

Exercise walk-through

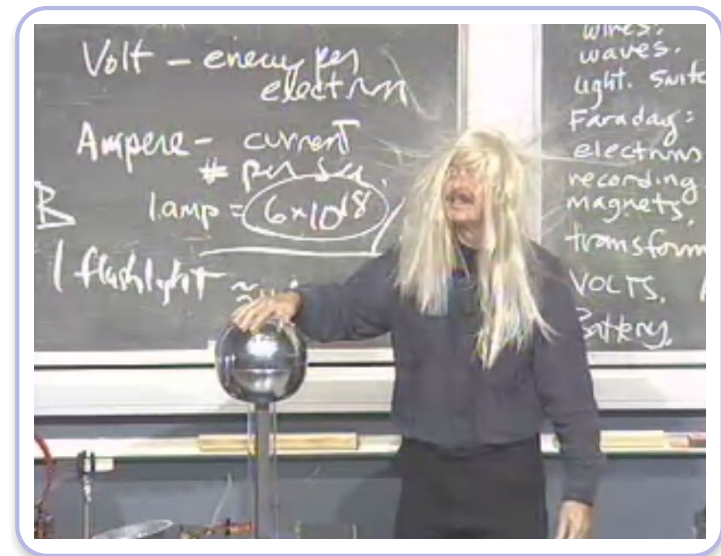
8.2

Electric Charge and the Process of Charging

AP Physics C: Electricity and Magnetism

The process of charging

- a **conductor** lets charge move; an
insulator holds it fixed
- **friction** – electrons rubbed
across
- **conduction** – touch: **same**
sign
- **induction** – near +
ground : **opposite** sign



Static charge builds on a Van de Graaff generator

Three ways to charge an object

charging by friction

rubbing two materials transfers electrons from one to the other – they end up equal and opposite

charging by conduction

a charged body *touches* a neutral one; charge flows until both share it, so **same sign** results

charging by induction

a charged body is brought *near*, the neutral body is grounded then ungrounded – the result is the **opposite** sign, with no contact

polarization

an **insulator** cannot pass charge, but its molecules stretch or turn so one face goes slightly positive – which is why a charged rod attracts paper

An **electroscope** both of them.

shows all of this: its leaves diverge when like charge spreads onto

Exercises 2.1-2.3

2.1 State the three methods of charging an object.

[2]

2.2 Explain the role of grounding when charging a conductor by induction.

[2]

2.3 State where excess charge sits on an isolated solid conductor.

[1]

Exercises 2.1-2.3

2.1 State the three methods of charging an object. [2]

2.1

- friction, conduction (contact), and induction
-

2.2 Explain the role of grounding when charging a conductor by induction. [2]

2.2

- grounding lets electrons flow in or out, leaving the conductor with a net induced charge once the ground is removed
-

2.3 State where excess charge sits on an isolated solid conductor. [1]

2.3

- entirely on its outer surface

Exercises 3.1-3.2

3.1 Charging by induction requires

[1]

☐

- A direct contact only
- B rubbing two materials
- C a nearby charge and a ground connection
- D heating the object

3.2 Grounding a conductor allows it to

[1]

☐

- A gain or lose electrons
- B melt
- C become an insulator
- D store light

Exercises 3.1-3.2

3.1 Charging by induction requires

[1]

☐

- A direct contact only
- B rubbing two materials
- C a nearby charge and a ground connection
- D heating the object

3.1 C

- a nearby charge and a ground connection.

3.2 Grounding a conductor allows it to

[1]

☐

- A gain or lose electrons
- B melt
- C become an insulator
- D store light

3.2 A

- gain or lose electrons.

Exercise 3.3 (a)

3.3 A positively charged rod is held near a neutral metal sphere; the sphere is then grounded, and the ground is removed before the rod.

(a) State the sign of the final charge on the sphere.

[1]

Exercise 3.3 (a)

3.3 A positively charged rod is held near a neutral metal sphere; the sphere is then grounded, and the ground is removed before the rod.

(a) State the sign of the final charge on the sphere. [1]

(a)

- negative

Exercise 3.3 (b)

3.3 A positively charged rod is held near a neutral metal sphere; the sphere is then grounded, and the ground is removed before the rod.

(b) Explain the sequence of steps that produces it.

[3]

Exercise 3.3 (b)

3.3 A positively charged rod is held near a neutral metal sphere; the sphere is then grounded, and the ground is removed before the rod.

(b) Explain the sequence of steps that produces it. [3]

(b)

- the positive rod attracts electrons to the near side; grounding lets more electrons flow onto the sphere; removing the ground traps this extra negative charge, then removing the rod leaves the sphere negatively charged