SAT Physics Practice Papers 9

Set 1

1. If the distance between two positive point charges is tripled, then the strength of the electrostatic repulsion between them will decrease by a factor of

A. 3

B. 6

C. 8

D. 9

E. 12

2. Two 1 kg spheres each carry a charge of magnitude 1 C. How does F_E, the strength of the electric force between the spheres, compare with F_G, the strength of their gravitational attraction?

A. $F_E < F_G$

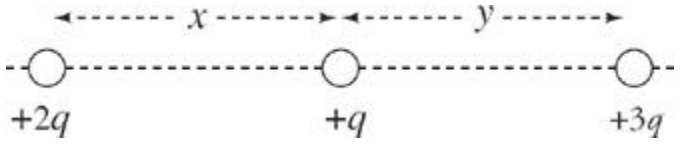
B. $F_E = F_G$

C. $F_E > F_G$

D. If the charges on the spheres are of the same sign, then $F_E > F_G$; but if the charges on the spheres are of opposite sign, then $F_E < F_G$.

E. Cannot be determined without knowing the distance between the spheres

3. The figure below shows three point charges, all positive. If the net electric force on the center charge is zero, what is the value of $\frac{y}{x}$?



A. $\frac{4}{9}$

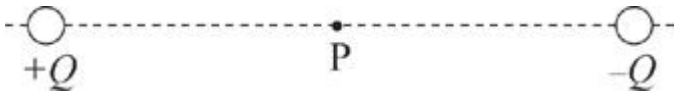
B. $\sqrt{\frac{2}{3}}$

C. $\sqrt{\frac{3}{2}}$

D. $\frac{3}{2}$

E. $\frac{9}{4}$

4.



The figure above shows two point charges, +*Q* and –*Q*. If the negative charge were absent, the electric field at point P due to +*Q* would have strength *E*. With –*Q* in place, what is the strength of the total electric field at P, which lies at the midpoint of the line segment joining the charges?

A. 0

B. $\frac{E}{4}$

C. $\frac{E}{2}$

D. *E*

E. 2*E*

5. A sphere of charge +*Q* is fixed in position. A smaller sphere of charge +*q* is placed near the larger sphere and released from rest. The small sphere will move away from the large sphere with

A. decreasing velocity and decreasing acceleration.

B. decreasing velocity and increasing acceleration.

C. decreasing velocity and constant acceleration.

D. increasing velocity and decreasing acceleration.

E. increasing velocity and increasing acceleration.

6. An object of charge +*q* feels an electric force $\mathbf{F}_E$ when placed at a particular location in an electric field, **E**. Therefore, if an object of charge –2*q* were placed at the same location where the first charge was, it would feel an electric force of

A. $\frac{-\mathbf{F}_E}{2}$

B. $-2\mathbf{F}_E$

C. $-2q\mathbf{F}_E$

D. $\frac{-2\mathbf{F}_E}{q}$

E. $\frac{-\mathbf{F}_E}{(2q)}$

7. A charge of $-3Q$ is transferred to a solid metal sphere of radius r. Where will this excess charge reside?

A. $-Q$ at the center, and $-2Q$ on the outer surface

B. $-2Q$ at the center, and $-Q$ on the outer surface

C. $-3Q$ at the center

D. $-3Q$ on the outer surface

E. $-Q$ at the center, $-Q$ in a ring of radius $\frac{1}{2}r$, and $-Q$ on the outer surface

8. Which of the following statements is true?

A. Electric field vectors point toward a positive source charge, and the resulting electric force on an electron would point in the same direction as the electric field vector.

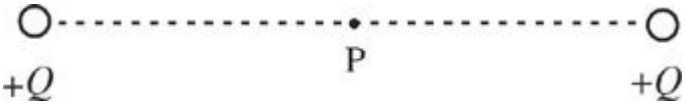
B. Electric field vectors point toward a positive source charge, and the resulting electric force on an electron would point in the opposite direction from the electric field vector.

C. Electric field vectors point toward a negative source charge, and the resulting electric force on an electron would point in the same direction as the electric field vector.

D. Electric field vectors point toward a negative source charge, and the resulting electric force on an electron would point in the opposite direction from the electric field vector.

E. None of the above

9.



The figure above shows two point charges, +*Q* and +*Q*. If the right-hand charge were absent, the electric field at Point P due to +*Q* would have a strength of *E*. With the right-hand charge in place, what is the strength of the total electric field at P, which lies at the midpoint of the line segment joining the charges?

A. 0

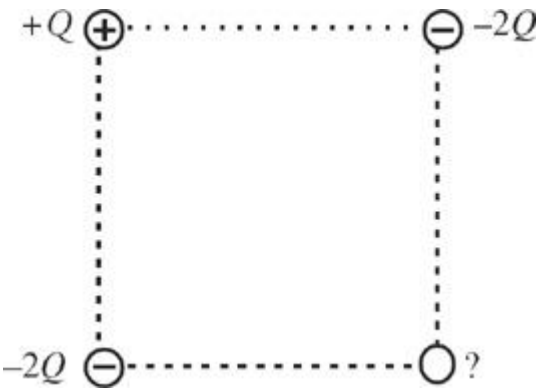
B. $\frac{E}{4}$

C. $\frac{E}{2}$

D. 2*E*

E. 4*E*

10.



