1. A charge of $-2q$ is placed a distance r from the origin and a charge of $+2q$ is placed a distance $2r$ from the origin. What is the amount of work needed to move a charge of q to the origin from infinity?

   A) $\frac{-3kq^2}{2r^2}$

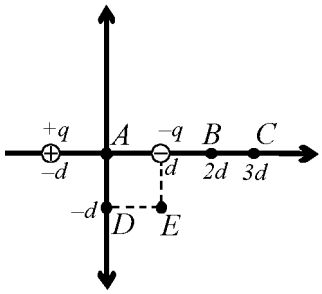
   B) $\frac{-kq^2}{r}$

   C) 0

   D) $\frac{3kq^2}{2r^2}$

   E) $\frac{kq^2}{r}$

2. Base your answer to the following question on the diagram below which shows two charges, magnitude q, of opposite sign. Each are located a distance d from the origin A of a coordinate system.



   How much work would it take to move a $+1C$ charge from infinity to point A?

   A) $\frac{-2q}{d^2}$

   B) $\frac{-q}{d}$

   C) 0

   D) $\frac{+q}{d}$

   E) $\frac{+2q}{d^2}$

3. Two identical conducting spheres are charged to $+2Q$ and $-Q$ respectively, and are separated by a distance d (much greater than the radii of the spheres). The amount of energy contained in the system is E_1. After the two spheres are made to touch and then are reseparated by a distance d, the amount of energy in the system is E_2. Which of the following relationships is correct?

   A) $2E_1 = -E_2$

   B) $E_1 = -E_2$

   C) $E_1 = -2E_2$

   D) $E_1 = -4E_2$

   E) $E_1 = -8E_2$

4. A 4.0×10^{-6} coulomb charge is moved horizontally a distance of 0.50 meters through a region with an electric field of magnitude 150 Newtons per coulomb directed vertically. The work done on the charge by the electric field is most nearly

   A) 2×10^{-4} Nm

   B) 3×10^{-4} Nm

   C) 4×10^{-4} Nm

   D) 1.9×10^{-7} Nm

   E) 7.5×10^{7} Nm

5. A parallel plate capacitor with plates of area A separated by a distance d is charged so that the potential difference across the plates is V. If the distance between the plates is decreased to $\frac{1}{2}d$, The potential across the plates is now

   A) $\frac{1}{4}V$

   B) $\frac{1}{2}V$

   C) V

   D) $2V$

   E) $4V$

6. A capacitor has a capacitance of 2.0×10^{-4} F. If it is charged to a potential difference of 300 volts the amount of energy stored in it is most nearly

   A) -4.8×10^{-3} J

   B) -3.0×10^{-4} J

   C) 9 J

   D) 3.0×10^{-4} J

   E) 4.8×10^{-3} J

7. An electron-volt is a measure of

   A) electric charge

   B) electric field

   C) electric potential

   D) energy

   E) momentum

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

   A) is negative.

   B) is positive.

   C) increases.

   D) decreases.

   E) electric fields cannot do work.

9. If positive work is performed on a negative charge to change its displacement from point *A* to point *B* within an electric field, then the electric potential energy

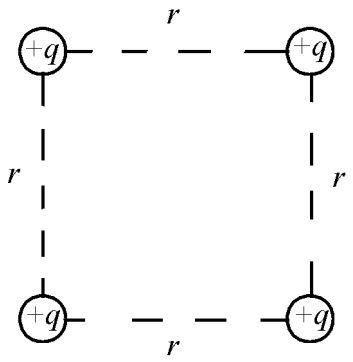
   A) is negative.

   B) is positive.

   C) is zero.

   D) increases.

   E) decreases.

10. 

    The work required to assemble the system shown above, bringing each charge in from infinity, is equal to

    A) $\frac{4kq^2}{r}$

    B) $\frac{k(4+\sqrt{2})q^2}{r}$

    C) $\frac{k(4+2\sqrt{2})q^2}{r}$

    D) $\frac{k(8+\sqrt{2})q^2}{r}$

    E) $\frac{k(8+2\sqrt{2})q^2}{r}$

11. 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.

12. A charge q experiences a displacement within an electric field from Position A to Position B. The change in the electrical potential energy is ΔU, and the work done by the electric field during this displacement is W. The change in electric potential from A to B is equal to

A) q/W

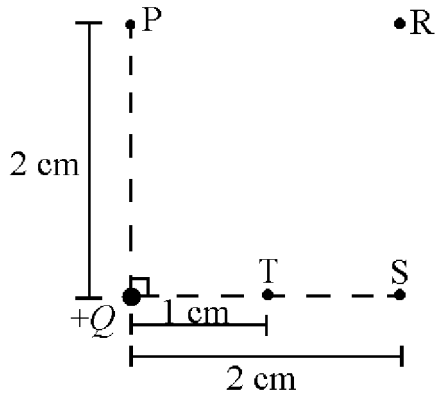
B) qW

C) $-qW$

D) $\Delta U/q$

E) $-\Delta U/q$

Base your answers to questions **13** and **14** on the following figure.



