Questions for Week 1

1. How many astronomical units are there in 1 light year?

2. How many seconds does it take light to travel one light year?

3. An express train, travelling at a steady speed of 30 m s^{-1}, approaches and passes a station. The train sounds its whistle at a frequency of 500 Hz. The speed of sound in air is 330 m s^{-1}.

(i) Calculate the wavelength of the sound waves being emitted by the whistle.

(ii) Calculate the wavelength of the sound waves detected by an observer on the station platform as the train approaches.

(iii) Calculate the wavelength and frequency of the sound waves detected by the observer when the train is moving away from the platform.

(iv) A faster train passes the same station travelling at a constant speed. This train also sounds its whistle at a frequency of 500 Hz. However, the observer on the station detects a sound wave of wavelength 0.78m.

(a) In what direction is the train travelling relative to the station when the observer measured this wavelength? Give a reason for you answer.

(b) Find the speed of the train.