

# 9.2 Single-Slit Diffraction

## Question Paper

Course	DPIB Physics
Section	9. Wave Phenomena (HL only)
Topic	9.2 Single-Slit Diffraction
Difficulty	Easy

**Time allowed:** 20  
**Score:** /10  
**Percentage:** /100

### Question 1

Light incident on a single slit creates a diffraction pattern on a screen a certain distance away.

What is the definition of a single slit diffraction pattern?

- A. A single slit diffraction pattern is represented as dark fringes of light on the screen separated by coloured strips that show areas of constructive and destructive interference.
- B. A single slit diffraction pattern is represented as a single white band of light in the centre of the screen with black surrounding it.
- C. A single slit diffraction pattern is represented as a series of light and dark fringes which show the areas of maximum and minimum intensity.
- D. A single slit diffraction pattern is represented as a series of wide and narrow strips of light which show the areas of constructive and destructive interference.

[1 mark]

### Question 2

When white light is diffracted through a single slit which colour appears closest to the central maximum when viewed on a screen?

- A. Violet
- B. Blue
- C. Red
- D. Green

[1 mark]

### Question 3

Light of different wavelengths is incident on a single slit. A diffraction pattern is created on a screen a distance away.

What is the relationship between the wavelength of the light and the width of the bright fringe on the diffraction pattern?

- A. Blue light produces a diffraction pattern with the widest fringes
- B. Red light produces a diffraction pattern with the widest fringes
- C. All wavelengths of light produce bright fringes of equal width
- D. Changing the width of the slit is the only variable that affects the width of the bright fringes

[1 mark]

### Question 4

Monochromatic light is incident on a narrow slit and a diffraction pattern of bright and dark fringes is observed on a screen some distance away.

How does making the single slit narrower affect the spacing of the bright fringes on the screen?

- A. The fringe spacing increases with diffraction angle away from the central maximum
- B. The fringe spacing is narrower
- C. The fringe spacing is wider
- D. It has no effect

[1 mark]

### Question 5

What is the equation for the angle of diffraction of the first minima for light diffracted through a single slit that creates a diffraction pattern onto a screen?

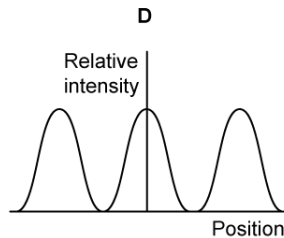
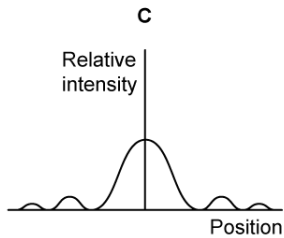
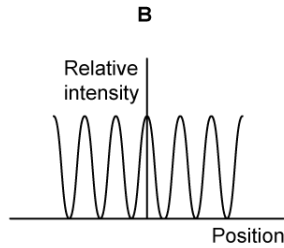
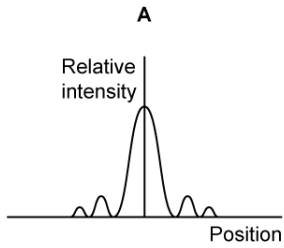
- A.  $\theta = \frac{\lambda}{b}$
- B.  $n\lambda = d\sin\theta$
- C.  $s = \frac{\lambda D}{d}$
- D.  $\theta = \frac{s}{d}$

[1 mark]

### Question 6

Light of the same wavelength is incident on a single slit. The width of the slit is changed. A diffraction pattern for each slit width is observed on a screen some distance away.

Which diffraction pattern represents that of the narrowest slit?

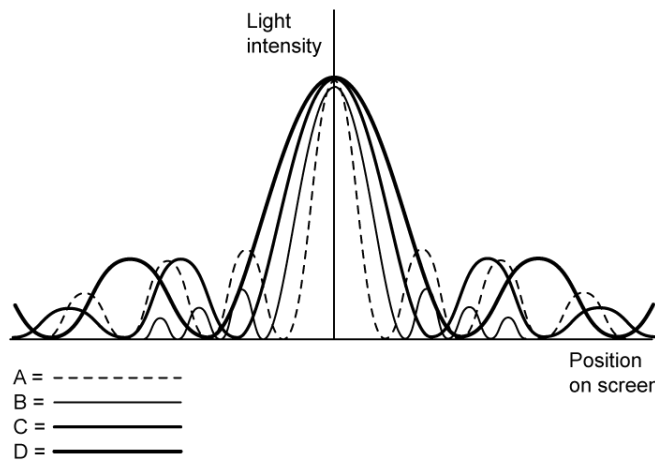


**Question 7**

[1 mark]

Monochromatic light of different wavelengths is incident on a single slit. A diffraction pattern is observed on a screen some distance away.

Which diffraction pattern represents the longest wavelength of light?



[1 mark]

**Question 8**

Monochromatic light is incident on a single slit and the interference pattern is observed on a screen some distance away.

What is the expression for the path difference between two rays that interfere destructively at a point P on the screen?

A.  $\frac{n\lambda}{2}$

B.  $n\lambda$

C.  $d\sin\theta$

D.  $\frac{\lambda D}{d}$

[1 mark]

**Question 9**

Monochromatic light is incident on a single slit with a diffraction pattern created on a screen some distance away.

What small angle approximation is used in obtaining the equation  $\theta = \frac{\lambda}{b}$  to calculate the angle of diffraction of the first minimum of the single slit diffraction pattern?

- A.  $\tan\theta \approx \sin\theta$
- B.  $\sin\theta \approx \theta$
- C.  $\tan\theta \approx \theta$
- D.  $\cos\theta \approx \theta$

[1 mark]

**Question 10**

Monochromatic light is incident on a single slit and a diffraction pattern is observed on a screen some distance away.

How does the diffraction pattern change when the single slit and the screen are moved further apart?

- A. Fringe intensity is decreased
- B. Fringe intensity is increased
- C. Fringe width is decreased
- D. Fringe width is increased

[1 mark]