

electrostatics - practice problems

1. A small negative bead is placed to the left of a small positive bead on a tabletop diagram. What direction is the force on the negative bead?

2. A $+3.0\ \mu\text{C}$ charge is $0.40\ \text{m}$ to the left of a $+2.0\ \mu\text{C}$ charge on a straight line. The charges are drawn as small dots, so use the center-to-center distance. What is the magnitude and direction of the force on the left charge?

3. A $-4.0\ \text{nC}$ charge and a $+6.0\ \text{nC}$ charge are $3.0\ \text{cm}$ apart. What is the electric force magnitude between them?

4. Two charged objects exert a $0.80\ \text{N}$ force on each other when they are $0.20\ \text{m}$ apart. If the same charges are moved to $0.40\ \text{m}$ apart, what is the new force?

5. Two identical small charges are 0.30 m apart and repel with a force of 0.040 N. What is the charge on each object?

6. A $+5.0\ \mu\text{C}$ charge and a $-2.0\ \mu\text{C}$ charge attract with a 1.0 N force. How far apart are their centers?

7. A plastic bead has 25 extra electrons. It is 2.0 cm from a proton in a simplified model of a tiny charged object. What is the electric force magnitude between them?

8. What is the electric field 0.50 m east of a $+8.0\ \text{nC}$ charge?

9. What is the electric field 20 cm west of a $-12\ \text{nC}$ charge?

10. How far from a $+2.0 \text{ nC}$ charge is the electric field strength 450 N/C ?

11. A point charge makes a $3.6 \times 10^4 \text{ N/C}$ electric field at a location 5.0 cm away. What is the magnitude of the charge?

12. A $-3.0 \text{ }\mu\text{C}$ charge is placed in a uniform 250 N/C electric field pointing right. What force acts on the charge?

13. A $+3.0 \text{ }\mu\text{C}$ bead is 0.20 m from another charged bead. What is the electric force between them?

14. A positive charge feels a 0.012 N force to the right in a 600 N/C electric field pointing right. What is the charge?

15. A 0.20 g particle with charge +50 nC is in a uniform 4000 N/C electric field pointing right. What is the particle's acceleration if no other horizontal forces act on it?

16. A 2.0 g bead with charge +0.50 μC starts from rest in a uniform 300 N/C field pointing right. If no other horizontal force acts, how fast is it moving after 0.40 s?

17. Two identical +2.0 nC charges are 10 cm apart. What is the electric field at the midpoint between them?

18. A +2.0 nC charge is 10 cm to the left of a -2.0 nC charge. What is the electric field at the midpoint between them?

19. A $+3.0 \text{ nC}$ charge is at $x = 0 \text{ cm}$, and a -1.0 nC charge is at $x = 20 \text{ cm}$. What is the electric field at $x = 5 \text{ cm}$?

20. A -4.0 nC charge is at $x = 0 \text{ cm}$, and a $+1.0 \text{ nC}$ charge is at $x = 30 \text{ cm}$. What is the electric field at $x = -10 \text{ cm}$?

21. A $+6.0 \text{ nC}$ source charge is 15 cm west of a -2.0 nC test charge. What force acts on the test charge?

22. Three charges are on a line. A $+4.0 \text{ }\mu\text{C}$ charge is at $x = 0 \text{ cm}$, a $+2.0 \text{ }\mu\text{C}$ charge is at $x = 30 \text{ cm}$, and a $-3.0 \text{ }\mu\text{C}$ charge is at $x = 50 \text{ cm}$. What is the net force on the $+2.0 \text{ }\mu\text{C}$ charge?

23. Three charges are on a line. A $-2.0\ \mu\text{C}$ charge is at $x = 0\ \text{cm}$, a $+1.0\ \mu\text{C}$ charge is at $x = 20\ \text{cm}$, and a $+3.0\ \mu\text{C}$ charge is at $x = 50\ \text{cm}$. What is the net force on the $+1.0\ \mu\text{C}$ charge?

24. A $+10\ \text{nC}$ charge is $20\ \text{cm}$ west of a point, and a $-5.0\ \text{nC}$ charge is $10\ \text{cm}$ east of the same point. A $-2.0\ \mu\text{C}$ bead with mass $3.0\ \text{g}$ is placed at the point. What is the bead's acceleration?

25. A $+4.0\ \text{nC}$ charge is at $x = 0\ \text{cm}$ and a $+1.0\ \text{nC}$ charge is at $x = 30\ \text{cm}$. Where between the charges is the electric field zero?

26. A $3.0\ \text{g}$ pith ball with charge $-20\ \text{nC}$ hangs near a charged board. Model the nearby part of the board as having $+35\ \text{nC}$ of charge at a point $2.0\ \text{cm}$ away. What is the electric force, and is it larger than the ball's weight?