Wavelength and Frequency

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

For electromagnetic waves in vacuum, $c = f\lambda$. Use $c = 3.00 \times 10^{8}$ m/s and 1 nm = 10^{-9} m.

1 How does wavelength change if the frequency of an electromagnetic wave in vacuum doubles?

(1) It doubles.

(2) It is cut in half.

(3) It stays the same.

(4) It becomes four times as large.

2 Convert a wavelength of 640. nm to meters. Show the conversion factor. [1]

Answer and work

_____

_____

3 A radio signal in vacuum has a frequency of 1.50×10^{8} Hz. Calculate its wavelength. [1]

Answer and work

_____

_____

4 Which property has the same value for visible light and radio waves in vacuum?

(1) Frequency

(2) Wavelength

(3) Wave speed

(4) Photon energy

Light for Optical Sensors

Use the information below to answer the questions.

An engineer compares three light sources for a sensor. The table gives wavelengths in vacuum. In this model, visible light spans approximately 400 to 700 nm.

Source	Wavelength (nm)
A	365
B	525
C	940

5 Which source produces light in the stated visible range?

(1) A

(2) B

(3) C

(4) A and C

6 Which source has the highest frequency? Explain using the relationship between frequency and wavelength. [1]

Answer and work

7 Calculate the frequency of source B in hertz. Show your wavelength conversion and calculation. [1]

Answer and work

8 Which statement correctly compares sources B and C in vacuum?

(1) B has a lower frequency than C.

(2) B and C have equal frequencies.

(3) B has a higher frequency than C.

(4) B travels faster than C.