Clicker Session –
Electric Charges, Electric Fields

Charges A and B exert repulsive forces on each other. $q_A = 4q_B$. Which statement is true?

A. $F_{A \text{ on } B} > F_{B \text{ on } A}$

B. $F_{A \text{ on } B} < F_{B \text{ on } A}$

C. $F_{A \text{ on } B} = F_{B \text{ on } A}$

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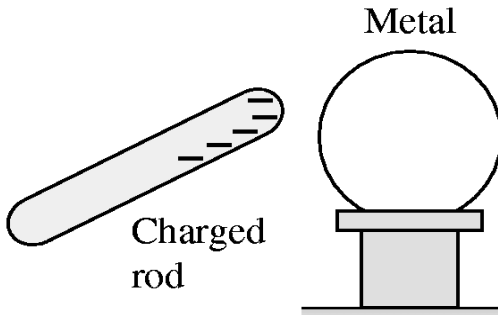
✔ **C. $F_{\text{A on B}} = F_{\text{B on A}}$**

If a negative charged rod is held near a neutral metal ball, the ball is attracted to the rod. This happens



A. because of magnetic effects.
B. because the ball tries to pull the rod's electrons over to it.
C. because the rod polarizes the metal.
D. because the rod and the ball have opposite charges.
E. The ball is not attracted to the rod because it has no charge.

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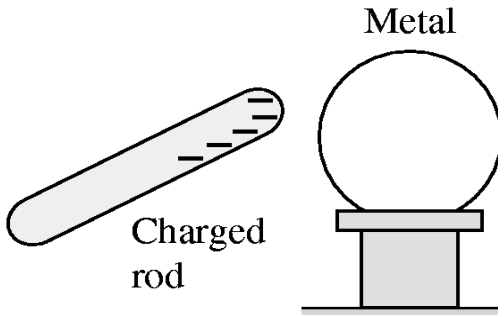

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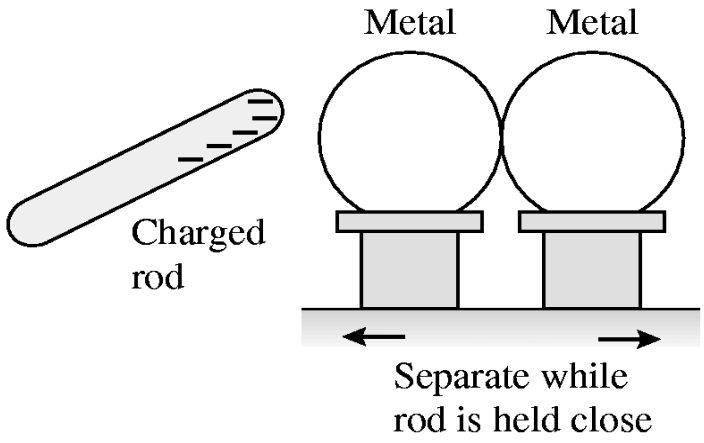
If a negative charged rod is held near (without touching) two neutral metal balls, and while the rod remains near, the metal balls are separated, what are the net charges on the two balls?



A. Both balls are positive charged.
B. The left ball has net positive charge and the right ball has net negative charge (the total charge remains zero).
C. The left ball has net negative charge and the right ball has net positive charge (the total charge remains zero).
D. The left ball has net positive charge and the right ball remains neutral.
E. Because the balls are metal, they have no net charge.
F. None of the above.

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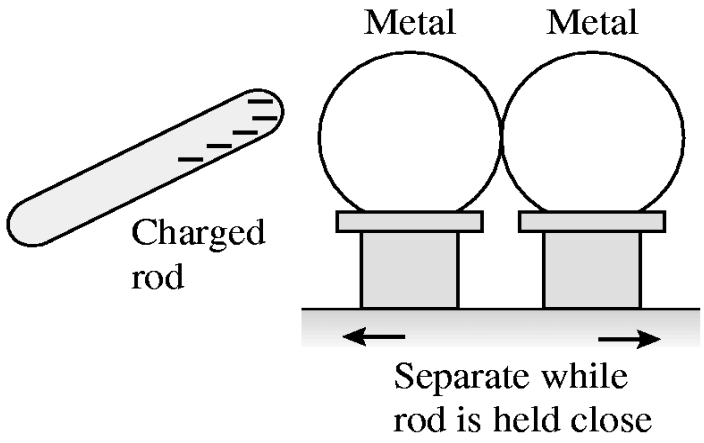