The figure above shows four point charges fixed in position at the corners of a square. What charge would have to be present at the bottom right location for the electric field at the center of the square to be zero?

A. +*Q*

B. +Q$\sqrt{2}$

C. +2*Q*

D. +3*Q*

E. +4*Q*

SET 2

1. True statements about the relationship between the electric field and electric potential include which of the following?

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

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

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

A. I only

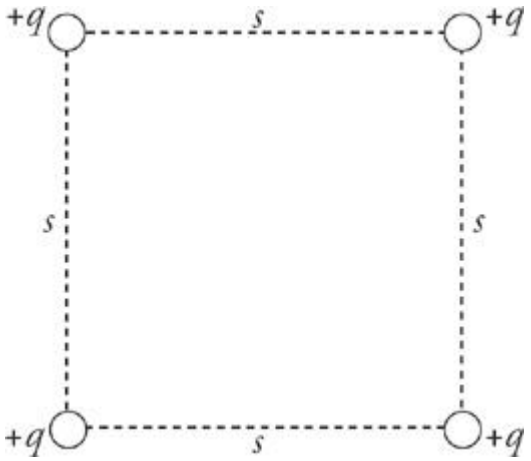
B. II only

C. I and II only

D. I and III only

E. None of the above

2.



Which expresses the value of the electric field at the center of the square?

A. 0

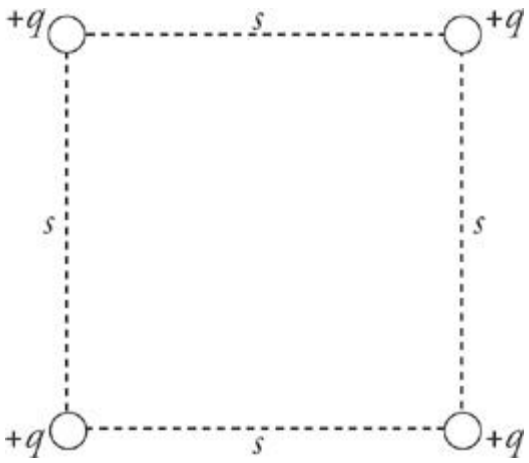
B. $k\frac{2q}{s^2}$

C. $k\frac{4q}{s^2}$

D. $k\frac{4q}{s}$

E. $k\frac{(4\sqrt{2})q}{s}$

3.



Which expresses the value of the electric potential at the center of the square?

A. 0

B. $k\frac{2q}{s^2}$

C. $k\frac{4q}{s^2}$

D. $k\frac{4q}{s}$

E. $k\frac{(4\sqrt{2})q}{s}$

4. Negative charges are accelerated by electric fields toward points

A. at lower electric potential

B. at higher electric potential

C. where the electric field is zero

D. where the electric field is weaker

E. where the electric field is stronger

5. Which of the following would be half as great at a distance of 2*R* from a source charge than it would be at a distance of *R* from the charge?

I. Electric force on another charge

II. Electric field due to the source charge

III. Electric potential due to the source charge

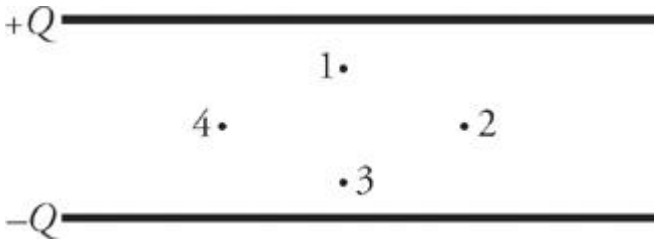
A. I only

B. II only

C. III only

D. I and II only

E. I, II, and III



6.

Which points in the uniform electric field (between the plates of the capacitor) shown above lie on the same equipotential?

A. 1 and 2 only

B. 1 and 3 only

C. 2 and 4 only

D. 3 and 4 only

E. 1, 2, 3, and 4 all lie on the same equipotential, since the electric field is uniform.

7. The potential at point *A* in an electric field is 10V higher than at point *B*. If a negative charge, $q = -2$ C, is moved from point *A* to point *B*, then the potential energy of this charge will

A. decrease by 20 J

B. decrease by 5 J

C. increase by 5 J

D. increase by 20 J

E. increase by 100 J

8. A parallel-plate capacitor is charged to a potential difference of ΔV; this results in a charge of $+Q$ on one plate and a charge of $-Q$ on the other. The capacitor is disconnected from the charging source, and a

dielectric is then inserted. What happens to the potential difference and the stored electrical potential energy?

