

GCSE Physics Questions on The Physics of a Microwave Oven

Microwave ovens use several GCSE Physics ideas, including the electromagnetic spectrum, waves, reflection, energy transfers, electrical power and efficiency. By answering these questions, you will see how physics explains the operation of a common kitchen appliance. Show all your working for calculation questions and use scientific vocabulary in your explanations.

1. Which part of the electromagnetic spectrum is used by a microwave oven?
2. State one property of microwaves.
3. What type of energy transfer occurs when a microwave heats food?
4. Why do water molecules in food absorb microwaves effectively?
5. Why does food usually heat from the inside as well as the outside in a microwave oven?
6. A microwave oven has a power rating of 800 W and operates from a 230 V supply. Calculate the current drawn by the microwave.
7. A microwave draws a current of 5.0 A from a 230 V supply. Calculate its power.
8. A microwave transfers 1.44×10^5 J of energy to food. If its power is 800 W, calculate the heating time.
9. A microwave operates for 3 minutes at a power of 900 W. Calculate the energy transferred in Joules (J).
10. A microwave transfers 2.16×10^5 J of energy while heating a meal. Calculate the time taken if the power is 1200 W.
11. Microwaves travel at 3.0×10^8 m/s. A microwave has a frequency of 2.5×10^9 Hz. Calculate its wavelength.
12. A microwave has a wavelength of 1.2×10^{-1} m and travels at 3.0×10^8 m/s. Calculate its frequency.
13. A microwave oven contains metal walls that reflect microwaves. Explain why reflecting the microwaves inside the oven helps to cook the food.

14. Explain why metal objects should not be placed inside a microwave oven.
15. A microwave is 75% efficient. It transfers 9.0×10^2 J of useful thermal energy to the food each second. Calculate the total energy supplied each second.
16. A microwave oven uses 8.0×10^{-2} kWh of energy to heat a meal. Calculate the energy transferred in Joules (J).
17. A microwave oven has a power rating of 1.2×10^3 W and is used for 10 minutes. Calculate:
 - a) The energy transferred in Joules (J).
 - b) The energy transferred in kilojoules (kJ).
 - c) The energy transferred in kilowatt-hours (kWh).