Jeopardy

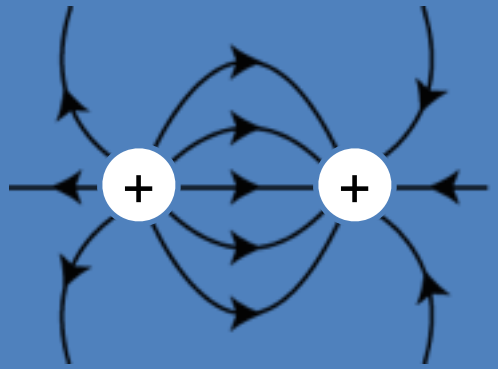
Electrostatics

Electric Fields	Voltage	Electrostatic Force	Capacitors	Grab Bag
10	10	10	10	10
20	20	20	20	20
30	30	30	30	30
40	40	40	40	40
50	50	50	50	50

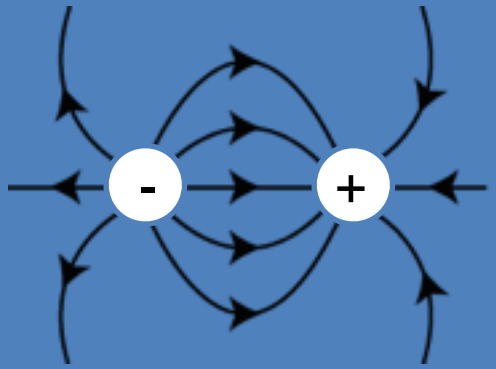
Electric Fields - 10

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

A.



C.



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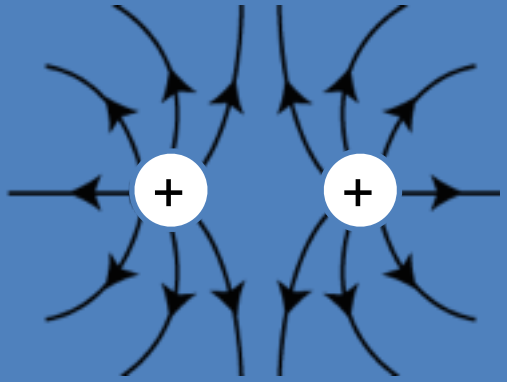

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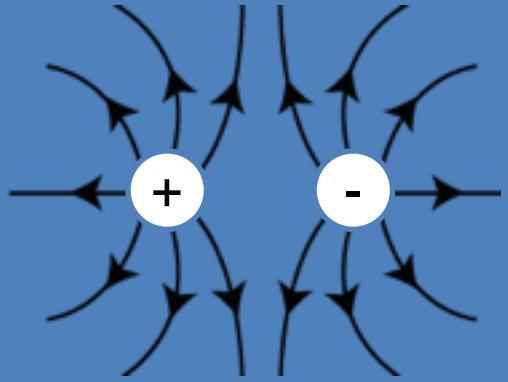

Electric Fields – 10

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

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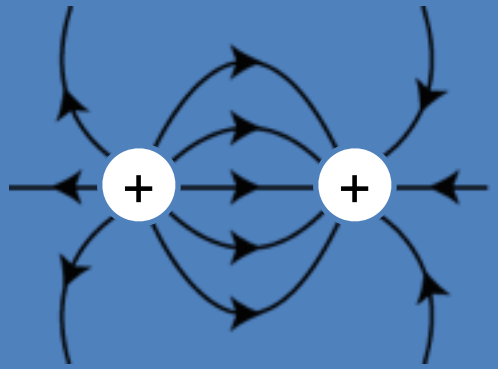

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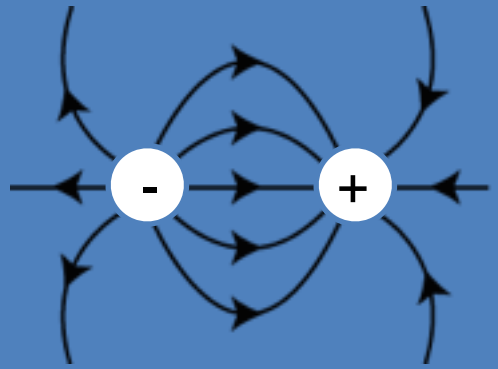

