



QUESTION WORKBOOK

The nature of light

Turning points · Year 13

AQA 3.12.2.1, 3.12.2.2, 3.12.2.3

10 questions · 28 marks

PRINT EDITION

SECTION A · Warm-up

- A1** Give two reasons why Newton's corpuscular theory of light was preferred over Huygens' wave theory for over a century. [2]

- A2** Explain, in general terms, why bright and dark fringes appear in Young's double slit experiment. [2]

- A3** State what the constants ϵ_0 and μ_0 each describe. [2]

SECTION B · Standard

- B1** Evaluate Maxwell's formula for the speed of electromagnetic waves using $\mu_0 = 4\pi \times 10^{-7} \text{ H m}^{-1}$ and $\epsilon_0 = 8.85 \times 10^{-12} \text{ F m}^{-1}$, and state the significance of the result. [3]

- B2** Hertz set up stationary radio waves with adjacent nodes 1.65 m apart, using an oscillator of frequency 9.1×10^7 Hz. Calculate the wave speed and state what the result demonstrated. [3]

- B3** In Fizeau's experiment a wheel with 720 teeth first blocked the returning light at 12.6 revolutions per second, with the mirror 8.63 km away. Calculate the speed of light this gives. [4]

- B4** Explain why Young's fringes cannot be accounted for by a particle theory of light. [3]

SECTION C · Stretch

- C1** Measurements descended from Fizeau's method later compared the speed of light in air and in water. Explain why this comparison was decisive between the two theories of light. [3]

- C2** Outline the significance of Hertz's experiments for the understanding of the electromagnetic spectrum. [4]

- C3** Young published his double slit results in 1801, yet the wave theory was not generally accepted for decades. Suggest why. [2]
