

Exercise walk-through

The Process of Charging ■ 10.2

eXercise

You must be able to

- distinguish **conductors** 导体 from **insulators** 绝缘体 by how freely charge moves
- explain charging by **friction** 摩擦, **conduction** 接触, and **induction** 感应
- describe how a charged object attracts a neutral one by **polarization** 极化
- apply **conservation of charge** 电荷守恒

Method — Conductors and insulators

In a **conductor** (metal) charge moves freely; in an **insulator** (plastic, glass) it stays put.

Method — Three ways to charge

- **Friction** — rubbing transfers electrons between materials.
- **Conduction** — touching a charged object shares charge.
- **Induction** — a nearby charge rearranges charge, then grounding removes some.

Method — Polarization

A charged rod attracts a neutral object by pulling its opposite charges slightly closer — the near side becomes oppositely charged.

Practice 2.1 ■ 2 marks

State the difference between a conductor and an insulator.

Solution 2.1

Method: Conductors and insulators

Worked steps

in a conductor charge moves freely **B1**; in an insulator charge stays fixed in place **B1**.

Practice 2.2 ■ 1 mark

Name the charging method in which two objects are rubbed together.

Solution 2.2

Worked steps

friction (rubbing) **B1**.

Practice 2.3 ■ 2 marks

Explain how a charged balloon sticks to a neutral wall.

Solution 2.3

Method: Polarization

Worked steps

the balloon's charge polarizes the wall, pulling opposite charge to the near surface **B1**, so the balloon is attracted and held **B1**.

Exam-style 3.1 ■ 1 mark

Charge moves freely through a

- A** insulator
- B** conductor
- C** vacuum only
- D** neutral object

Solution 3.1

Method: Conductors and insulators

A insulator

B conductor



C vacuum only

D neutral object

Worked steps

B.

Exam-style 3.2 ■ 1 mark

Charging by induction involves

- A** rubbing two materials
- B** direct contact only
- C** bringing a charge near, then grounding
- D** heating the object

Solution 3.2

- A** rubbing two materials
- B** direct contact only
- C** bringing a charge near, then grounding 
- D** heating the object

Worked steps

C.

Exam-style 3.3 ■ 2 marks

A negatively charged rod is brought near (but not touching) a neutral metal sphere on an insulating stand.

- (a) Describe the arrangement of charge on the sphere.
- (b) State the net charge on the sphere.

Solution 3.3

Worked steps

(a) the near side becomes positive and the far side negative (charges separate) **B1** **B1**. (b) zero — the sphere is still neutral overall **B1**.