

Exercise walk-through

2.3

Electrostatics (P)

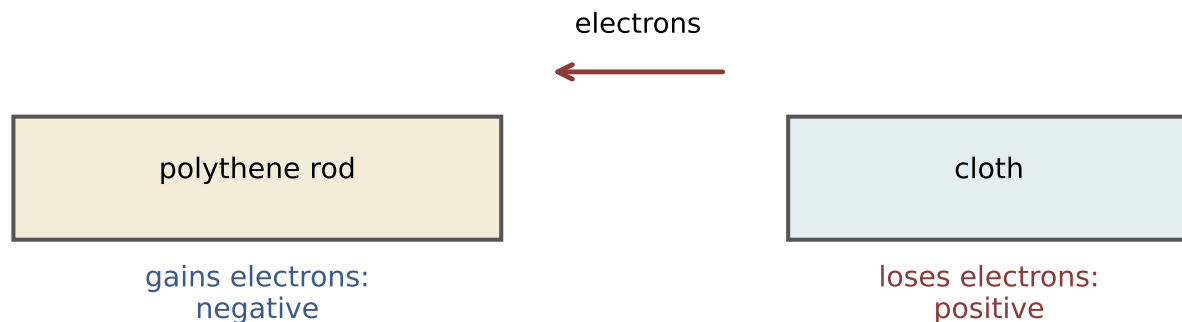
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The method

Method — Charge is electrons moving

Only **electrons** transfer. Rub a polythene rod with a dry cloth: electrons move cloth → rod, so the rod becomes **negative** and the cloth **positive** (equal amounts). Unlike charges attract; like charges repel.



only electrons move; the charges are equal and opposite

Method — Danger and use

Danger: fuelling aircraft and tankers – flowing fuel gathers charge, a spark can ignite vapour; earthed bonding cables keep everything at the same potential.

Uses: photocopiers charge a drum so toner sticks where the image is; inkjet printers steer charged droplets.

Exercises 2.1·2.3

2.1 (P) Name the particle transferred when insulators are charged by friction. [1]

2.2 (P) A balloon rubbed on hair sticks to a wall. Explain why. [3]

2.3 (P) State the force rule for like and unlike charges. [2]

Exercises 2.1·2.3

2.1 (P) Name the particle transferred when insulators are charged by friction. [1]

2.1 (P) Electrons.

2.2 (P) A balloon rubbed on hair sticks to a wall. Explain why. [3]

2.2 (P) Rubbing transfers electrons to (or from) the balloon, charging it; the charged balloon induces an opposite charge on the wall's surface – charges in the wall's molecules shift; the unlike induced charge attracts, holding the balloon.

2.3 (P) State the force rule for like and unlike charges. [2]

2.3 (P) Like charges repel; unlike charges attract.

Exercises 2.4·3.2

2.4 (P) Give one danger of electrostatic charging during refuelling and the precaution used. [2]

3.1 (P) An acetate rod rubbed with a cloth becomes positive. Explain, in terms of particles, what happened to each object. [3]

3.2 (P) Describe how a photocopier uses electrostatic charge. [3]

Exercises 2.4·3.2

2.4 (P) Give one danger of electrostatic charging during refuelling and the precaution used. [2]

2.4 (P) A spark from accumulated charge could ignite fuel vapour; the tanker/aircraft is connected to earth with a bonding conductor so charge drains away.

3.1 (P) An acetate rod rubbed with a cloth becomes positive. Explain, in terms of particles, what happened to each object. [3]

3.1 (P) Electrons are transferred from the rod to the cloth; the rod lost electrons so it has too few negatives – net positive; the cloth gained the same number, becoming equally negative.

3.2 (P) Describe how a photocopier uses electrostatic charge. [3]

3.2 (P) The drum is charged in the pattern of the image; oppositely charged toner powder sticks to the charged areas; toner transfers to paper and is fixed by heat.

Exercise 3.3

3.3 (P) Explain why a charged plastic comb picks up small pieces of dry paper. [3]

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3.3 (P) Explain why a charged plastic comb picks up small pieces of dry paper. [3]

3.3 (P) The comb's charge induces opposite charge on the near side of each paper piece, so the near side is attracted more strongly than the far side is repelled; the paper is light, so this net attraction lifts it.