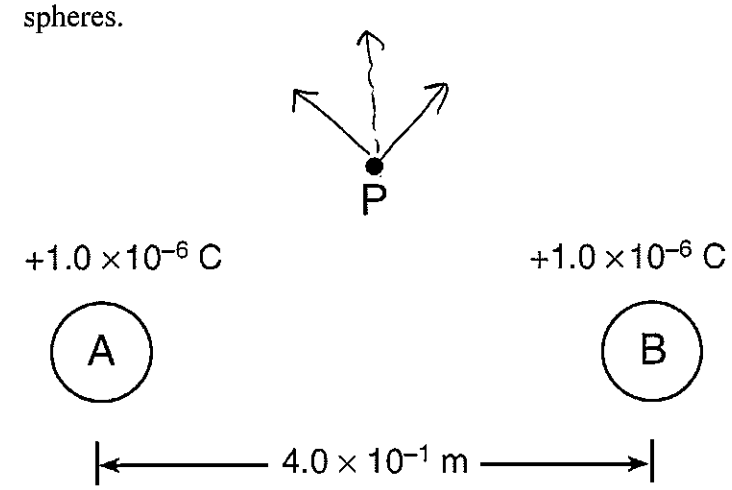
Skill 36 - Electrostatic Force

42. Base your answer to the following question on the information and diagram below.

Two small metallic spheres, *A* and *B*, are separated by a distance of 4.0×10^{-1} meter, as shown. The charge on each sphere is $+1.0 \times 10^{-6}$ coulomb. Point *P* is located near the spheres.



Which arrow best represents the direction of the resultant electric field at point *P* due to the charges on spheres *A* and *B*?

A) 

B) 

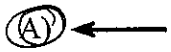
C) 

D) 

43. In the diagram below, *P* is a point near a negatively charged sphere.

Test charges are defined as +

Which vector best represents the direction of the electric field at point *P*?

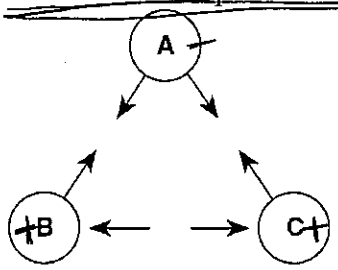
A) 

B) 

C)

D) 

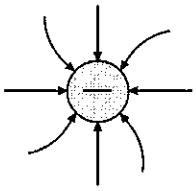
44. The diagram below shows the arrangement of three charged hollow metal spheres, *A*, *B*, and *C*. The arrows indicate the direction of the electric forces acting between the spheres. At least two of the spheres are positively charged.

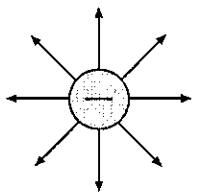


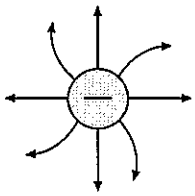
Which sphere, if any, could be negatively charged?

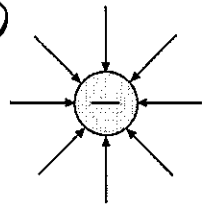
(A) sphere *A*
B) sphere *B*
C) sphere *C*
D) no sphere

45. Which diagram best represents the electric field around a negatively charged conducting sphere?

A)


B)


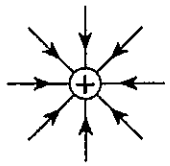
C)


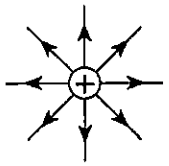
(D)


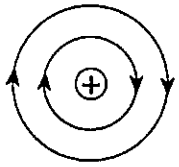
Field lines always indicate behavior of a positive particle

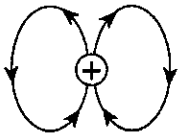
away from +
toward −

46. Which diagram best represents the electric field near a positively charged conducting sphere?

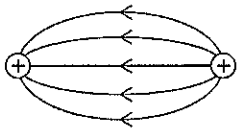
A)


