Exercise walk-through

Redistribution of Charge Between Conductors ▪ 10.2

eXercise

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

Method — Contact reaches a common potential

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

Method — Conservation of charge

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

Method — Two spheres

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

Practice 2.1 ▪ 2 marks

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

Solution 2.1

Method: Two spheres

Worked steps

they are identical, so the charge splits equally: $\frac{8.0}{2} = 4.0\ \mu\text{C}$ each **M1** **A1**.

Practice 2.2 ▪ 1 mark

State what becomes equal on two conductors joined by a wire at equilibrium.

Solution 2.2

Worked steps

their electric potential B1.

Practice 2.3 ▪ 1 mark

State the conservation law used in charge sharing.

Solution 2.3

Method: Conservation of charge

Worked steps

conservation of charge B1.

Exam-style 3.1 ▪ 1 mark

Two conductors connected by a wire reach a common

A charge

B potential

C mass

D field

Solution 3.1

Method: Contact reaches a common potential

A charge

B potential ✓

C mass

D field

Worked steps

B.

Exam-style 3.2 ▪ 1 mark

When two identical charged spheres touch, the total charge is

A doubled

B conserved and shared equally

C reduced to zero

D lost to the surroundings

Solution 3.2

Method: Two spheres

A doubled

B conserved and shared equally ✓

C reduced to zero

D lost to the surroundings

Worked steps

B.

Exam-style 3.3 ▪ 2 marks

A sphere carrying $+12\ \mu$C briefly touches an identical neutral sphere.
(a) Find the charge on each sphere after they separate.
(b) State the principle you used.

Solution 3.3

Method: Two spheres

Worked steps

(a) $\dfrac{12}{2} = 6.0\ \mu$C on each M1 A1. (b) conservation of charge (with equal sharing between identical spheres) B1.