10.2 Redistribution of Charge Between Conductors

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

Objective

Build the skills to answer exam questions on **redistribution of charge between conductors**.

You must be able to:

- describe how charge **redistributes** when two conductors touch
- explain that connected conductors reach a common **potential** 电势
- use **conservation of charge** to find the final charge on each
- analyse charge sharing between two spheres

1 Worked examples

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

■ Contact reaches a common potential

When two conductors are joined, charge flows until both are at the **same potential**.

■ Conservation of charge

The total charge before equals the total after —it is only shared, never lost.

■ Two spheres

Joined spheres share charge so that $V = k\dfrac{Q}{r}$ is equal; a larger sphere ends up with **more** charge. Two **identical** spheres split the total equally.

2 Practice

2.1 A metal sphere with $+8.0\ \mu$C touches an identical neutral sphere, then they separate. Find the charge on each. [2]

2.2 State what becomes equal on two conductors joined by a wire at equilibrium. [1]

2.3 State the conservation law used in charge sharing. [1]

3 Exam-style questions

3.1 Two conductors connected by a wire reach a common [1]

- **A** charge
- **B** potential
- **C** mass
- **D** field

3.2 When two identical charged spheres touch, the total charge is [1]

- **A** doubled
- **B** conserved and shared equally
- **C** reduced to zero
- **D** lost to the surroundings

3.3 A sphere carrying $+12\ \mu\text{C}$ briefly touches an identical neutral sphere.

(a) Find the charge on each sphere after they separate. [2]

(b) State the principle you used. [1]

4 Go further

- work through the **10.2 Redistribution of Charge Between Conductors** lesson on the **Learn** page;
- read the **Conductors and Capacitors** section of the AP Physics C: E&M handout on the **Know** page.

Solutions

2.1 they are identical, so the charge splits equally: $\frac{8.0}{2} = 4.0\ \mu\text{C}$ each.

2.2 their electric potential.

2.3 conservation of charge.

3.1 B.

3.2 B.

3.3 (a) $\frac{12}{2} = 6.0\ \mu\text{C}$ on each. (b) conservation of charge (with equal sharing between identical spheres).