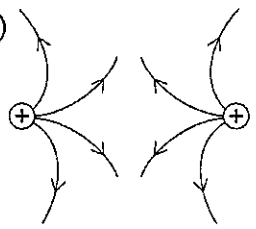
(B)


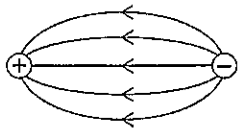
C)


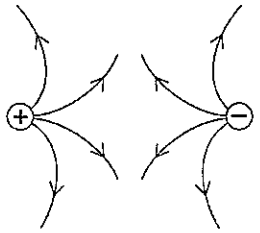
D)


47. Which diagram represents the electric field lines between two small electrically charged spheres?

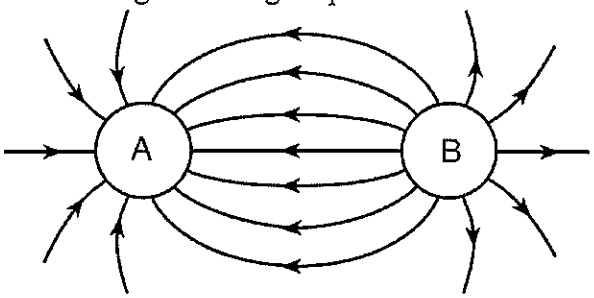
A)


(B)


C)


D)


48. The diagram below represents the electric field surrounding two charged spheres, *A* and *B*.



What is the sign of the charge of each sphere?

A) Sphere *A* is positive and sphere *B* is negative.
B) Sphere *A* is negative and sphere *B* is positive.
C) Both spheres are positive.
D) Both spheres are negative

Toward negative
away from positive

49. Two positively charged masses are separated by a distance, *r*. Which statement best describes the gravitational and electrostatic forces between the two masses?

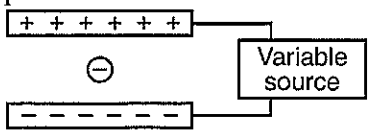
A) Both forces are attractive.
B) Both forces are repulsive.
C) The gravitational force is repulsive and the electrostatic force is attractive.
D) The gravitational force is attractive and the electrostatic force is repulsive.

50. Two protons are located one meter apart. Compared to the gravitational force of attraction between the two protons, the electrostatic force between the protons is

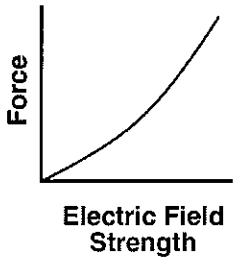
A) stronger and repulsive
B) weaker and repulsive
C) stronger and attractive
D) weaker and attractive

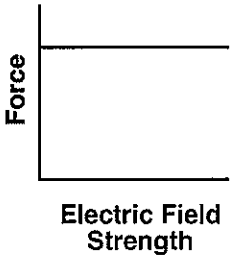
Skill 36 - Electrostatic Force

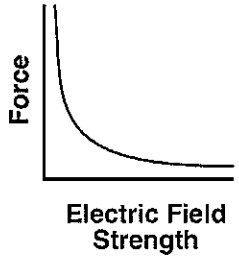
51. Two parallel metal plates are connected to a variable source of potential difference. When the potential difference of the source is increased, the magnitude of the electric field strength between the plates increases. The diagram below shows an electron located between the plates.

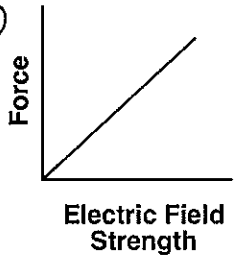


Which graph represents the relationship between the magnitude of the electrostatic force on the electron and the magnitude of the electric field strength between the plates?

