

8.2 Electric Charge and the Process of Charging

Name: _____ Class: _____ Date: _____ **Total: 11 marks**

KEY WORDS ground 接地 • conductor 导体 • induction 感应 • insulator 绝缘体
• conduction 接触

Objective

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

You must be able to:

- distinguish **conductors** 导体 from **insulators** 绝缘体
- explain charging by **friction** 摩擦, **conduction** 接触, and **induction** 感应
- explain the role of **grounding** 接地 in charging
- account for charge distributions using **conservation of charge**

1 Worked examples

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

■ Conductors and insulators

Charge moves freely in a **conductor**, but stays put in an **insulator**.

■ Three ways to charge

Friction (transfers electrons), conduction (contact shares charge), and induction (a nearby charge rearranges charge, then grounding removes some).

■ Grounding

A **ground** is a huge charge reservoir: it can supply or drain electrons, fixing the sign of an induced charge before the connection is broken.

2 Practice

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]

3 Exam-style questions

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

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]

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

Solutions

2.1 friction, conduction (contact), and induction.

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

2.3 entirely on its outer surface.

3.1 C.

3.2 A.

3.3 (a) negative. (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.