

Exercise walk-through

10.1

Electric Charge and Electric Force

AP Physics 2

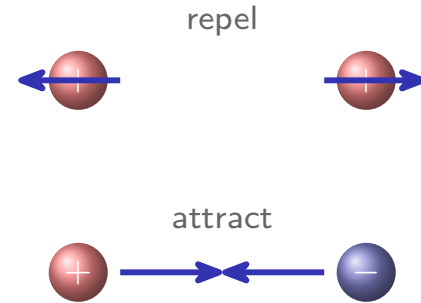
Electric charge and Coulomb's law

Electric charge comes in two kinds;
it is **conserved** and
quantized ($q = ne$).

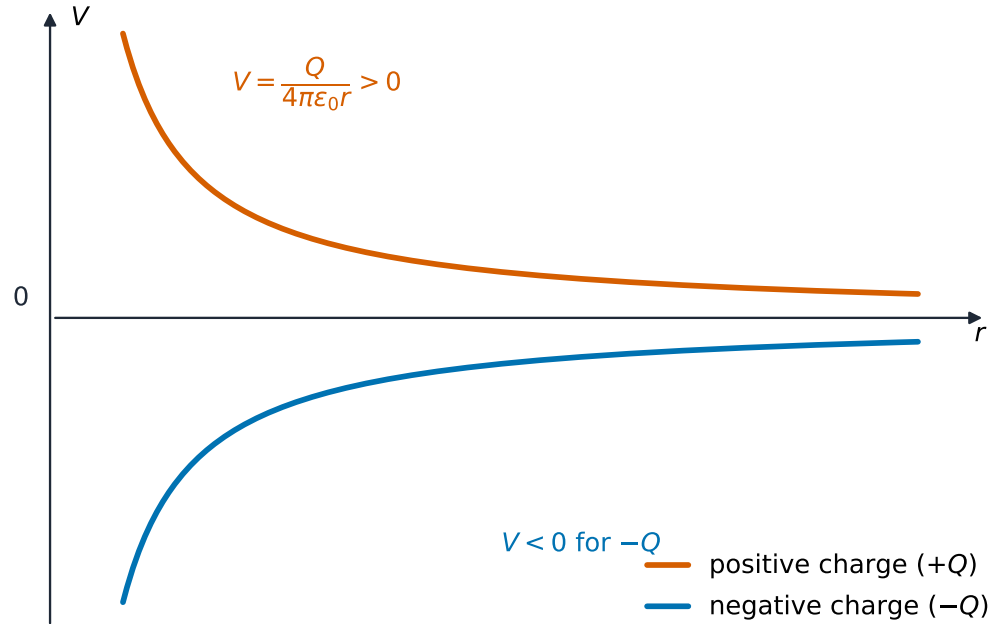
Coulomb's law

$$F = k \frac{q_1 q_2}{r^2}$$

An **inverse-square** law – double r ,
quarter the force.



The potential near a point charge varies as $1/r$



The potential near a point charge varies as $1/r$

Exercises 2.1-2.3

2.1 State whether two negative charges attract or repel.

[1]

2.2 Two point charges are moved twice as far apart. State the factor by which the force between them changes.

[1]

2.3 Find the force between a $+3.0 \mu\text{C}$ and a $-3.0 \mu\text{C}$ charge 0.20 m apart ($k = 8.99 \times 10^9$).

[2]

Exercises 2.1-2.3

2.1 State whether two negative charges attract or repel. [1]

2.1

- repel
-

2.2 Two point charges are moved twice as far apart. State the factor by which the force between them changes. [1]

2.2

- it becomes one quarter as large ($1/2^2$)
-

2.3 Find the force between a $+3.0 \mu\text{C}$ and a $-3.0 \mu\text{C}$ charge 0.20 m apart ($k = 8.99 \times 10^9$). [2]

2.3

- $F = 8.99 \times 10^9 \times \frac{(3.0 \times 10^{-6})^2}{(0.20)^2} = 2.0 \text{ N, attractive}$

Exercises 3.1-3.2

3.1 The Coulomb force between two point charges varies with their separation as [1]

☐

A $1/r$

B $1/r^2$

C r

D r^2

3.2 An object carries a charge of -4.8×10^{-19} C. The number of excess electrons is [1]

☐

A 1

B 2

C 3

D 4

Exercises 3.1·3.2

3.1 The Coulomb force between two point charges varies with their separation as [1]

☐

A $1/r$

B $1/r^2$

C r

D r^2

3.1 B

- $1/r^2$.

3.2 An object carries a charge of -4.8×10^{-19} C. The number of excess electrons is [1]

☐

A 1

B 2

C 3

D 4

3.2 C

- $4.8 \times 10^{-19} / 1.6 \times 10^{-19} = 3$

Exercise 3.3 (a)

3.3 Two point charges, $+5.0 \mu\text{C}$ and $+2.0 \mu\text{C}$, are 0.30 m apart.

(a) Find the force between them.

[3]

Exercise 3.3 (a)

3.3 Two point charges, $+5.0 \mu\text{C}$ and $+2.0 \mu\text{C}$, are 0.30 m apart.

(a) Find the force between them.

[3]

(a)

- $$F = 8.99 \times 10^9 \times \frac{(5.0 \times 10^{-6})(2.0 \times 10^{-6})}{(0.30)^2} = 1.0 \text{ N}$$

Exercise 3.3 (b)

3.3 Two point charges, $+5.0 \mu\text{C}$ and $+2.0 \mu\text{C}$, are 0.30 m apart.

(b) State whether the force is attractive or repulsive.

[1]

Exercise 3.3 (b)

3.3 Two point charges, $+5.0 \mu\text{C}$ and $+2.0 \mu\text{C}$, are 0.30 m apart.

(b) State whether the force is attractive or repulsive.

[1]

(b)

- repulsive (both charges positive)