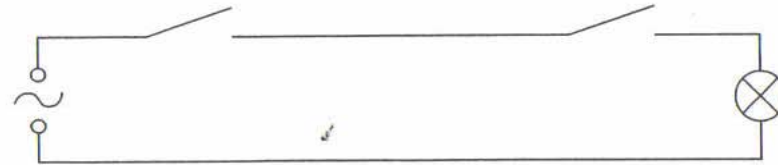


Domestic Electricity

12 (a) A lamp in a long hallway is to be controlled by two switches at either end of the hallway. The lamp is to be switched on or off using either switch.

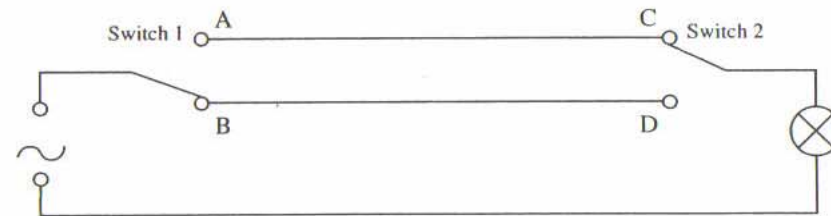
①

(i) Suggest why the circuit shown below would **not** be suitable.



Both switches must be closed
for lamp to light. [1]

The following circuit would be suitable.



(ii) Describe what happens in the circuit when

1. switch 1 is moved to A

bulb lights / current flows ①

2. then switch 2 is moved to D

bulb goes out / no current flows ① [2]

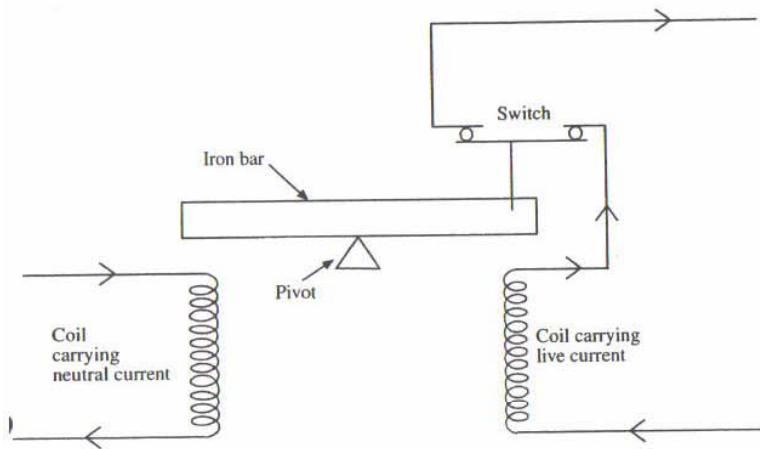
- (b) Three differently coloured wires are connected in a domestic lighting circuit. Normally only one of the wires has the switch in it.

Which one is switched and why?

live/brown ①
→ carries large voltage & therefore
dangerous ① [2]

- (c) Residual current circuit breakers are used to protect users in domestic electrical circuits.

A simple circuit breaker is shown below.



- (i) Describe how this circuit breaker protects the user.

when current flows, e-magnet turns
on ① and opens switch / breaks
circuit ① [2]

- (ii) State two advantages of using a circuit breaker instead of a fuse.

1. can be reset
2. faster response time [2]

101

Examiner Only	
Marks	Remark

8

- Mains electricity is dangerous. There are a number of ways in which the user can be protected from harm. A metal table lamp is connected to the mains supply with a three pin plug.



- (a) The live and neutral wires are connected to the bulb.

- (i) Name the third wire.

earth [1]

- (ii) To what part of the lamp is the third wire connected?

metal casing / base [1]

- (b) Explain how this third wire will protect the user from harm.

If live touches metal casing ①
a large current flows to earth (low
resistance path)
blowing the fuse & stopping current ① [3]

102

For Examiner's use only	

8 An electric shower has a power rating of 8000 W. It is switched on for 15 minutes.

4

(a) How much energy, in kilowatt-hours, does the shower use?

Show clearly how you obtain your answer.

$$E = P \times t \quad \textcircled{1}$$

$$E = 8 \times 0.25 \quad \textcircled{1} \quad \textcircled{1}$$

$$= 2 \text{ kWh}$$

Energy = 2 kWh kWh [4]

(b) If one unit of electricity costs 10p calculate the cost of heating the water.

Show clearly how you obtain your answer.

Cost = 20 p [1]

103

[Turn over

6 (a) (i) A filament lamp lights when it is connected in an electric circuit. The filament carries a current of 3.0 amperes when lit.

5

How much charge passes through the filament in 0.5 second?

$$Q = It$$

$$= 3 \times 0.5$$

$$= 1.5 \text{ C}$$

Charge = 1.5 C [2]

(ii) If the power of the lamp is 36 W and the current flowing through it is 3.0 A, calculate the voltage across the lamp. Show clearly how you obtain your answer.

$$P = IV \quad \textcircled{1}$$

$$36 = 3 \times V$$

$$\frac{36}{3} = V \quad \textcircled{1}$$

$$12 \text{ V} = V$$

Voltage = 12 V [3]

(iii) The filament lamp is connected to a joulemeter which measures the energy consumed by the lamp. If the lamp uses 4320 joules of energy, calculate the length of time it has been switched on. Show clearly how you obtain your answer.

$$P = \frac{E}{t} \quad \textcircled{1}$$

$$36 = \frac{4320}{t} \quad \textcircled{1}$$

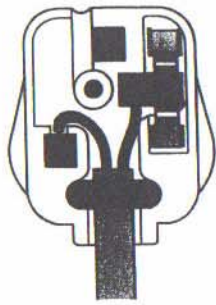
$$t = \frac{4320}{36}$$

Time = 120 secs [3]

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(d)
6



Source: Physics Through Applications, Edited by Jim Jardine.

The diagram above shows the wiring in a plug connected to a hairdryer.

- (i) Explain fully why it is safe to use the hairdryer even though there are only two wires connected to the plug.

double insulation / plastic body
and current cannot flow
in casing so no earth wire
needed.

[2]

- (ii) Explain why the fuse is always placed on the live wire.

If fuse blows equipment/and
user will be safe
as live wire carries high voltage [1]

* Note if fuse blows no current flows