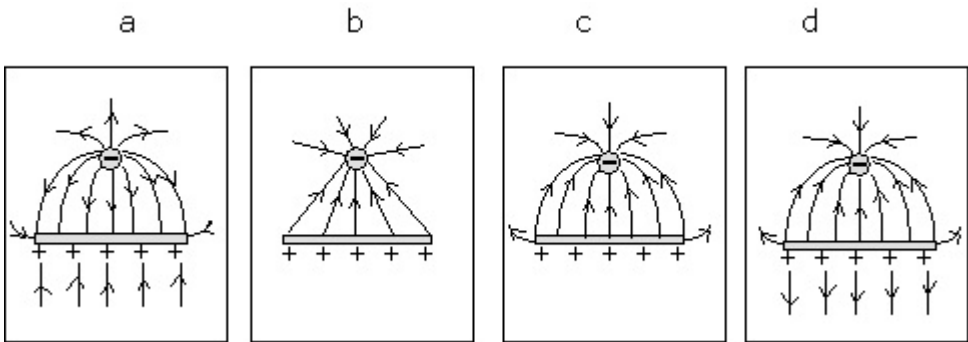
- 13 Which of the following diagrams properly shows the electrical field around a positively charged sphere?



- 14 Which diagram shows the electric field around two negatively charge spheres?



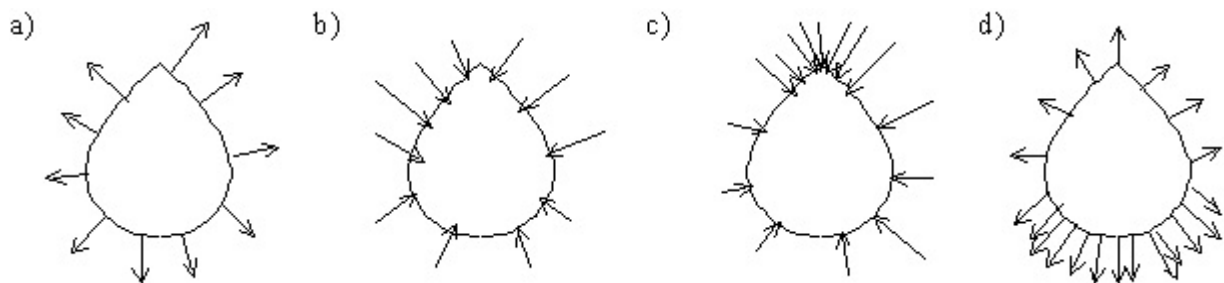
15 A negatively charged ball is brought near a positively charged plate. Which diagram best represents the resulting field?



16 Where is the safest place to be in a lightning storm?

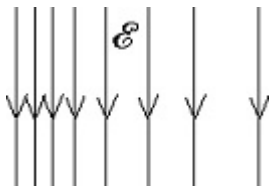
- A at the center of a large metal drum
- B in a rowboat on a lake
- C standing on a rubber mat
- D under a tree

17 A teardrop-shaped metal conductor is given a negative charge. Which diagram best illustrates the electric field about the conductor?



18 Which statement best describes the electric field shown to the right?

- A it increases to the right
- B it increases going down
- C it increase going up
- D it increases to the left



19 How may the electric field strength at a point in space be defined?

- A a parabolic curvature of space
- B the density of lines of force
- C the net force at that point
- D the ratio of electrical force to charge for a test charge placed at that point

20 At 3 times the distance from a point source, what is the strength of the electric field?

- A it is 9 times its original value
- B it is 3 times it original value
- C it is one-third its original value
- D it is one-ninth its original value

21 What would be the charge on a Van de Graaf generator if the field strength is 20.3 N/C and the distance from the ball is 2.0 m?

- A $9.0 \times 10^{-9} \text{ C}$
- B $2.1 \times 10^2 \text{ C}$
- C $4.0 \times 10^6 \text{ C}$
- D $1.9 \times 10^9 \text{ C}$

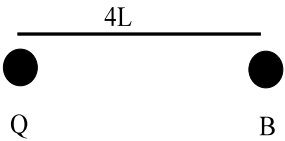
22 A force of $4 \times 10^{-2} \text{ N}$ acts on a charge of $2.0 \text{ }\mu\text{C}$ when it is placed in a uniform electric field. What is the magnitude of the electric field?