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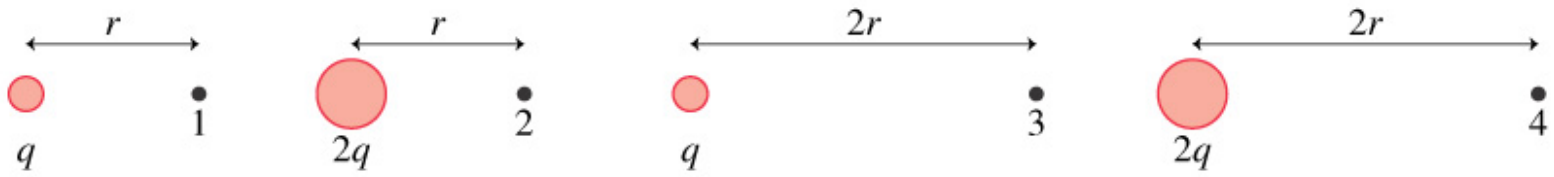
Rank in order, from largest to smallest, the electric field strengths E_1 to E_4 at points 1 to 4.



A. $E_2 > E_4 > E_1 > E_3$
B. $E_2 > E_1 = E_4 > E_3$
C. $E_2 > E_1 > E_4 > E_3$
D. $E_1 = E_2 > E_3 = E_4$
E. $E_1 > E_2 > E_3 > E_4$

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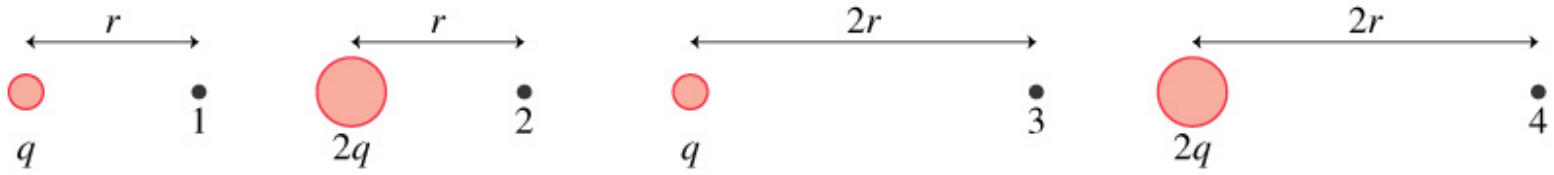

A. $E_2 > E_4 > E_1 > E_3$
B. $E_2 > E_1 = E_4 > E_3$
C. $E_2 > E_1 > E_4 > E_3$
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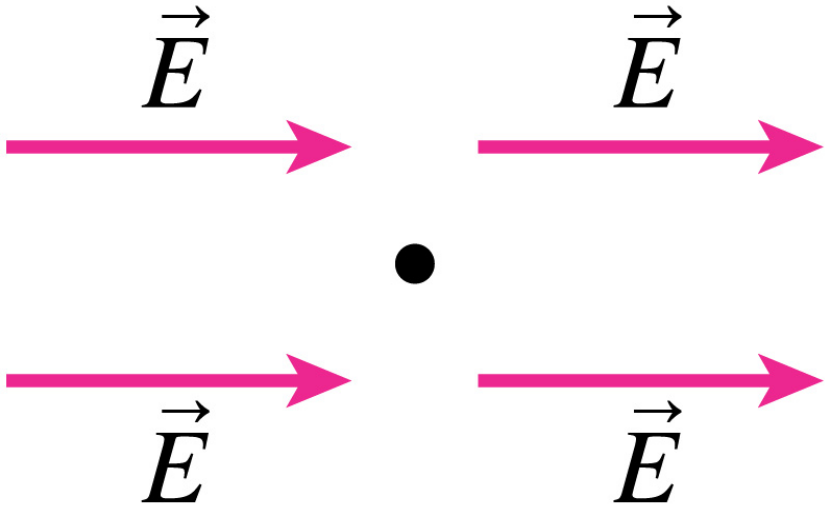
An electron is placed at the position marked by the dot. The force on the electron is



