

Waves and Space - Unit 1

Define amplitude of a wave.	The maximum displacement from the mean position
Define wavelength.	The shortest distance between two points on a wave that are oscillating in phase.
Define frequency.	The number of oscillations per second.
What is the unit for amplitude?	Metres (m)
What is the unit for wavelength?	Metres (m)
What is the unit of frequency?	Hertz (Hz)
What is a longitudinal wave?	In a longitudinal wave the vibrations are parallel to the direction of energy travel.
What is a transverse wave?	In a transverse wave the vibrations are perpendicular to the direction of energy travel.
What is a mechanical wave?	A mechanical wave involves the vibrations of particles of matter e.g. sound
What is an electromagnetic wave?	An electromagnetic wave is the oscillation of electric and magnetic fields as energy travels through space.
What type of energy reaches us from outer space?	Electromagnetic energy (as that is the only type that can travel through the vacuum of space).
What types of energy reach the outer limits of our atmosphere?	All of the parts of the electromagnetic spectrum
What types of energy can pass through the several miles of our atmosphere without being totally absorbed?	Visible light, High energy infra red and lower energy ultraviolet (the ozone layer absorbs some of that!). Radiowaves also penetrate the atmosphere.
What happens to X-rays from outer space?	They are totally absorbed by the atmosphere.
What happens to gamma-rays from outer space?	They are totally absorbed by the atmosphere
What happens to UV-rays from outer space?	The high energy ones are totally absorbed by the ozone layer in the atmosphere - low energy ones get through and give us a tan!
What happens to IR from outer space?	Most are totally absorbed by the atmosphere - only high energy IR from the Sun gets through - and when re-emitted after warming the Earth they are absorbed by the atmosphere too!
What happens to microwaves from outer space?	They are totally absorbed by the atmosphere.
What happens to radio waves from outer space?	They are able to get through the atmosphere.
What happens to visible light rays from outer space?	They get through the atmosphere.
What is the Big Bang Theory?	Current evidence suggests that the universe is expanding and that matter and space expanded (note expanded NOT exploded!) violently and rapidly from a very small initial point. i.e. the universe began with a big bang.
What sort of energy is picked up by a telescope?	There are a wide range of telescopes - they have been made to detect all of the parts of the electromagnetic spectrum. There are gamma ray telescopes and X-ray telescopes as well as the common visible light ones and radio telescopes.
Why is it better to put a telescope on a high mountain or in a high altitude desert?	So that the atmosphere is as thin as possible and/or will have little cloud cover and will therefore not interfere too much with the signal being picked up by the telescope.
Why is it best to put a telescope in orbit around the Earth?	So that it is outside the atmosphere and the atmosphere cannot absorb any of the signal

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What types of telescope can be stationed on the Earth's surface and why?	Visible (and near IR and UV) and radio wave - as these are the only rays that can penetrate the atmosphere well enough for a good signal to be picked up.
How does the size of the dish relate to the type of radiation detected by the telescope?	The bigger the wavelength of the wave to be picked up the bigger the diameter of the dish needs to be. (Therefore radio-telescopes have the biggest dishes!)
What do you observe if a wave source (light or sound) is moving away from an observer?	There will be an increase in the observed wavelength and a decrease in the frequency.
What do you observe if a wave source (light or sound) is moving towards an observer?	There will be a decrease in the observed wavelength and an increase in the frequency.
What colour shift is there in light with an increased wavelength or decreased frequency?	Red shift
What colour shift is there in light with a decreased wavelength or increased frequency?	Blue shift
What is observed in light from most distant galaxies?	Red-shift. The further away galaxies are the bigger the red-shift.
What does red-shift indicate?	That galaxies are moving further apart so the Universe is expanding. This supports the 'big bang' theory