- A 20,000 N/C
- B $2 \times 10^{-2} \text{ N/C}$
- C $8 \times 10^{-2} \text{ N/C}$
- D $5.0 \times 10^{-5} \text{ N/C}$

- 23 A 1.0 C charge is 5.0 m away from a 1.0 nC test charge. What is the electric field at the 1.0 nC charge?
- A 1.8 N/C
 B 3.6 N/C
 C 3.6×10^8 N/C
 D 1.8×10^9 N/C
- 24 A 7.0 μC charge is placed at the 0 cm mark of a meter stick and a -5.0 μC charge is placed at the 60 cm mark. What is the electric field at the 40 cm mark?
- A -7.3×10^5 N/C
 B 3.0×10^5 N/C
 C 1.5×10^6 N/C
 D 7.3×10^5 N/C
- 25 What is the electric field 0.50 m from a small sphere with a positive charge of 7.2×10^{-5} C?
- A 2.9×10^{-4} N/C [inward]
 B 2.6×10^6 N/C [inward]
 C 2.9×10^{-4} N/C [outward]
 D 2.6×10^6 N/C [outward]
- 26 In the figure at the right, point B is a distance of 4L away from Q. What is the equation of the electric field at point B?

A $E = \frac{kQ}{2L^2}$

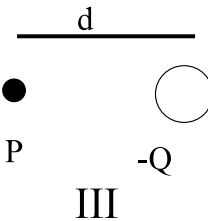
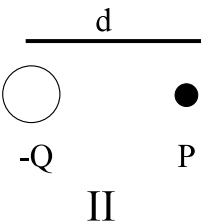
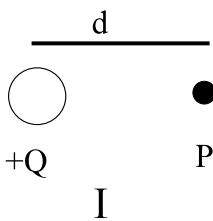
C $E = \frac{kQ}{4L^2}$



B $E = \frac{kQ}{8L^2}$

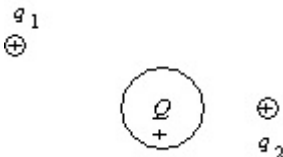
D $E = \frac{kQ}{16L^2}$

- 27 Each of the diagrams below shows the location of a single charge, +Q or -Q, with respect to a point "P". For which diagrams will both the magnitude and the direction of the electric field be the same?



- A I and II
 B I and III
 C II and III
 D I, II, and III
- 28 A particle with a charge of 4.0 μC has a mass of 5.0×10^{-3} kg. What electric field directed upward will exactly balance the weight of the particle?
- A 1.2×10^4 N/C
 B 4.1×10^4 N/C
 C 5.1×10^4 N/C
 D 8.2×10^4 N/C
- 29 What is the energy supplied to 15 C of charge by a 2.0 V electric cell?
- A 0.03 J
 B 7.5 J
 C 13 J
 D 30 J
- 30 Two equal positive test charges q_1 and q_2 are placed in the electric field about charge +Q as shown in the figure. Which statement is correct about charges q_1 and q_2 ?

- A If q_1 was moved to where q_2 is then q_1 would gain kinetic energy.
 B There is not enough information to comment on *potential*.
 C They are at the same potential.
 D You would have to do work on q_1 to move it to where q_2 is.

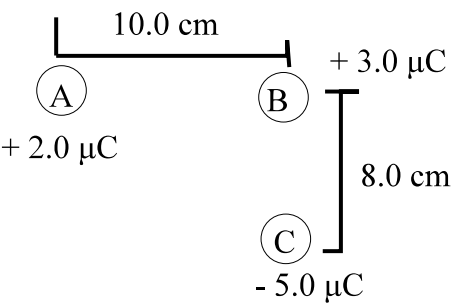


31 Two identically charged objects are placed 2.0 cm apart. The force of repulsion between them is 2.8×10^{-2} N. Determine the magnitude of the charge on each object. {6}

32 Calculate the net force on object B due to A and C. {4}

$Q_A = 8.33 \mu\text{C}$ $Q_B = 3.55 \mu\text{C}$ $Q_C = 7.22 \mu\text{C}$ $d_{AB} = 14.2 \text{ cm}$ $d_{BC} = 20.4\text{cm}$

33 For the diagram below, determine the **net force** on object B due to the presence of A and C. {6}



- 34 Two charges, one of charge $+2.5 \times 10^{-5} \text{ C}$ and the other of charge $-3.7 \times 10^{-5} \text{ C}$, are 25.0 cm apart. The positive charge is to the left of the negative charge.
- (a) Draw a diagram showing the point charges and label a point Y that is 10.0 cm away to the right of the negative charge, on the line connecting the charge. (Field lines do not need to be drawn.) {1}
- (b) Calculate the **electric field** at point Y. {3}

- 35 What is the **electric field** midway between charged objects of $-3.2 \mu\text{C}$ and $+4.7 \mu\text{C}$ that are placed 80.0 cm apart? {4}

- 36 A field strength of 150 N/C exists between the charged plates in the diagram. Calculate the acceleration of an electron of mass $9.11 \times 10^{-31} \text{ kg}$ placed between the plates. {3}

