



Unit 8 • Electricity and Magnetism

Full marks 31

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. static electricity
2. electrons
3. positively
4. electrostatic force
5. electric discharge
6. earthing
7. electric circuit
8. battery

K • 4

Each carries 0.5 mark.

2 Multiple choice

- i. a. a solar bulb

K • 1

A load uses electricity. The bulb uses it to make light. A battery, a dry cell and a photocell (a solar cell) are all **sources** that supply electricity.

- ii. a. The statement is correct, but both reasons are incorrect.

U • 1

The statement is right. Reason 1 is wrong: losing electrons makes a substance **positive**. Reason 2 is wrong: protons never move when things are rubbed; a substance becomes positive by **losing electrons**.

- iii. a. Cells are joined in parallel to light a bulb for a long time.

U • 1

In parallel the cells share the work, so they last longer. Adding cells in parallel doesn't make the bulb brighter; cells in series make it brighter but run down **faster**; and most appliances (torches, remotes, clocks) join their cells in series.

- iv. c. The flow of electrons from the negative terminal to the positive terminal of a cell, round a circuit, is current electricity.

U • 1

In a wire, **electrons** carry the current, and they flow out of the **negative** terminal, round the circuit, into the **positive** terminal, always the same way with a cell. Protons don't move.

- v. a. in series, so that their voltages add up to 3 V

A • 1

In series the voltages add: $1.5\text{ V} + 1.5\text{ V} = 3\text{ V}$. In parallel the voltage stays at 1.5 V, too little for a 3 V torch.

3 Label the diagram

- | | |
|---------------------------------|-------------------|
| 1. wire (electrons flow - to +) | 4. + terminal |
| 2. switch (closed) | 5. source: a cell |
| 3. - terminal | 6. load: a bulb |

K • 3

Each carries 0.5 mark.

4 Very short answers

- a. MARKING SCHEME
✓ Positive (+).

K • 1

- b. MARKING SCHEME
✓ 1.5 volts.

K • 1

- c. MARKING SCHEME
✓ Copper.

K • 1



5 Short answers

a. MARKING SCHEME

U • 2

- ✓ Any one difference, e.g. in current electricity electrons flow continuously through a conductor; static charge builds up on an object and stays there.
- ✓ Any second difference, e.g. current electricity is produced by cells, batteries and generators; static electricity by rubbing (or an example of each: a torch; a rubbed comb or lightning).

b. MARKING SCHEME

U • 2

- ✓ Lightning usually strikes the highest point around, such as a tall tree or building.
- ✓ Its current runs down into the ground and can jump sideways into, or spread through the ground to, a person beside it.

c. MARKING SCHEME

U • 2

- ✓ Combing moves electrons from the hair to the comb, so the comb becomes negatively charged.
- ✓ It pushes electrons in the paper away, leaving the near side positive; opposite charges attract, so the paper is pulled up.

d. MARKING SCHEME

K • 2

- ✓ Using two or more cells together in a circuit is a combination of cells.
- ✓ It is done to get a higher voltage (series) or to make the cells last longer (parallel).

6 Long answer

ANSWER

U • 4

Lightning is a giant electric discharge (spark) between a charged cloud and another cloud, or between a cloud and the ground, with a huge flash of light, heat and sound. How it is produced: In a tall storm cloud, strong rising winds carry water drops up until they freeze. Small ice crystals and heavier soft hail crash into each other millions of times, and charge moves between them, as in rubbing. The light ice crystals become positive and are carried to the top of the cloud; the heavier hail becomes negative and gathers in the lower part. When the charge becomes very large, electrons rush through the air between the charged parts, or from the cloud to the ground, which becomes positive below the cloud. This sudden discharge is lightning; the air heated by it expands with a bang, the thunder.

MARKING SCHEME

- ✓ Lightning: a giant electric discharge (spark) between clouds, or between a cloud and the ground, with light, heat and sound.
- ✓ In a storm cloud, small ice crystals and heavier soft hail crash into each other, and charge moves between them, as in rubbing.
- ✓ The light ice crystals become positive and go to the top; the heavier hail becomes negative and gathers lower down.
- ✓ When the charge becomes very large, electrons rush through the air (to another part of the cloud, or to the ground below, which has become positive): lightning.

7 Numerical problem

ANSWER

A • 2

In series the voltages add up: $4.5\text{ V} \div 1.5\text{ V} = 3$ cells ($1.5\text{ V} + 1.5\text{ V} + 1.5\text{ V} = 4.5\text{ V}$). In parallel the voltage stays that of one cell, 1.5 V .

MARKING SCHEME

- ✓ 3 cells in series ($1.5 + 1.5 + 1.5 = 4.5\text{ V}$).
- ✓ In parallel: 1.5 V .



8 Think

ANSWER

HA - 2

Flowing fuel builds up static charge on the tanker. The cable leads that charge away into the ground (earthing), so no spark can jump near the fuel vapor and start a fire.

MARKING SCHEME

- ✓ The flowing fuel builds up static charge, and a spark near the fuel vapor could start a fire.
- ✓ The cable leads the charge into the ground (earthing), so no charge builds up and no spark jumps.

9 Activity: More cells in series (Activity 8.4)

(not marked)

WHAT STUDENTS SHOULD FIND

One cell: the bulb glows dimly (1.5 V); two cells: brighter (3 V); three cells: brightest (4.5 V). The more cells in series, the brighter the bulb, because their voltages add up.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	13	13	3	2	31

