Electromagnetic Spectrum

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

List the groups of the electromagnetic spectrum from longest to shortest wavelength, and state two properties shared by all of them. (4 marks)

Step 1 · Order

Radio, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays.

Step 2 · Shared properties

All are transverse waves; all travel at the same speed in a vacuum (3×10^8 m/s); all transfer energy from a source to an absorber.

Answer: Radio → gamma; transverse, same speed in a vacuum

Check: Frequency increases in the same order that wavelength decreases.

2. Now try one with the steps

Explain why X-rays are used to produce images of broken bones. (3 marks)

Step 1 · Soft tissue

Step 2 · Bone

Step 3 · Image

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. List the parts of the electromagnetic spectrum in order from longest to shortest wavelength. [3]

2. State two properties that all electromagnetic waves share. [2]

3. State the part of the electromagnetic spectrum detected by the human eye. [1]

4. Give one use of microwaves and one use of infrared. [2]

5. Describe two harmful effects of ultraviolet radiation on people. [2]

6. Explain why X-rays are used to make images of bones. [2]

7. Explain why gamma rays are used to sterilise surgical instruments. [2]

8. Explain how infrared cameras can show people in the dark. [2]

9. A radio station broadcasts on a wavelength of 1500 m. Calculate the frequency in kHz. Speed = 3.0×10^8 m/s. [3]

10. State the effect of X-rays and gamma rays on the body that makes them hazardous. [2]

11. A microwave oven uses a frequency of 2.45×10^9 Hz. Calculate the wavelength in cm to 2 significant figures. Speed = 3.0×10^8 m/s. [3]

12. Explain how radio waves can induce an alternating current in a receiving aerial. [2]

13. Explain why microwaves rather than radio waves are used to communicate with satellites. [2]

14. Explain why a glass prism refracts violet light more than red light. [2]

4. Before you hand it in

"Gamma rays travel faster than radio waves."
They differ in wavelength and frequency, not in their speed in a vacuum (3×10^8 m/s).

Getting the spectrum order the wrong way round
Radio has the longest wavelength and lowest frequency; gamma the shortest wavelength and highest frequency.

"Microwaves are ionising, so they cause cancer."
X-rays and gamma rays are ionising. Microwaves can heat tissue but do not ionise atoms.

Giving a use without a reason in a 'why' question
Link the use to a property: for example, X-rays are absorbed by bone but pass through soft tissue.