

8. Superposition

Starter Quiz · 课前小测

A-Level Physics

Name: _____ Score: _____

1. When two waves overlap at a point, the resultant displacement is:

- ☐ the sum of their separate displacements
- ☐ always the larger displacement
- ☐ always zero
- ☐ the average of the two

2. Diffraction is the _____ of a wave as it passes through a gap.

- ☐ spreading
- ☐ speeding up
- ☐ reflection
- ☐ disappearing

3. Two coherent sources have:

- ☐ a constant phase difference
- ☐ the same amplitude only
- ☐ randomly changing phases
- ☐ different frequencies

4. A diffraction grating is made of:

- ☐ many equally spaced slits
- ☐ exactly two slits
- ☐ a single slit
- ☐ 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. Diffraction is the _____ of a wave as it passes through a gap or around an obstacle.

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. **spreading**

Spreading, not bending: refraction bends a wave at a boundary, and the two words are marked differently.