

Rec. Time

Name

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This shows **some** of the possible questions you encountered on the online test. Point values here are arbitrary.

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For full credit, make your work clear. Show formulas used, essential steps, and results with correct units and significant figures. Points shown in parenthesis. For TF and MC, choose the *best* answer. Bonus points possible by correctly using prefixes like 2.0 mV, 7.8 MW, 1.6 k $\Omega$ , 3.4  $\mu$ T, etc., in lieu of scientific notation like  $2.0 \times 10^{-3}$  V.

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**OpenStax Ch. 24 - Electromagnetic Waves**

1. (10) 150. MHz radio waves travel out from a transmitter to a receiver 90.0 km away.

a) (5) What time interval is required for the waves to travel from transmitter to receiver?

b) (5) Calculate the distance between successive wave crests of the magnetic field vector of the waves.

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2. (10) A beam of electromagnetic waves traveling in vacuum has an energy density of 5.00 nJ/m<sup>3</sup>.

a) (5) What is the intensity of the waves in watts/m<sup>2</sup>?

b) (5) If the waves were emitted isotropically by a 125 kW transmitter, how far away is it?

3. (15) A laser produces a beam of electromagnetic waves with a radiant power of 5.00 mW concentrated over an area of  $1.00 \text{ mm}^2$ . The wavelength is 632.8 nm.

a) (5) Calculate the intensity of the waves.

b) (5) How strong is the peak electric field strength in the beam?

c) (5) If there is a 2.00 nC electric charge affected by the beam, what maximum electric force does it experience?