M1. (a) plastic or rubber

accept any named plastic
*do **not** accept wood*

1

it is a (good) insulator **or** it is a poor conductor

ignore mention of heat if in conjunction with electricity

1

(b) *The answer to this question requires ideas in good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme.*

Maximum of 2 marks if ideas not well expressed.

pulls iron bolt down **or** attracts the iron bolt **or** moves bolt out of plunger

answers in terms of charges attracting
or repelling gain no credit

1

plunger pushed / moved to the right (by spring) **or** plunger released

1

push switch opens / goes to off / goes to right

accept circuit is broken

for maximum credit the points must follow a logical sequence

*3 correct points but incorrect sequence scores **2** marks only*

ignore reset action

1

[5]

M2. Quality of written communication: One mark for correct sequencing.
bolt out → plunger up → switch off / circuit broken

1

any **five** from

- high current flows
- electromagnet is stronger
- the iron bolt is pulled out
- the plastic plunger moves up
- the switch is lifted / open / off
  accept circuit is broken
- no current flowing
- to re-set the plunger must be pushed down

5

[6]

M3. electromagnet becomes <u>stronger</u> (*not* becomes magnetic) iron moves left – implied OK
plunger goes up push switch goes to off or circuit broken unless plunger moves down
for 1 mark each

[4]

M4. (i) relay

accept solenoid

*do **not** accept magnetic switch*

1

(ii) a current flows through the coil (of the electromagnet)
or a current flows through the electromagnet
or a (magnetic) field is produced

accept 'electricity' for 'current'

*accept the electromagnet is activated **or** magnetised **or** turned on*

*do **not** accept answer in terms of magnetic charge*

1

the (iron) arm is attracted to the electromagnet

*accept the arm pivots **or** moves towards the electromagnet*

1

the contacts are pushed together

*do **not** accept contacts attract*

1

[4]

M5. (a) current flows
coil / core magnetised / electromagnet activated / energised / turned on
attracts iron bar causing bolt to be pulled out
each for 1 mark

4

(b) more turns
bigger current / e.m.f
softer iron core
any two for 1 mark each

2

(c) to relock door / return iron bar / to lock door
for 1 mark

1

(d) iron bar would still be attracted / coil still magnetised so still works
for 1 mark each

yes + wrong answer
0 marks

yes + current still flows
1 mark

yes + still magnetised / iron bar still attracted
2 marks

2

[9]