Questions in waves from the Cambridge AS book:

# 2. When a sound wave is displayed at c.r.o. (Cathode-Ray Oscilloscope) screen, two complete waves occupy five scale divisions. The calibrated time-base is set on 0.005 s per division. Determine the frequency of the waves.

Solution:

wavesnumber = 2

divisionsnumber = 5

timeforeachdivision = 0.005

frequency = 1 / (timeforeachdivision \* divisionsnumber / wavesnumber)

MsgBox frequency

3. Using the axes of displacement and distance, sketch two waves A and B such that A has twice the wavelength and half the amplitude of B.

4. A 100 W lamp emits electromagnetic radiation in all directions. Assuming a lamp to be a point source, calculate the intensity of the radiation:

a at distance of 1.0 m from the lamp

b at distance of 2.0 m from the lamp.

Soolution:

Power = 100

R = 2

pi = 4 \* Atn(1)

Area = 4 \* pi \* R ^ 2

intensity = Power / Area

MsgBox intensity

5. Waves from a source have an amplitude of 5.0 cm and an intensity of 400 Wm-2.

a The amplitude of the waves is increased to 10.0 cm. What is their intensity now?

b The intensity of the waves is decreased to 100 Wm-2. What is their amplitude?

Solution:

intencity = 400

amplitude = 5 \* 10 ^ (-2)

constant = intencity / amplitude

amplitude2 = 10 \* 10 ^ (-2)

intencity2 = constant \* amplitude2 ^ 2

MsgBox intencity2

intencity3 = 100

amplitude3 = (intencity3 / constant) ^ (1 / 2)

MsgBox amplitude3

11. Red light of wavelength 700 nm in a vacuum travels into glass, where its speed decreases to 2.0×108ms-1. Determine:

a the frequency of the light in vacuum

b its frequency and wavelength in glass.

Solution:

wavelength = 700 \* 10 ^ (-9)

c = 300000000

frequency = c / wavelength

MsgBox frequency

c2 = 200000000

wavelength2 = 200000000 / frequency

MsgBox wavelength2

12. An astronomer observes light from a distant star. A particular line in its spectrum has a wavelength of 550 nm. When measures in the laboratory, the same spectral line has a wavelength of 535 nm. Determine:

a the change in the wavelength of the spectral line

b the speed of the star

c the direction of the movement of the star (towards or away from the observer).

(Speed of light in free space = 300000000 m/s)

Solution:

c = 300000000

lambdas = 550 \* 10 ^ (-9)

lambdao = 535 \* 10 ^ (-9)

vs = c \* (1 - lambdao / lambdas)

MsgBox vs