

1. Identical electric charges of $+2q$ are placed at the points $(r,0,0)$, $(0,r,0)$ and $(0,0,r)$. What is the magnitude of the electric field at the origin?

- A) $\frac{6q}{r^2}$
- B) $\frac{3q}{r^2}$
- C) $\frac{2\sqrt{3}q}{r^2}$
- D) $\frac{6q}{r}$
- E) $\frac{2\sqrt{3}q}{r}$

Base your answers to questions 2 and 3 on the following. A point P is 3.0 m away from a point charge of 1.0 C and 1.0 m away from a point charge of -0.5 C.

2. What is the minimum magnitude of the electric field possible at point P ?
- A) 5.0×10^8 N/C
 - B) 1.5×10^9 N/C
 - C) 3.5×10^9 N/C
 - D) 5.5×10^9 N/C
 - E) 7.5×10^9 N/C

3. What is the maximum magnitude of the electric field possible at point P ?

- A) 5.0×10^8 N/C
- B) 1.5×10^9 N/C
- C) 3.5×10^9 N/C
- D) 5.5×10^9 N/C
- E) 7.5×10^9 N/C

Base your answers to questions 4 and 5 on the following. Point P is located 3.0 m from a point charge of -5.0 C and point Q is located 5.0 m from the same charge.

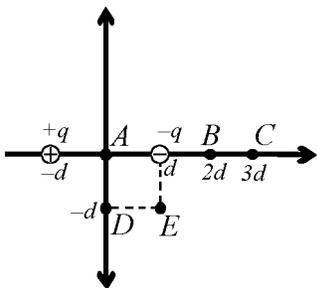
4. What is the magnitude of the electric field at point P ?

- A) 1.8×10^9 N/C
- B) 5.0×10^9 N/C
- C) 5.4×10^9 N/C
- D) 9.0×10^9 N/C
- E) 15.0×10^9 N/C

5. What is the magnitude of the electric field at point Q ?

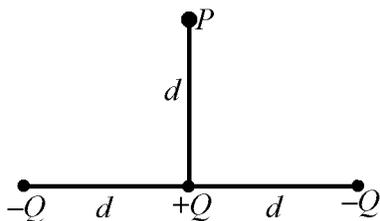
- A) 1.8×10^9 N/C
 - B) 5.0×10^9 N/C
 - C) 5.4×10^9 N/C
 - D) 9.0×10^9 N/C
 - E) 15×10^9 N/C
-

6. 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.



At which of the following points is the electric field **greatest** in magnitude?

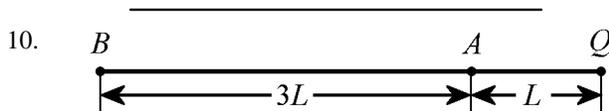
- A) A
 B) B
 C) C
 D) D
 E) E
7. Base your answer to the following question on the diagram below showing three point charges arranged in a horizontal line.



The magnitude of the electric field at point P is most nearly

Base your answers to questions **8** and **9** on the following information. A proton weighing 1.67×10^{-27} kg is accelerated from rest for a time of 10^{-8} s by a uniform electric field that exerts a force of 6.4×10^{-14} N on the proton.

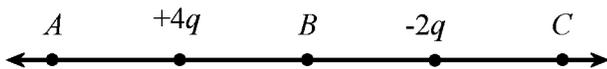
8. What is the magnitude of the electric field experienced by the proton?
- A) 1.0×10^{-32} N/C
 B) 6.4×10^{-21} N/C
 C) 6.4×10^{-13} N/C
 D) 1.6×10^{-4} N/C
 E) 4.0×10^5 N/C
9. The speed of the proton after it has accelerated for the 10^{-8} seconds is most nearly
- A) 4.0×10^0 m/s
 B) 4.0×10^1 m/s
 C) 4.0×10^3 m/s
 D) 4.0×10^5 m/s
 E) 4.0×10^7 m/s



Point A is a distance L to the left of a charge Q . Point B is a distance $3L$ to the left of point A . If the electric field at point A due to charge Q is E , what is the electric field at point B ?

