

- 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 stronger (*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]