A. to the left.
B. to the right.
C. zero.
D. There's not enough information to tell.

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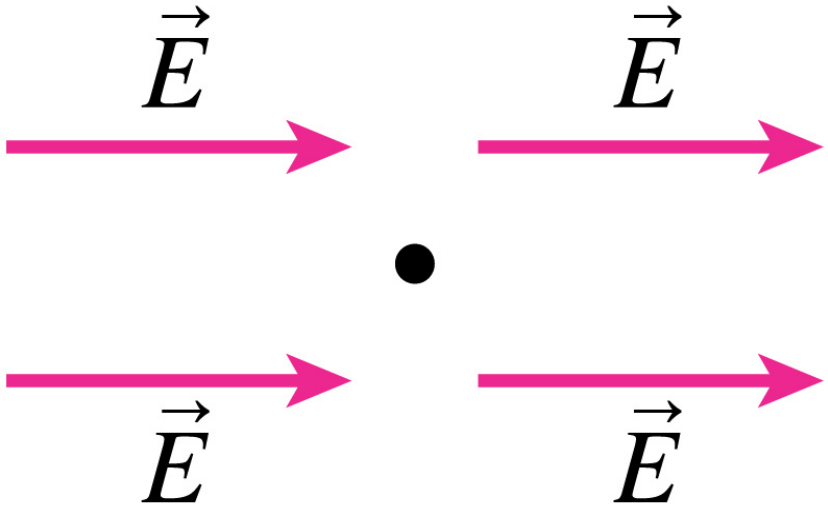

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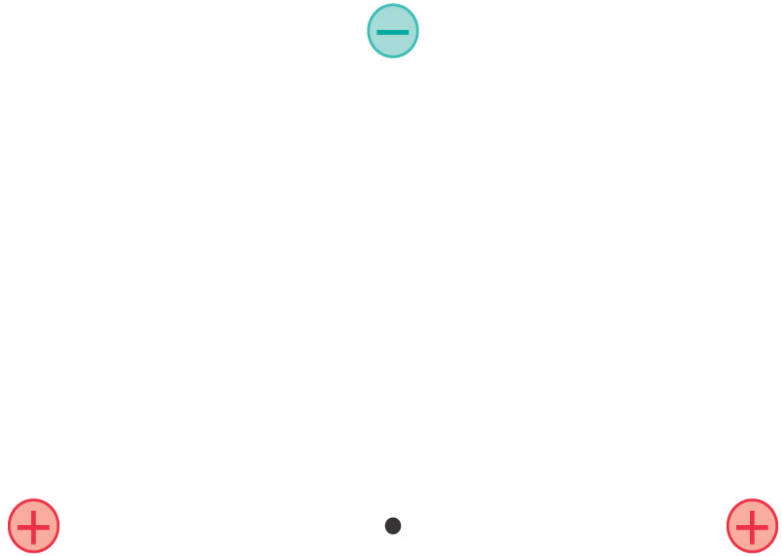
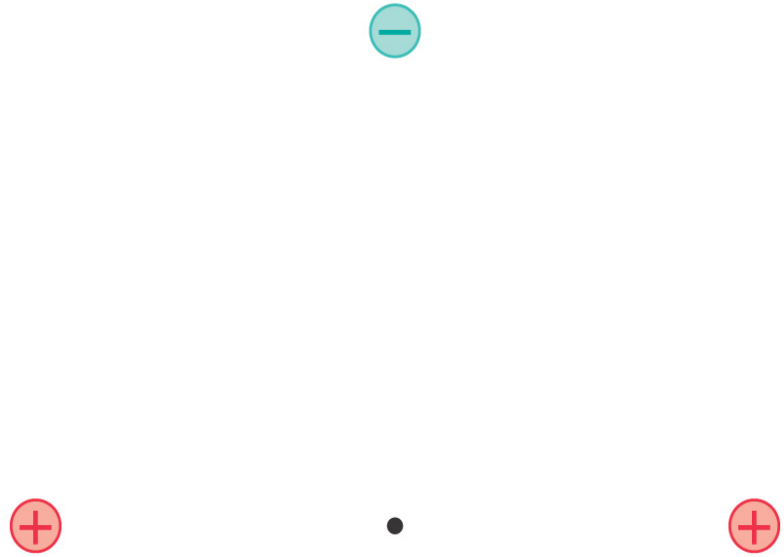
At the position of the dot,
the electric field points