A)


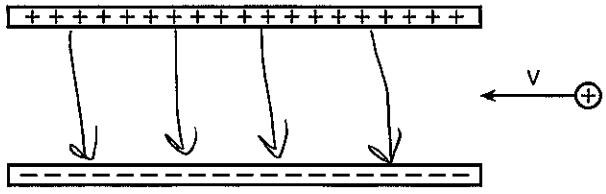
B)


C)


(D)


$F_e = \frac{k q_1 q_2}{r^2}$

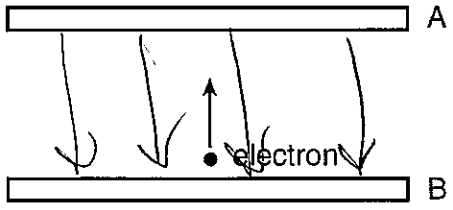
52. The diagram below represents a positively charged particle about to enter the electric field between two oppositely charged parallel plates.



The electric field will deflect the particle

A) into the page
B) out of the page
C) toward the top of the page
(D) toward the bottom of the page

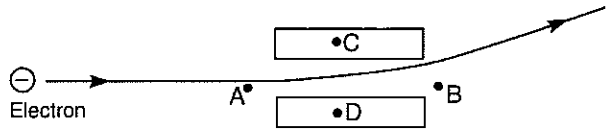
53. An electron placed between oppositely charged parallel plates *A* and *B* moves toward plate *A*, as represented in the diagram below



What is the direction of the electric field between the plates?

A) toward plate *A*
(B) toward plate *B*
C) into the page
D) out of the page

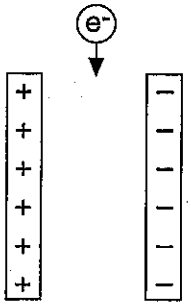
54. A moving electron is deflected by two oppositely charged parallel plates, as shown in the diagram below.



The electric field between the plates is directed from

A) *A* to *B*
B) *B* to *A*
C) *C* to *D*
D) *D* to *C*

55. Base your answer to the following question on the diagram below which represents an electron being projected between two oppositely charged parallel plates.



As the electron moves through the electric field, the magnitude of the electric force on the electron

A) decreases
B) increases
C) remains the same

56. An electron is located in an electric field of magnitude 600. newtons per coulomb. What is the magnitude of the electrostatic force acting on the electron?

A) 3.75×10^{21} N
B) 6.00×10^{2} N
C) 9.60×10^{-17} N
D) 2.67×10^{-22} N

$q = 1.6 \times 10^{-19}$ C
$E = 600$ N/C
$F_e = ?$

$F_e = Eq$
$= (600\text{N/C})(1.6 \times 10^{-19}\text{C})$
$= 960 \times 10^{-19}$ N
$= 9.6 \times 10^{-17}$ N

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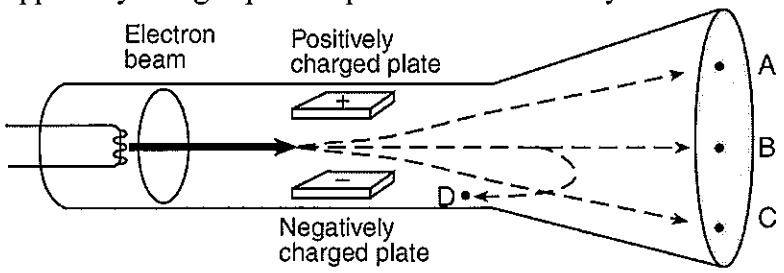
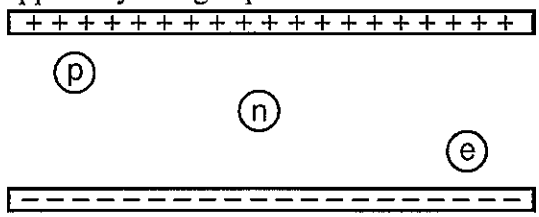
57. The diagram below shows a beam of electrons fired through the region between two oppositely charged parallel plates in a cathode ray tube.



