Electromagnetic Radiation

CfE Specimen Paper

9. As part of a physics project a student carried out experiments to obtain values for the permeability of free space and the permittivity of free space.

    The results obtained by the student were

    permeability of free space, $\mu_0 = (1 \cdot 32 \pm 0 \cdot 05) \times 10^{-6} \, H\,m^{-1}$

    permittivity of free space, $\varepsilon_0 = (8 \cdot 93 \pm 0 \cdot 07) \times 10^{-12} \, F\,m^{-1}$

    (a) State the number of significant figures in the value of each result.   **1**

    (b) Use these results to determine a value for the speed of light.

        Your answer must be consistent with (a).   **3**

    (c) (i) Determine which of the uncertainties obtained by the student is more significant for the calculation of the speed of light.

        You must justify your answer by calculation.   **3**

        (ii) Calculate the absolute uncertainty in the value obtained for the speed of light.   **2**