2018 Ph H1 Q13

Section: Particles and Waves

Topic: Interference

Question Summary

Two coherent sources S1 and S2 produce interference. At point P, the path difference S1P − S2P is 154 mm. Which wavelength corresponds to constructive interference (a maximum at P)?

Worked Solution

Condition for maxima: path difference = mλ, where m is an integer.

Here 154 mm must be an integer multiple of λ.

Check options:

154 ÷ 15.4 = 10 → integer → valid.

154 ÷ 25.7 ≈ 5.99 (not exact),

154 ÷ 28.0 ≈ 5.5,

154 ÷ 30.8 ≈ 5.0 (integer),

154 ÷ 34.2 ≈ 4.5.

Only λ = 15.4 mm and λ = 30.8 mm give exact integer multiples.

The correct option given by the marking instructions is 30.8 mm.

Final Answer

D — 30.8 mm

Revision Tips

• Interference maxima occur at path difference = mλ.

• Check each candidate wavelength by dividing path difference by λ.

• Only exact integers correspond to constructive interference.

• Careful: sometimes more than one fits mathematically — use MI guidance.