A. Left.
B. Down.
C. Right.
D. Up.
E. The electric field is zero.

At the position of the dot,
the electric field points

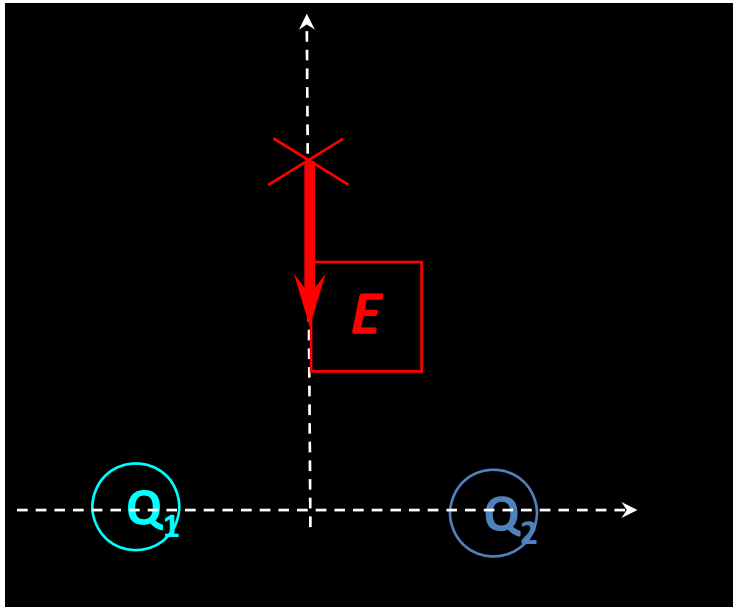


A. Left.
B. Down.
C. Right.
D. Up.
E. The electric field is zero.

Find the Charges

Two charges are fixed along the *x*-axis. They produce an electric field ***E*** directed along the negative *y*-axis at the indicated point. Which of the following is true?

1) charges are equal and positive
2) charges are equal and negative
3) charges are equal and opposite
4) charges are equal, but sign is undetermined
5) charges cannot be equal

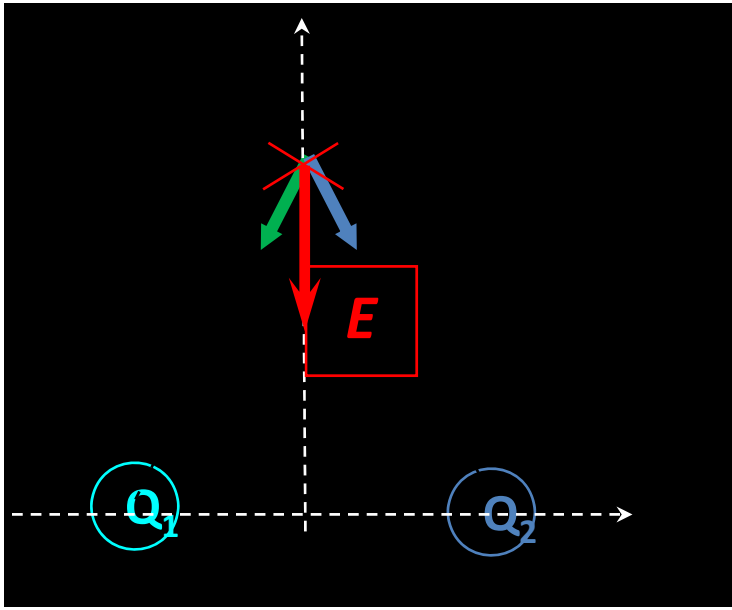


Find the Charges

Two charges are fixed along the *x*-axis. They produce an electric field *E* directed along the negative *y*-axis at the indicated point. Which of the following is true?