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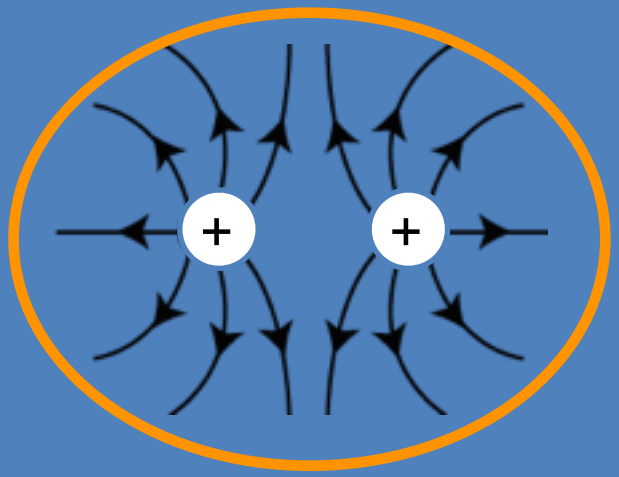

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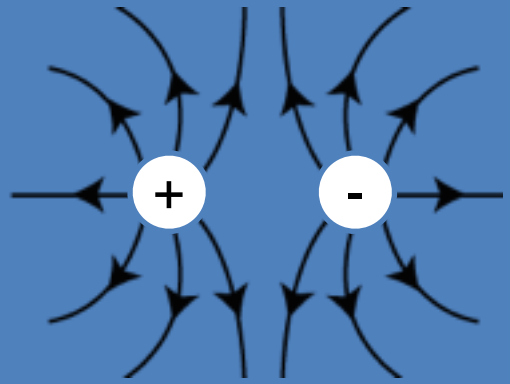

Electric Fields - 20

- What is the magnitude of the electrostatic force acting on an electron located in an electric field having a strength of 5.0×10^{3}N/C?

A. 3.1×10^{22} N

B. 5.0×10^{3} N

C. 8.0×10^{-16} N

D. 3.2×10^{-23} N

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Electric Fields - 30

- A 3.00×10^{-9} C test charge is placed near a negatively charged metal sphere. The sphere exerts an electrostatic force of magnitude 6.00×10^{-5} N on the test charge. What is the magnitude and direction of the electric field 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

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Electric Fields - 40

- Two parallel conducting plates, separated by a distance *d*, are connected to a battery with a voltage source that supplies a potential difference *V*. If the separation between the plates in halved, which of the following will occur?

A. The electric charge on the plates will be halved
B. The electric charge on the plates will be double
C. The potential difference between the plates will be halved
D. The potential difference between the plates will be doubled
E. The capacitance will not change

Electric Fields – 40

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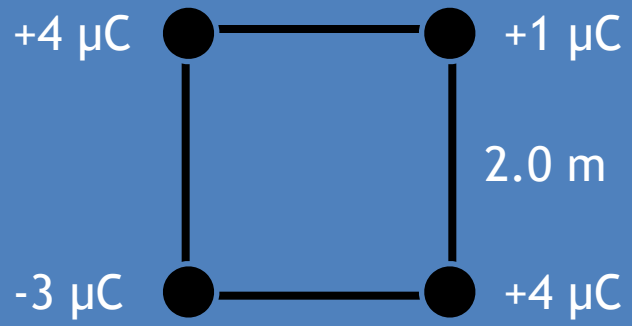
Electric Fields - 50

- Base your answer to the following question on



- Four point charges are placed at the corners of a square as shown in diagram above. Each side of the square has length 2.0 m. Determine the magnitude of the electric field at the center of square.