After passing between the charged plates, the electrons will most likely travel path

A) *A* B) *B* C) *C* D) *D*

58. In the diagram below, proton *p,* neutron *n,* and electron *e* are located as shown between two oppositely charged plates.



The magnitude of acceleration will be greatest for the

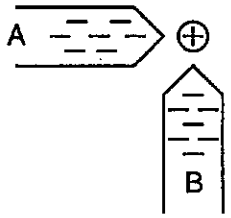
A) neutron, because it has the greatest mass
B) neutron, because it is neutral
C) electron, because it has the smallest mass
D) proton, because it is farthest from the negative plate

Both p & e will experience the same force (they have equal size charge)

electrons will accelerate more because they have less mass

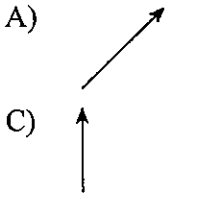
$a = \frac{F_{net}}{m}$

59. Two plastic rods, *A* and *B*. each possess a net negative charge of 1.0×10^{-3} coulomb. The rods and a positively charged sphere are positioned as shown below.

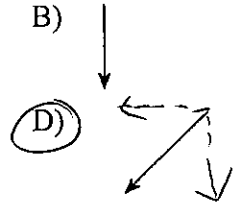


Which vector best represents the resultant electrostatic force on the sphere?

A) B)



C)



D)

60. A proton and an electron traveling with the same velocity enter a uniform electric field. Compared to the acceleration of the proton, the acceleration of the electron is

A) less, and in the same direction
B) less, but in the opposite direction
C) greater, and in the same direction
D) greater, but in the opposite direction

61. A 3.00×10^{-9}-coulomb test charge is placed near a negatively charged metal sphere. The sphere exerts an electrostatic force of magnitude 6.00×10^{-5} newton on the test charge. What is the magnitude and direction of the electric field strength at this location?

A) 2.00×10^{4} N/C directed away from the sphere
B) 2.00×10^{4} N/C directed toward the sphere
C) 5.00×10^{-5} N/C directed away from the sphere
D) 5.00×10^{-5} N/C directed toward the sphere

$q = 3\times10^{-9}C$
$Fe = 6\times10^{-5}N$
$E = \frac{Fe}{q} = \frac{6\times10^{-5}N}{3\times10^{-9}C} = 2\times10^{4}N/C$

62. What is the magnitude of the electric field intensity at a point where a proton experiences an electrostatic force of magnitude 2.30×10^{-25} newton?

A) 3.68×10^{-44} N/C
B) 1.44×10^{-6} N/C
C) 3.68×10^{6} N/C
D) 1.44×10^{44} N/C

$q = 1.6\times10^{-19}C$
$E = ?$
$Fe = 2.3\times10^{-25}N$
$E = \frac{Fe}{q} = \frac{2.3\times10^{-25}N}{1.6\times10^{-19}C}$

63. An object with a net charge of 4.80×10^{-6} coulomb experiences an electrostatic force having a magnitude of 6.00×10^{-2} Newtons when placed near a negatively charged metal sphere. What is the electric field strength at this location?

A) 1.25×10^{4} N/C directed away from the sphere
B) 1.25×10^{4} N/C directed toward the sphere
C) 2.88×10^{-8} N/C directed away from the sphere
D) 2.88×10^{-8} N/C directed toward the sphere

$E = \frac{Fe}{q} = \frac{6\times10^{-2}N}{4.8\times10^{-6}C} = 1.25\times10^{4}N/C$

64. What is the magnitude of the electric force acting on an electron located in an electric field with an intensity of 5.0×10^{3} Newtons per coulomb?

A) 3.2×10^{-23} N
B) 8.0×10^{-16} N
C) 5.0×10^{3} N
D) 3.2×10^{22} N

$Fe = Eq$
$(5\times10^{3}N/C)(1.6\times10^{-19}C)$