4

Two coherent sources S_1 and S_2 of electromagnetic waves are separated by a distance of 600 m. A communication satellite is travelling overhead in the direction shown in Fig. 4.1. The altitude of the satellite is 20 400 km.

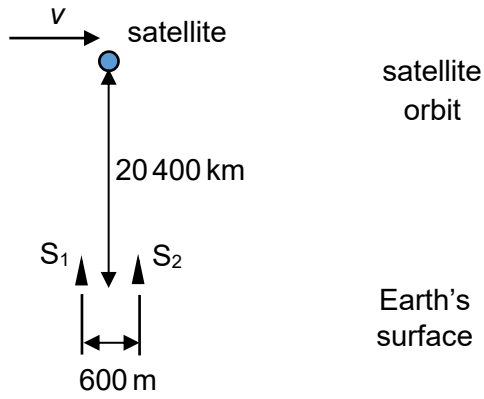

Fig. 4.1

(a)

Show that the velocity v of the satellite, v, is 3 850 m s^{-1}.

Radius of Earth = 6 400 km

Gravitational field strength at an altitude of 20 400 km = 0.554 N kg^{-1}.

[2]

[redacted]

(b)

The satellite detects the maxima of intensity of the waves at a frequency of 1.22 Hz.

Determine the wavelength of the electromagnetic waves emitted by S_1 and S_2.

[redacted]

wavelength = _____ m

[3]

[redacted]

(c)

Based on the wavelength found in **(b)**, state the region of the electromagnetic spectrum received by the satellite.

[redacted]

region = _____.

[1]

[Total: 6]