

Name of the Student: _____

Max. Marks : 20 Marks

Time : 20 Minutes

Q1.

Figure 1 shows some hair straighteners.

Hair straighteners contain heating elements.

Figure 1



- (a) When the hair straighteners reach normal operating temperature, an LED turns on.

Draw the circuit symbol for an LED in the box.



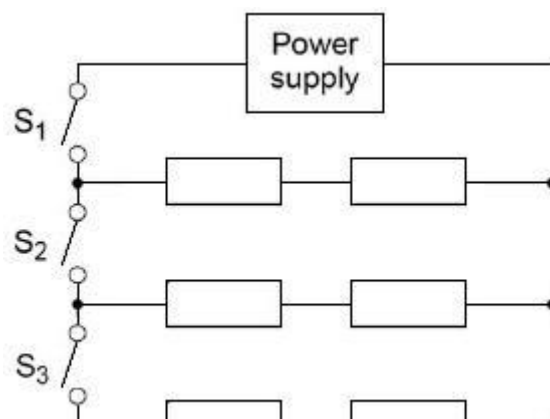
(1)

Figure 2 shows the circuit diagram for the hair straighteners.

Each resistor represents a heating element.

The power output of the hair straighteners can be changed by closing different switches.

Figure 2



- (b) Why do the hair straighteners **not** turn on when only switch S_2 is closed?

(1)

- (c) The hair straighteners have a maximum power output of 120 W.

The energy transferred to the hair straighteners to reach normal operating temperature is 3.6 kJ.

Calculate the time taken for the hair straighteners to reach normal operating temperature when operating at maximum power.

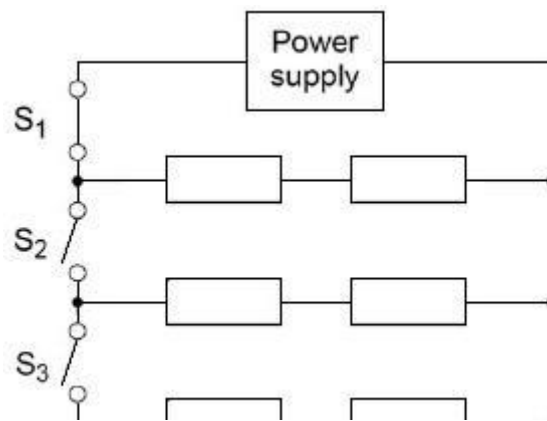
Use the Physics Equations Sheet.

Time = _____ seconds

(4)

- (d) **Figure 3** shows the hair straighteners circuit with switch S_1 closed.

Figure 3



Switch S_2 and switch S_3 are then closed at the same time.

Explain what happens to the power output of the power supply.

(3)

(Total 9 marks)

Q2.

- (a) During one year, 1.25×10^{18} J of energy was transferred from the National Grid.

number of seconds in 1 year = 3.16×10^7

Calculate the mean energy transferred from the National Grid each second.

Give your answer to 3 significant figures.

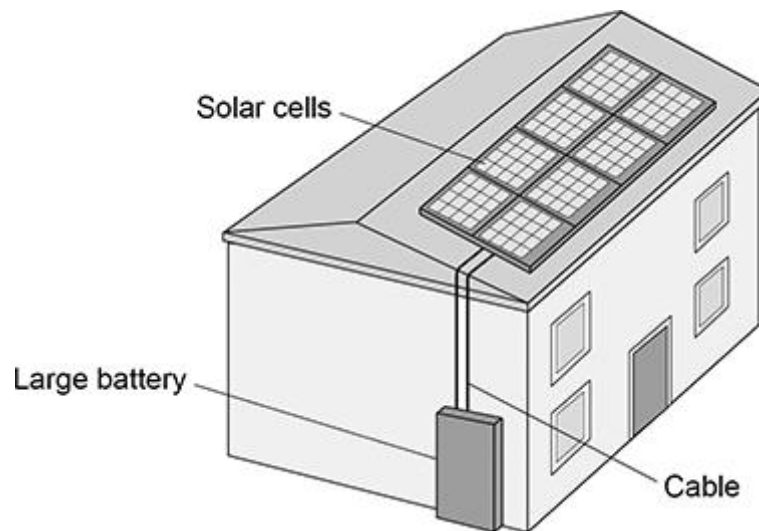
Energy each second (3 significant figures) = _____ J

(2)

The figure below shows a house with a solar power system.

The solar cells generate electricity.

When the electricity generated by the solar cells is not needed, the energy is stored in a large battery.



- (b) The charge flow through the cable between the solar cells and the battery in 24 hours was 27 000 coulombs.

Calculate the mean current in the cable.

Mean current = _____ A

(4)

- (c) At one time, the total power input to the solar cells was 7.8 kW.

The efficiency of the solar cells was 0.15

Calculate the useful power output of the solar cells.

Useful power output = _____ W

(3)

- (d) It is unlikely that **all** of the electricity that the UK needs can be generated by solar power

systems.

Explain why.

(2)

(Total 11 marks)