

20 A 'smart meter' collects information about the use of electricity in the home. This information is transmitted to the electricity company using radio waves.

- (a) A typical smart meter emits radio waves with a power output of 1.00 W.  
An intensity of radiation greater than  $4.5 \text{ W m}^{-2}$  is dangerous to people.

A person stands 25 cm from a smart meter.

Deduce whether the radiation emitted by this smart meter would be dangerous to the person at this distance.

(3)

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- (b) It is suggested that the energy per photon could be important in determining if the radiation emitted by the smart meter is dangerous.

The smart meter transmits radio waves of frequency 902 MHz.

Calculate the energy per photon, in eV, of the photons emitted by the smart meter.

(3)

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Energy per photon = ..... eV



- (c) The display of the smart meter in one household is shown. This shows the total electrical energy used in one day.



1 kWh is a unit of energy equivalent to 1 kW of power used for 1 hour.

The kettle in this house has a power of 1200 W. The kettle takes 125 seconds to heat the water to boiling. The kettle then switches off.

A student suggests that boiling the kettle once uses less than 1% of the total energy shown on the smart meter display.

Assess the student's suggestion.

(3)

(Total for Question 20 = 9 marks)