2018 Exam Questions

(a) An observer sitting on a platform at a train station listens to the sound produced by a train moving through the station at constant speed.

Discuss the changes in the observed sound. Include in your discussion:

- The frequency of the sound as the train moves towards, and away from, the observer;
- The Doppler equations to describe the frequency or wavelength of the sound as the train moves towards, and away from, the observer.

Include an explanation of any symbols used. [3 marks]

(b)

(i) When astronomers observe distant galaxies they notice the light is red shifted. What is red shift and how do astronomer explain the red shift observed in light from **distant** galaxies? [2 marks]

(ii) The shift in the wavelength of light from a distant galaxy is 2.2×10^{-9} m. The wavelength of the light observed is 550×10^{-9} m. Calculate the recession speed of this galaxy in kilometres per second. [3 marks]

Note: this question is ambiguous as written! The wavelength of light given here is the rest wavelength, not the wavelength the observer measures.

(c) Calculate a value for the estimated age of the universe in years. [3 marks]

2019 Exam Questions

The speed of a star travelling directly away from our Solar System is 2.6×10^7 m s^{-1}.

(a) Calculate the red shift parameter *z* for the star.

(b) A line of the spectrum of light observed from a hydrogen source on Earth is measured to be 486nm.

Calculate the wavelength of this line when it is observed from a hydrogen source on the star.