

10.2 The Process of Charging

Name: _____ Class: _____ Date: _____

Total: 10 marks

Objective

Build the skills to answer exam questions on **the process of charging**.

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

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ Conductors and insulators

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

■ 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.

■ Polarization

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

2 Practice

2.1 State the difference between a conductor and an insulator.

[2]

2.2 Name the charging method in which two objects are rubbed together. [1]

2.3 Explain how a charged balloon sticks to a neutral wall. [2]

3 Exam-style questions

3.1 Charge moves freely through a [1]

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

3.2 Charging by induction involves [1]

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

3.3 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. [2]

(b) State the net charge on the sphere. [1]

4 Go further

- work through the **10.2 The Process of Charging** lesson on the **Learn** page;

- read the **Electric Force, Field, and Potential** section of the AP Physics 2 handout on the **Know** page.

Solutions

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

2.2 friction (rubbing).

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

3.1 B.

3.2 C.

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