# The electromagnetic spectrum

(l) state that all electromagnetic waves travel with the same speed in free space and recall the orders of magnitude of the wavelengths of the principal radiations from radio waves to γ-rays.



Charting the electromagnetic spectrum

Annotate this chart to answer questions 1 and 2. Answer the remaining questions in the spaces provided.



The electromagnetic spectrum

Using the frequency chart of the electromagnetic spectrum:

1. Add the wavelength (in a vacuum) for each frequency to the chart (*c* = 3  108 m s–1).

2. Insert the following kinds of electromagnetic radiation into the appropriate frequency band:

* long-wave radio
* medium-wave radio
* UHF radio (television frequencies)
* microwaves
* infrared radiation
* visible spectrum
* ultraviolet radiation
* x-rays
* gamma radiation

3. Why is the frequency (rather than the wavelength) of the electromagnetic radiation a more certain method of distinguishing the wave and its properties?

4. The scale increases in powers of ten. What type of scale is this?

5. How can each type of radiation above be detected?

6. What kind or kinds of electromagnetic radiation are associated with each of these sources?

* hot bodies
* quasars
* radioactive nuclei
* Klystron oscillator in an oven
* gas discharge tube
* stars
* oscillations in electrical circuits
* x-ray tubes
* slowing down of high-energy particles?

7. In the SI system certain multiples or submultiples of units are preferred, e.g. kilometre = 103 m. Since the electromagnetic spectrum is so broad it can be useful to apply these prefixes to the wavelengths.  
 Different energy emissions can be assigned to different wavelengths, e.g. picometre can be assigned to either gamma rays or x-rays. What kinds of radiation have wavelengths appropriately described in units of:

* picometre, pm
* nanometre, nm
* micrometre, m
* millimetre, mm
* metre, m
* kilometre, km?