A. The potential difference decreases, and the stored electrical potential energy decreases.

B. The potential difference decreases, and the stored electrical potential energy increases.

C. The potential difference increases, and the stored electrical potential energy decreases.

D. The potential difference increases, and the stored electrical potential energy increases.

E. The potential difference decreases, and the stored electrical potential energy remains unchanged.

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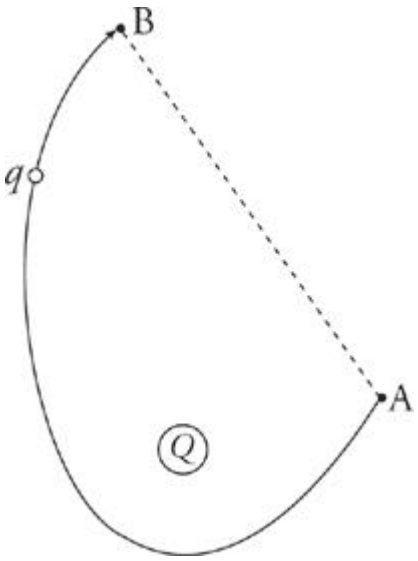

9. How much work would the electric field (created by the stationary charge *Q*) perform as a charge *q* is moved from point B to A along the curved path shown?

(V_A = 200 V, V_B = 100 V, q = –0.05 C, length of line segment AB = 10 cm, length of curved path = 20 cm.)

A. 0 J

B. 5 J

C. 10 J

D. 15 J

E. 20 J

SET 3

1. True statements about the relationship between the electric field and electric potential include which of the following?

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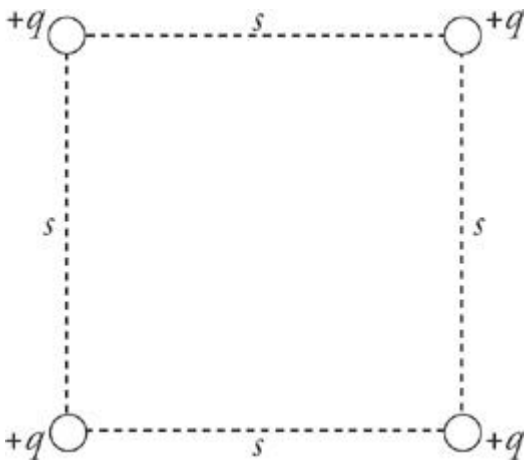

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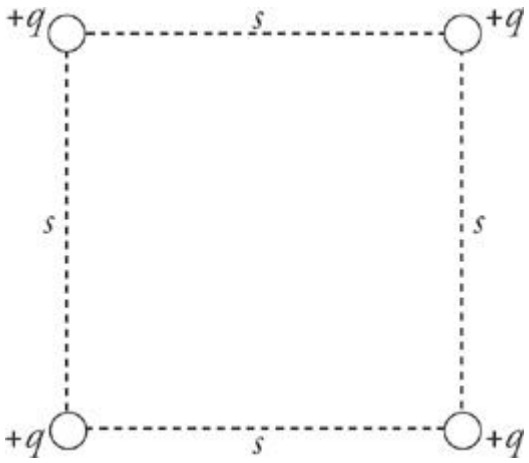

3. Which expresses the value of the electric potential at the center of the square?

A. 0

B. $k\frac{2q}{s^2}$

C. $k\frac{4q}{s^2}$

D. $k\frac{4q}{s}$

E. $k\frac{(4\sqrt{2})q}{s}$

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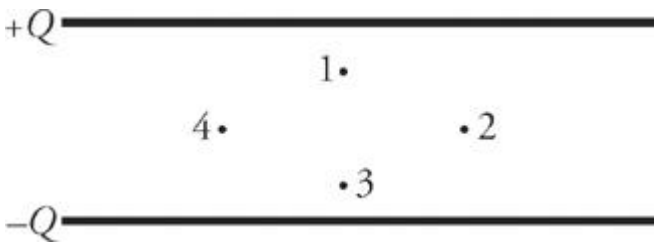

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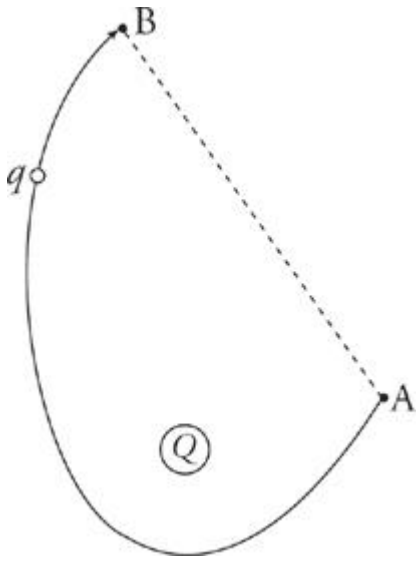

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