A. 2×10^{-6} N/C

B. 9×10^{3} N/C

C. 2.7×10^{4} N/C

D. 3×10^{-6} N/C

E. 1.8×10^{4} N/C

Electric Fields – 50

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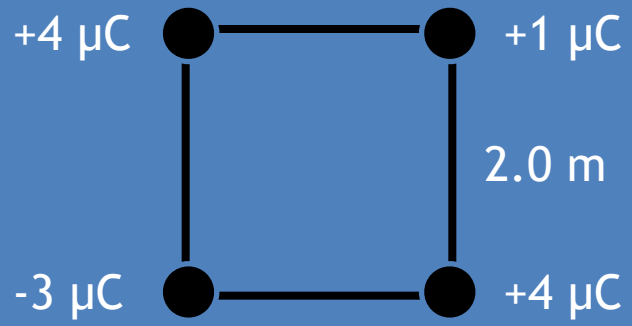

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Voltage - 10

- Of the following, which is a unit of electric field strength?
  I. Electron volt
  II. Newton per ampere-second
  III. Volt per meter

A. I only
B. III only
C. I, II, and III
D. II only
E. II and III only

Voltage – 10

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Voltage - 20

- Positive charges are accelerated by electric fields toward points

A. where the electric field is weaker
B. where the electric field is stronger
C. where the electric field is zero
D. at lower electric potential
E. at higher electric potential

Voltage – 20

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Voltage - 30

- If the electric field does positive work an a negative charge as the charge undergoes a displacement point *A* to point *B* within an electric field, then the electric potential energy

A. is negative
B. is positive
C. increases
D. decreases
E. electric fields cannot do work

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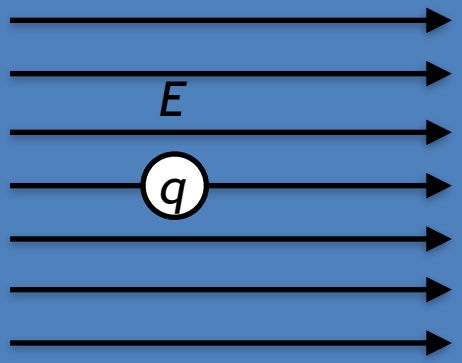
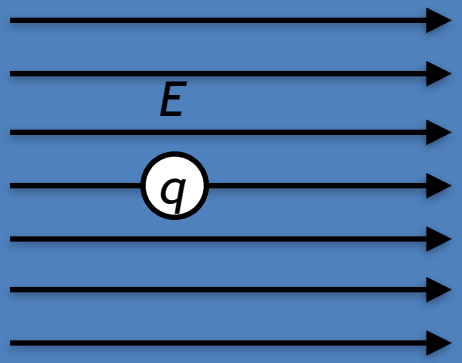


- If the charge *q* at rest in the above electric field *E* is negative, it will accelerate

A. towards the left, which has a lower electric potential
B. towards the left, which has a higher electric potential
C. towards the right, which has lower electric potential
D. towards the right, which has a higher electric potential
E. towards the top of the page, which has a constant electric potential

Voltage – 40

- Base your answer to the following question on



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E. towards the top of the page, which has a constant electric potential

Voltage - 50

- Which of the following statements is necessarily true?

A. If the electric field at a certain point is zero, then the electric potential at the same point is also zero

B. If the electric potential at a certain point is zero, then the electric field at the same point is also zero

C. The electric potential is inversely proportional to the strength of the electric field

D. The electric potential is directly proportional to the strength of the electric field

E. None of the above

Voltage – 50

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E. None of the above

Electrostatic Force - 10

- A neutron, a proton, and an electron are initially at rest the same distance from a relatively large, stationary nucleus. Assume the masses of the proton and neutron are equal. Which particle experiences the greatest force?