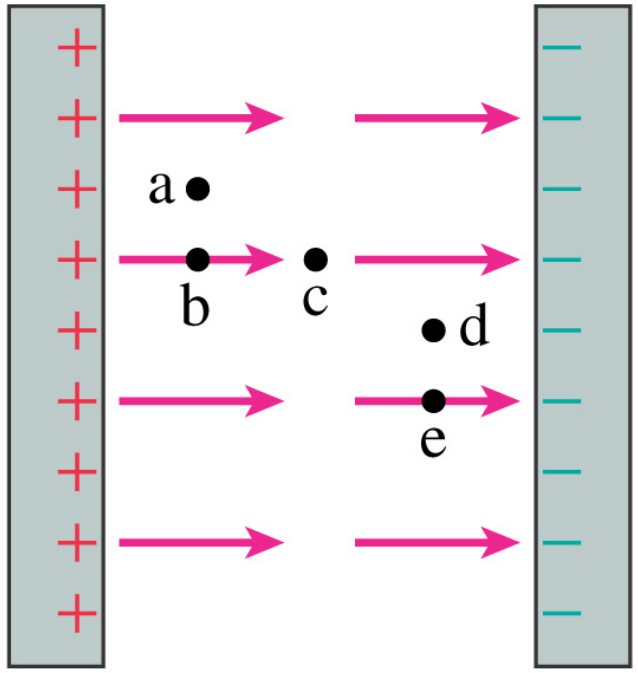
1) charges are equal and positive
2) charges are equal and negative
3) charges are equal and opposite
4) charges are equal, but sign is undetermined
5) charges cannot be equal

The way to get the resultant RED vector is to use the GREEN and BLUE vectors. These *E* vectors correspond to **equal charges** (because the lengths are equal) that are **both negative** (because their directions are toward the charges).



Follow-up: How would you get the *E* field to point toward the right?

Rank in order, from largest to smallest, the forces F_a to F_e a proton would experience if placed at points a – e in this parallel-plate capacitor.



A. $F_a = F_b = F_c = F_d = F_e$
B. $F_a = F_b > F_c > F_d = F_e$
C. $F_a = F_b = F_d = F_e > F_c$
D. $F_e > F_d > F_c > F_b > F_a$
E. $F_e = F_d > F_c > F_a = F_b$

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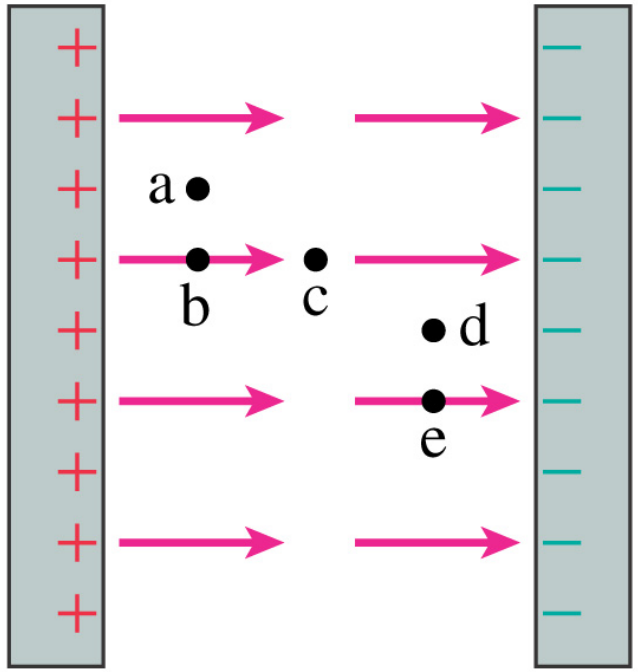