- A) $\frac{E}{16}$
 B) $\frac{E}{9}$
 C) $\frac{E}{3}$
 D) E
 E) $3E$

11. *Not to scale

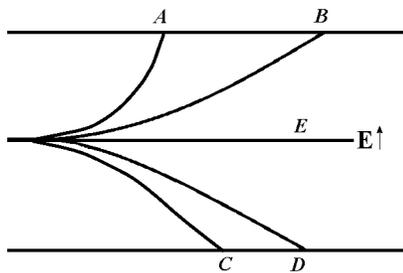


At which point(s) in the diagram above, which shows two point charges of $+4q$ and $-2q$, can the electric field be equal to zero?

- A) *A*
- B) *B*
- C) *C*
- D) *A and C*
- E) The electric field is not zero at any point.

Base your answers to questions **12** through **15** on the following information.

Five particles, all of the same mass and initial horizontal velocity, are sent through an electric field directed upwards and follow the paths depicted by *A*, *B*, *C*, *D*, and *E*, respectively.



12. Which path did the particle with the greatest magnitude of charge follow?

- A) *A*
- B) *B*
- C) *C*
- D) *D*
- E) *E*

13. Which path did the particle with the smallest negative charge follow?

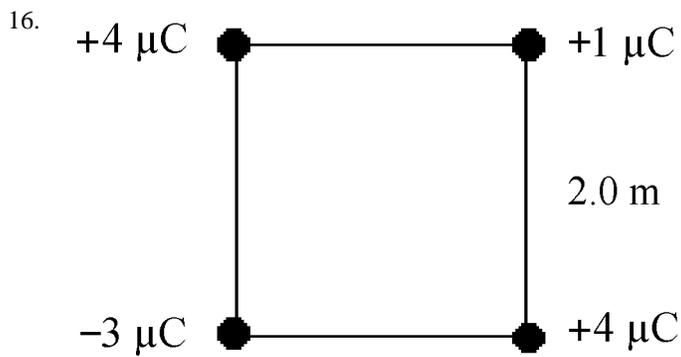
- A) *A*
- B) *B*
- C) *C*
- D) *D*
- E) *E*

14. Which of the following best explains the particle that followed path *E*?

- A) The particle bypassed the electric field.
- B) The magnitude of charge on the particle was greater than that on either plate generating the electric field.
- C) The particle experienced no net force.
- D) The particle only had a slightly positive charge on it.
- E) The particle only had a slightly negative charge on it.

15. Which of the following statements below is true?

- A) All of the particles moved to a higher level of electric potential.
- B) Particles *A*, *B*, *C*, *D* and *E* are at equipotentials.
- C) Particle *E* moved to a lower electric potential.
- D) Particle *A* is at a higher electric potential than Particle *B*.
- E) Particle *C* and Particle *D* are at equipotentials.



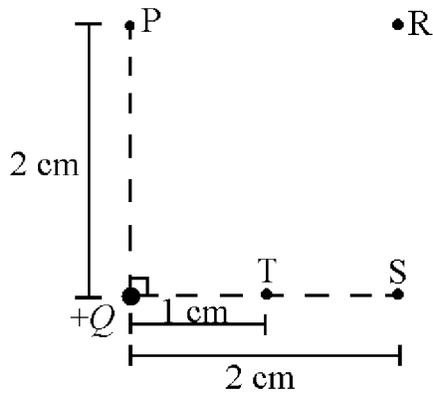
Four point charges are placed at the corners of a square as shown in the diagram above. Each side of the square has length 2.0 m. Determine the magnitude of the electric field at the center of the square.

- A) $2 \times 10^{-6} \text{ N/C}$
 B) $3 \times 10^{-6} \text{ N/C}$
 C) $9 \times 10^3 \text{ N/C}$
 D) $1.8 \times 10^4 \text{ N/C}$
 E) $2.7 \times 10^4 \text{ N/C}$
17. A point charge is in a uniform electric field created by two parallel plates. The point charge is initially a distance of L away from the negative plate and $7L$ away from the positive plate. The point charge experiences a force of magnitude F . If the distance from the negative plate is decreased by $2L$ and the plates remain stationary, what is the magnitude of force that the point charge will experience?
- A) $\frac{5F}{7}$
 B) F
 C) $\frac{7F}{5}$
 D) $5F$
 E) $7F$