13. How much work is done on the electric field generated by the stationary charge $+Q = +1$ C to move a charge $+q = +2$ μC from P to T?

A) 900 kJ

B) 900 ` 2 kJ

C) 900 ` 3 kJ

D) 1800 kJ

E) 1800 ` 3 kJ

14. The work done on the electric field generated by the stationary charge $+Q$ to move a charge $+q$ from P to T to R is W_1. The work done to move the same charge from P to S to R is W_2. Which is necessarily true concerning W_1 and W_2?

A) $W_1 > W_2$

B) $W_2 > W_1$

C) $W_2 = W_1$

D) $W_1 > 0, W_2 < 0$

E) $W_1 < 0, W_2 > 0$

15. Of the following, which is NOT a unit of electric field strength?

I. Volt per meter
II. Newton per coulomb
III. Electron volt

A) I only

B) II only

C) III only

D) II and III only

E) None of these

16. 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

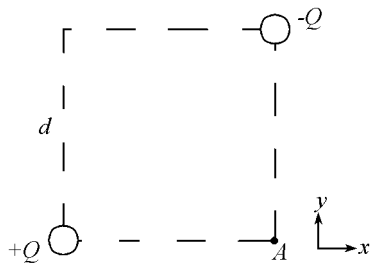
B) II only

C) III only

D) II and III only

E) I, II, and III

Base your answers to questions **17** and **18** on the figure below which shows two particles, with charges $+Q$ and $-Q$, located at opposite corners of a square of side d.



17. What is the direction of the electric field at A, relative to the axes shown?

A) $x > 0, y < 0$

B) $x > 0, y > 0$

C) $x < 0, y > 0$

D) $x > 0, y = 0$

E) $x < 0, y = 0$

18. What is the work required to bring a point charge $+q$ from infinity to point A?

A) 0

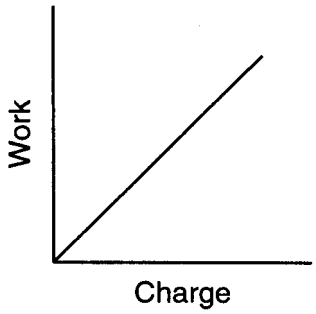
B) $\frac{\sqrt{2}kqQ}{d}$

C) $\frac{kqQ}{d}$

D) $\frac{2kqQ}{d}$

E) $\frac{2\sqrt{2}kqQ}{d}$

19. The graph below shows the relationship between the work done on a charged body in an electric field and the net charge on the body.



What does the slope of this graph represent?

A) power

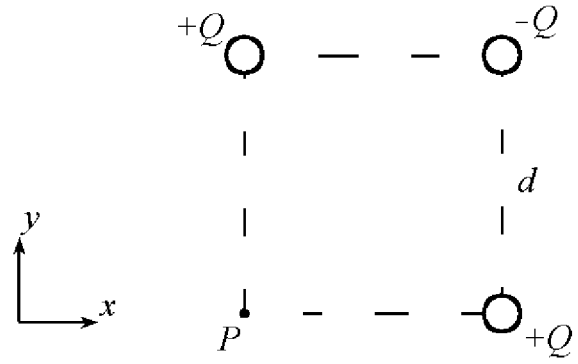
B) potential difference

C) force

D) electric field intensity

E) resistance

20. Base your answer to the following question on the diagram below, which shows three particles, with the charges shown, located at corners of a square with side of length *d*.



What is the work required to move a small point charge $+q$ from infinity to point *P*?

A) $(2-\sqrt{2}/2)\frac{kQq}{d}$

B) $(\sqrt{2}/2-2)\frac{kQq}{d}$

C) $(\sqrt{2}/2+2)\frac{kQq}{d}$

D) $\frac{2kQq}{d}$

E) $\frac{kQq}{\sqrt{2}d}$

Answer Key
Calculating Voltage MC Questions [Mar 28, 2011]

1. B
2. C
3. E
4. B
5. B
6. C
7. D
8. D
9. D
10. E
11. D
12. D
13. A
14. C
15. C
16. D
17. B
18. A
19. B
20. A

Name _____ Class _____ Date _____

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