Solution 1

(3 marks)

A space probe travels along a line from the Earth to Uranus at a constant speed of 0.95c relative to the solar system. Just as it reaches midway between the two planets, it sends laser beams out to the Earth and Uranus at the same time. What speed do the laser beams approach the Earth and Uranus, respectively?

Speed of laser beam approaching the Earth: _____

Speed of laser beam approaching Uranus: _____

To an observer on Uranus, will the light from the space probe appear red shifted, or blue shifted? Circle the correct answer.

Description	Marks
c or 3×10^8 m s^{-1}	1
c or 3×10^8 m s^{-1}	1
Blue shifted	1
	Total 3

Solution 2

(4 marks)

Electromagnetic radiation (emr) is said to have both wave and particle properties. State and describe an example of each of these properties of emr.

Description	Marks
Wave – states one of the following: diffraction; refraction; passing through one another; other wave properties. Then gives a description of that term as applied to emr.	1–2
Particle – states one of the following: affected by gravity; photoelectric effect; does not require a medium; exerts pressure; quanta. Then gives a description of that term as applied to emr.	1–2
Total	4