18. The electric field at the point $x = 0$ a distance $x = r$ from a fixed charge $-q$ is E . When a charge of $+q$ is placed at $x = -r$ the electric field at $x = 0$ will be

- A) $\frac{E}{4}$
 B) $\frac{E}{2}$
 C) 0
 D) E
 E) $2E$
19. An object with a charge of $-2q$ feels a force of F when put at a point P in an electric field E . In terms of F and q , The strength of the electric field at this point is
- A) $\frac{F}{-2q}$
 B) $\frac{2F}{q}$
 C) $\frac{F}{-2q^2}$
 D) $\frac{F}{2q^2}$
 E) $2qF$
20. A solid conducting sphere of radius R has a has an excess charge of $2Q$. Which of the following most nearly describes the distribution of this charge?
- A) $2Q$ distributed evenly throughout the sphere.
 B) $2Q$ concentrated at the center.
 C) $2Q$ on the outer surface.
 D) Q on the surface, and Q at the center.
 E) $4Q$ on the surface and $-2Q$ at the center.

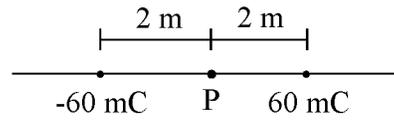
21. Base your answer to the following question on the following figure.



What is the ratio of the strength of the electric field at point T to the strength of the electric field at point P due to the charge $+Q$?

- A) 1:2
 B) 2:1
 C) 2:1
 D) 3:1
 E) 4:1
22. Point A is twice as far from charge $+Q$ as Point B . The ratio of the electric field at Point A to Point B is
- A) 1:4
 B) 1:2
 C) 1:2
 D) 2:1
 E) 4:1

23.



What is the strength of the electric field at the point P in the above diagram?

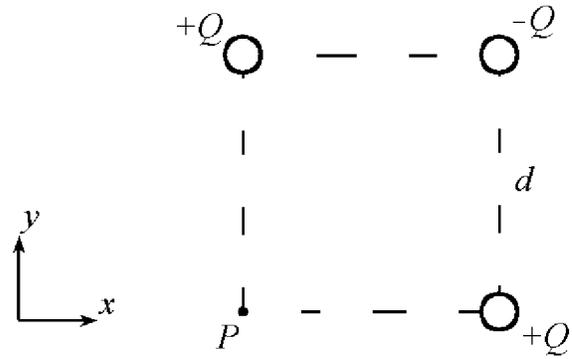
- A) 0 N/C
 B) 1.35×10^8 N/C
 C) 2.7×10^8 N/C
 D) 5.4×10^8 N/C
 E) 1.08×10^9 N/C
24. An electric dipole is made up of two opposite charges with equal magnitude q separated by a distance d . Midway between the charges, the electric field is
- A) 0
 B) $\frac{2kq^2}{d^2}$
 C) $\frac{2kq}{d^2}$
 D) $\frac{4kq}{d^2}$
 E) $\frac{8kq}{d^2}$
25. Two parallel plates are placed a distance d apart and connected to a constant voltage source V . The magnitude of the electric field between the plates is E . If the separation is doubled and the voltage is doubled, the strength of the electric field will be

- A) $\frac{E}{4}$
 B) $\frac{E}{2}$
 C) E
 D) $2E$
 E) $4E$

26. Two parallel conducting plates are connected to a constant 2000 V voltage source. If the strength of the electric field between the plates is 20000 N/C, what is the distance between the plates?

- A) 0.1 cm
- B) 1 cm
- C) 10 cm
- D) 100 cm
- E) 1000 cm

27. 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 .



Relative to the axes shown, in which direction is the electric field at point P ?

- A) $x > 0, y = 0$
- B) $x < 0, y = 0$
- C) $y > 0, x = 0$
- D) $x > 0, y > 0$
- E) $x < 0, y < 0$

Answer Key
Coulomb's Law MC Questions [Mar 28, 2011]

1. C

2. C

3. D

4. B

5. A

6. A

7.

8. E

9. D

10. A

11. C

12. A

13. D

14. C

15. E

16. D

17. B

18. E

19. A

20. C

21. E

22. A

23. C

24. E

25. C

26. C

27. E

Name _____

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