M1. (a) **Level 2 (3–4 marks):**
A detailed and coherent explanation is provided. The student makes logical links between clearly identified, relevant points.

Level 1 (1–2 marks):
Simple statements are made, but not precisely. The logic is unclear.

0 marks:
No relevant content

Indicative content
- friction (between cloth and rod) causes
- electrons (to) move
- from the acetate rod **or** to the cloth
- (net) charge on cloth is now negative
- (net) charge on rod is now positive

4

(b) there is a force of attraction between the acetate rod and the cloth

(reason)

1

unlike charges attract

or

negative charges attract positive charges

1

(c) increase

1

(d) 0.000025 × 60 000

1

1.5 (J)

1

*accept 1.5 (J) with no working shown for **2** marks*

[9]

M2. (a) (i) (bottom **or** other ends) move apart or repel

accept they move apart

1

(ii) have <u>same</u> charge

accept both have negative charge
(from part (b) do not credit both have positive charge

same **or** like charges repel

not just opposite charges attract

2

(b) positive

1

electrons

1

cloth

1

polythene

accept strips

1

(c) (i) conductors

accept metals

1

(ii) insulators

accept non-conductors/poor conductors do not credit non-metals

1

[9]

M3. (a) becomes (electrically) charged or description of electron movement

for 1 mark

1

(b) comb attracts paper

for 1 mark

1

(c) charge/electricity gone to Earth/body

for 1 mark each

2

[4]

M4. (a) (i) electrons

1

jumper

1

(ii) positive

accept protons

accept +

1

(iii) positively charged

accept any clear way of indicating the answer

1

(b) (i) copper

1

it is an (electrical) conductor

only accept if copper is identified

*do **not** accept it conducts heat*

accept it conducts heat and electricity

accept copper is the best conductor

accept correct description of conduction

1

(ii) current

1

[7]

M5. (a) repel

1

opposite

1

attract

1

correct order only

(b) refuelling an aircraft

reason cannot score if refuelling aircraft is not chosen

1

a spark may cause an explosion / fire / ignite the fuel

accept the static for a spark

accept named fuel

there must be a consequence of having a spark

*do **not** accept answers in terms of people getting a shock or electrocuted*

1

[5]

M6. (a) (i) electrons

1

a positive

1

(ii) (forces are) equal

accept (forces are)the same

forces are balanced is insufficient

1

(forces act in) opposite directions

accept (forces) repel

both sides have the same charge is insufficient

1

(b) aluminium

1

[5]

M7. (a) fleece rubs against shirt

it refers to the fleece

1

or

friction (between fleece and shirt)

(causing) <u>electrons</u> to transfer from one to the other

accept a specific direction of transfer

*do **not** accept charge for electrons*

positive electrons negates this mark

movement of protons negates this mark

1

(b) Electrical charges move easily through metals.

1

An electric current is a flow of electrical charge.

1

(c) (i) copper

reason only scores if copper chosen

1

(good electrical) conductor

accept it is a metal

any mention of heat conduction negates this mark

1

(ii) lower than

1

(iii) accept any sensible suggestion,eg:

- too many variables (to control)
- lightning strikes / storms are random / unpredictable

- do not know which building will be struck
- do not know when a building will be struck
- do not know when lightning will happen
- (very) difficult to create same conditions in a laboratory
- lightning storms are not the same

  it is not safe is insufficient

  *do **not** accept lightning does not strike the same place twice*

1

[8]