A. $\boldsymbol{F_a = F_b = F_c = F_d = F_e}$
B. $F_a = F_b > F_c > F_d = F_e$
C. $F_a = F_b = F_d = F_e > F_c$
D. $F_e > F_d > F_c > F_b > F_a$
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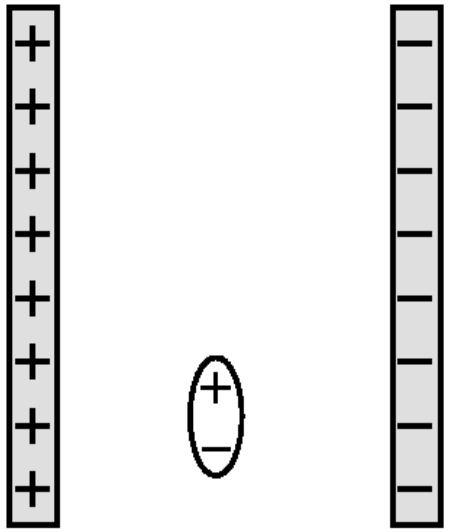
This dipole is placed between the plates of a capacitor. Does it



a. not move,
b. move to the right,
c. move to the left,
d. rotate clockwise,
e. rotate counterclockwise or
f. some combination of these?

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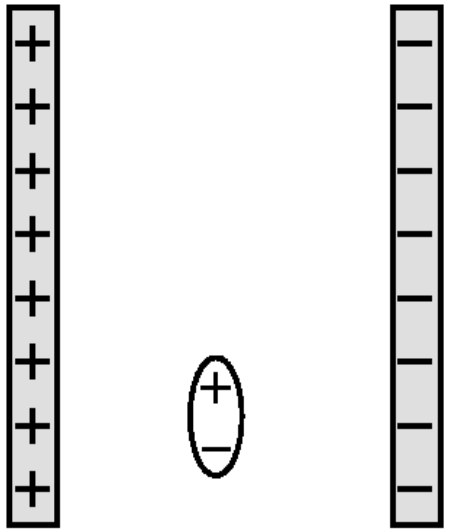

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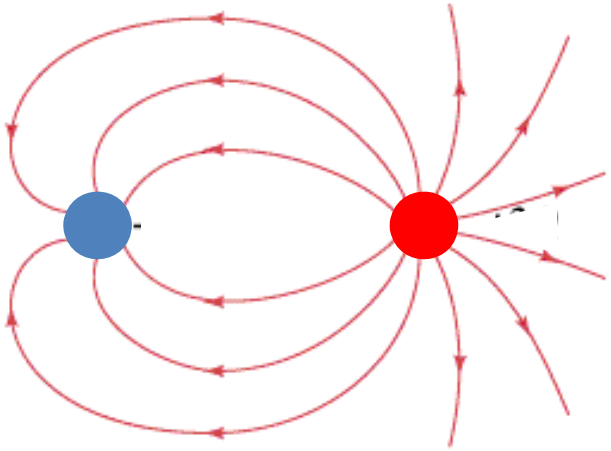
Electric Field Lines I

What are the signs of the charges whose electric fields are shown at right?

1) + −
2) − +
3) − −
4) + +
5) no way to tell



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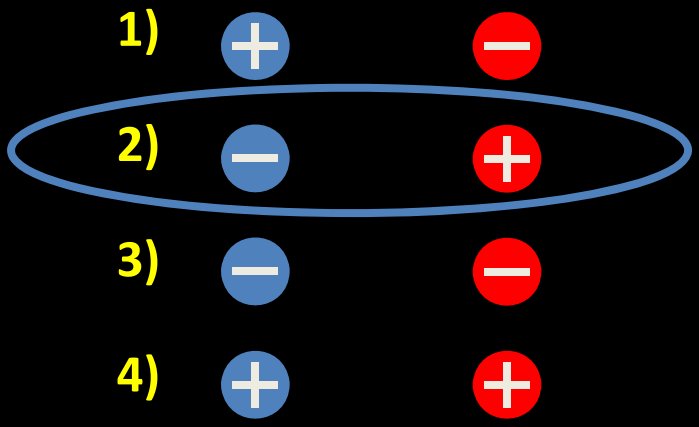

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Electric field lines **originate on positive charges** and **terminate on negative charges**.