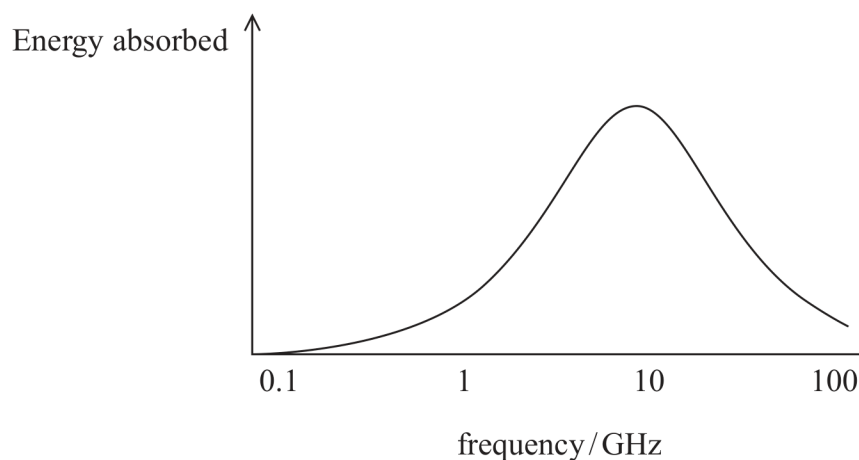


- 19 Microwave ovens use microwave radiation at a frequency of 2.45 GHz to cook food. The absorption of microwave energy by water in the food causes a heating effect.

- (a) The graph shows how the energy absorbed by a water molecule depends on the frequency of the radiation.



A website suggests that water molecules absorb energy because the microwaves produced by the oven cause the water molecules to resonate.

Comment on this suggestion.

(2)

- (b) The microwave radiation causes the water molecules to rotate.

- (i) Explain how this cooks the food.

(3)



- (ii) Suggest why the transfer of energy from the microwaves may be less efficient for ice than for liquid water.

(2)

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- (c) 325 g of water at 25.0 °C is heated at full power in a microwave oven. After 225 s the temperature of the water is 85.0 °C.

power of microwave oven = 650 W

specific heat capacity of water = 4190 J kg⁻¹ K⁻¹

- (i) The manufacturer claims that the microwave oven has an efficiency of 90%.

Assess the validity of this claim.

(3)

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- (ii) The 325 g of hot water at 85.0 °C is poured into a polystyrene beaker containing 62.5 g of ice at 0.0 °C.

Calculate the final temperature of the mixture of water and melted ice.

latent heat of fusion of ice = $3.33 \times 10^5 \text{ J kg}^{-1}$

(4)

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Final temperature of mixture =

(Total for Question 19 = 14 marks)

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