A. the neutron
B. the proton
C. the electron
D. the electron and the proton feel the same force
E. the proton and the neutron feel the same force

Electrostatic Force – 10

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Electrostatic Force - 20

- A neutron, a proton, and an electron are initially at rest the same distance from a relatively large, stationary nucleus. Assume the masses of the proton and neutron are equal. Which particle experiences the greatest acceleration?

A. the neutron
B. the proton
C. the electron
D. the electron and the proton experience the same acceleration
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Electrostatic Force – 20

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B. the proton

C. the electron

D. the electron and the proton experience the same acceleration

E. the neutron and the proton experiences the same acceleration

Electrostatic Force - 30

- A negatively charged plastic comb is brought close to, but does not touch, a small piece of aluminum foil. If the comb and the foil are attracted to each other, the charge on the foil

A. may be negative or neutral
B. may be positive or neutral
C. must be negative
D. must be positive

Electrostatic Force – 30

- A negatively charged plastic comb is brought close to, but does not touch, a small piece of aluminum foil. If the comb and the foil are attracted to each other, the charge on the foil

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B. may be positive or neutral

C. must be negative

D. must be positive

Electrostatic Force - 40

- Two 1 kg spheres each carry a charge of 1 C. Compared to the electrostatic force between the spheres, the gravitational force between them is _____. Calculate each of the forces for a distance of 1.0 m between each particle.

A. much greater
B. about equal
C. much less
D. more dependent upon the distance
E. stronger if the charges are the same sign, but weaker if the charges have opposite signs

F_E = ?; F_g = ?

Electrostatic Force – 40

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A. much greater

B. about equal

C. much less

D. more dependent upon the distance

E. stronger if the charges are the same sign, but weaker if the charges have opposite signs

$F_E = 9.0\times10^{9}$ N; $F_g = 6.67\times10^{-11}$ N

DAILY DOUBLE! Electrostatic Force - 100

- Two identical, charged particles sit one above the other in a vertical, neutral column. Both have charge $q = 5.7\times10^{-7}$ C and mass $m = 3.2\times10^{-5}$ kg. How far apart must they be for the top particle to hover motionlessly above the bottom one?

DAILY DOUBLE! Electrostatic Force – 100

- $mg = kq^2/r^2$
- $r = \sqrt{(kq^2/mg)}$
- $r = \sqrt{\dfrac{(9\times10^{9}\ \mathrm{Nm^2/C^2})(5.7\times10^{-7}\ \mathrm{C})^2}{(3.2\times10^{-5}\ \mathrm{kg})(9.8\ \mathrm{m/s^2})}}$
- ***r = 3.1 m***

Capacitors - 10

- Which of the following would increase the capacitance of a parallel-plate capacitor?

A. Decreasing the area of the plates
B. Decreasing the voltage between the plates
C. Increasing the voltage between the plates
D. Moving the plates closer together
E. Moving the plates further apart

Capacitors – 10

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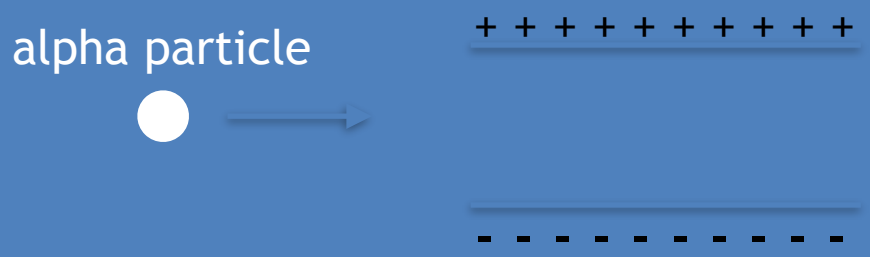
Capacitors - 20

- A moving alpha particle enters the space between two oppositely charged plates as indicated in the diagram below



- Which arrow best represents the path of the alpha particle as it travels between the plates?

A. 

