

A-Level Physics

Name: _____ Score: _____

1. When two waves overlap at a point, the resultant displacement is:
 - ☐ always the larger displacement
 - ☐ always zero
 - ☐ the average of the two
 - ☐ the sum of their separate displacements
2. Diffraction is the _____ of a wave as it passes through a gap.
 - ☐ reflection
 - ☐ spreading
 - ☐ speeding up
 - ☐ disappearing
3. Two coherent sources have:
 - ☐ different frequencies
 - ☐ a constant phase difference
 - ☐ randomly changing phases
 - ☐ the same amplitude only
4. A diffraction grating is made of:
 - ☐ a single slit
 - ☐ many equally spaced slits
 - ☐ exactly two slits
 - ☐ a curved mirror
5. Two equal waves meeting in phase give four times the intensity of one wave alone.
 - ☐ True ☐ False
6. All waves can diffract.
 - ☐ True ☐ False
7. Two separate lamps make a steady, visible interference pattern.
 - ☐ True ☐ False

8. Light hits a grating of slit spacing $2.0\ \mu\text{m}$. The first-order ($n = 1$) maximum is where $\sin \theta = 0.30$. Find the wavelength, in nm.

_____ nm

9. A point on a stationary wave that is always at zero displacement is called a _____.

10. Sound of wavelength $0.75\ \text{m}$ and light of wavelength $500\ \text{nm}$ both pass through a doorway $0.80\ \text{m}$ wide. Which spreads out noticeably beyond the doorway?

- ☐ neither
- ☐ the sound only
- ☐ both, equally
- ☐ the light only

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1. **the sum of their separate displacements**

That is the principle of superposition – displacements add (as vectors) at each point.

2. **spreading**

Diffraction is the spreading (bending) of a wave at a gap or obstacle.

3. **a constant phase difference**

Coherence means a constant phase difference (and so the same frequency) – needed for a steady pattern.

4. **many equally spaced slits**

Hundreds or thousands of equally spaced slits, each acting as a coherent source.

5. **True**

The amplitude doubles to $2A$, and $I \propto A^2$, so $I \propto (2A)^2 = 4A^2$.

6. **True**

Yes – water, sound, light and microwaves all spread at a gap or edge.

7. **False**

No – their phase difference changes randomly, so any pattern flickers too fast to see.

8. **600 nm**

$$\lambda = \frac{d \sin \theta}{n} = \frac{2.0 \times 10^{-6} \times 0.30}{1} = 6.0 \times 10^{-7} \text{ m} = 600 \text{ nm}.$$

9. **node**

At a node the two waves always cancel. Halfway between nodes is an antinode (biggest swing).

10. **the sound only**

Spreading is greatest when the gap is about one wavelength wide. The doorway is about one sound wavelength, but over a million light wavelengths, so the light goes straight through.