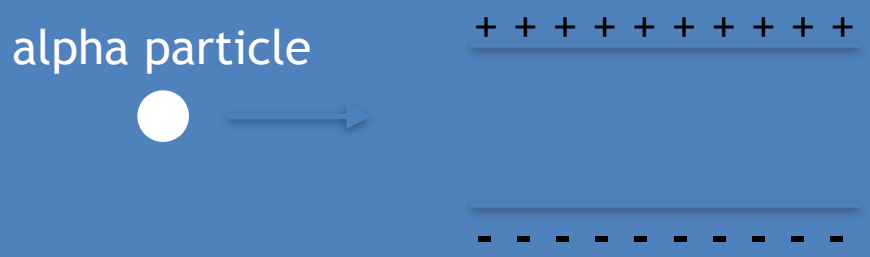
B. 

C. 

D. 

Capacitors – 20

- A moving alpha particle enters the space between two oppositely charged plates as indicated in the diagram below



- Which arrow best represents the path of the alpha particle as it travels between the plates?

A. 

B. 

C. 

D. 

Capacitors- 30

- A 10 μF capacitor is charged to a potential difference of 20 V. The electric energy stored in the capacitor is

A. 2×10^{-5} J

B. 4×10^{-4} J

C. 4×10^{-3} J

D. 2×10^{-4} J

E. 2×10^{-3} J

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Capacitors - 40

- How much work is required to charge a 40 mF capacitor to a potential difference of 200 V?

A. 0.8 J

B. 1.6 J

C. 80 J

D. 160 J

E. 800 J

Capacitors – 40

- How much work is required to charge a 40 mF capacitor to a potential difference of 200 V?

A. 0.8 J

B. 1.6 J

C. 80 J

D. 160 J

E. 800 J

Capacitors - 50

- A capacitor is charged to a potential of 400 V and stores a charge of 4 mC in 5 s. What is the average power delivered to the capacitor in this time?

A. 0.16 W

B. 20 W

C. 160 W

D. 3.2 W

E. 64 W

Capacitors – 50

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A. 0.16 W

B. 20 W

C. 160 W

D. 3.2 W

E. 64 W

Grab Bag - 10

- Gravitational field strength is to Newton per kilogram as electric field strength is to

A. coulombs per joule
B. coulombs per newton
C. joules per coulomb
D. newtons per coulomb

Grab Bag – 10

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A. coulombs per joule

B. coulombs per newton

C. joules per coulomb

D. newtons per coulomb

Grab Bag - 20

- The diagram below represents two electrically charged, identical-sized metal spheres, *A* and *B*.

- If the spheres are brought into contact, which sphere will have a net gain of electrons?

A. *A* only
B. both *A* and *B*
C. *B* only
D. neither *A* nor *B*

Grab Bag – 20

- The diagram below represents two electrically charged, identical-sized metal spheres, *A* and *B*.

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A. A only

B. both *A* and *B*

C. *B* only

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Grab Bag - 30

- The diagram below represents two identical-sized metal spheres, *A* and *B*. Sphere *A* has a charge of +12 C, and sphere *B* is a neutral sphere.

- After contact, the spheres are moved apart. As the distance between the spheres is increased, the electric potential energy of the system

A. decreases
B. increases
C. remains the same

Grab Bag- 30

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- After contact, the spheres are moved apart. As the distance between the spheres is increased, the electric potential energy of the system

A. decreases

B. increases

C. remains the same

Grab Bag - 40

- Two parallel conducting plates are connected to a constant 2000 V voltage source. If the strength of the electric field between the plates in 20,000 N/C, what is the distance between the plates?

A. 0.1 cm

B. 10 cm

C. 1000 cm

D. 1 cm

E. 100 cm

Grab Bag – 40

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A. 0.1 cm

B. 10 cm

C. 1000 cm

D. 1 cm

E. 100 cm

Grab Bag - 50

- The plates of a capacitor store 0.01 C of charge. If the potential across the capacitor is 10 MV, the capacitance of the capacitor is

A. 0.1 nF

B. 10 nF

C. 1000 nF

D. 1 nF

E. 100 nF

Grab Bag – 50

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