Mark Scheme Interference Past Paper Questions

Jan 2002 to Jan 2009

1(a) graph to show:
- maxima of successively smaller intensity ✓
- subsidiary maxima/minima equally spaced ✓
  (at least two each side of central axis)
- width of subsidiary sections half width of central section ✓
- symmetrical pattern each side of central axis ✓

Q1 Jan 2002

(b)(i) broader maxima or pattern ✓ [or fringes wider apart]
dimmer pattern ✓

(ii) maxima are closer ✓ [or narrower fringes]
green and dark regions ✓

max (3)

(7)

2(a) slits act as coherent sources ✓
- waves/light diffract at slits ✓
- waves overlap/superpose/meet/cross ✓
- bright patches: constructive/waves in phase/reinforce ✓
- dark patches: destructive/waves out of phase/cancel ✓

Q2 Jan 2003

(b)(i) spacing \( w = \frac{76 \pm 1(\text{mm})}{26} \) = 3.0 or 2.9 mm ✓
- (2.92 ± 0.04 mm)
- 15 or more fringes used ✓

(b)(ii) (use of \( \lambda = \frac{ws}{D} \) gives)
- \( \lambda = \frac{2.92 \times 10^{-3} \times 0.90 \times 10^{-3}}{4.2} \) ✓
- \( = 6.26 \times 10^{-7} \) ✓
- (allow C.E. for sensible value of \( w \) from (i)) (4)

(7)
### Question 2

**a** (i) bright and dark bands (or fringes) ✓  
  equally spaced ✓  
  of similar intensity to each other (or suitable comment about decrease of intensity outwards from centre) ✓  

(ii) central band wider than others ✓  
  intensity decreases greatly away from centre of pattern ✓  

**b** (i) fringe width \( w = \frac{58}{20} = 2.9 \text{ mm} \) ✓  

(ii) \( \lambda = \frac{ws}{D} \) gives \( \frac{w}{D} = \frac{w'}{D'} \) (since \( \lambda \) and \( s \) are constant) ✓  

\[
2.9 = \frac{3.7}{D + 0.80} \text{ gives } D = 2.9 \text{ m} ✓
\]

(iii) \( \lambda = \frac{2.9 \times 10^{-3} \times 0.60 \times 10^{-3}}{2.9} = 6.0 \times 10^{-7} \text{ m (600 nm)} ✓ \)

**Total** 9

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**Question 2**

**a** same wavelength or frequency ✓  
(same phase or) constant phase difference ✓  

**b** (i) narrow slit gives wide diffraction ✓  
(to ensure that) both \( S_1 \) and \( S_2 \) are illuminated ✓  

(ii) slit \( S \) acts as a point source ✓  
\( S_1 \) and \( S_2 \) are illuminated from same source giving monochromatic/same \( \lambda \) ✓  
paths to \( S_1 \) and \( S_2 \) are of constant length giving constant phase difference ✓  
[or \( SS_1 = SS_2 \) so waves are in phase] ✓  

Max 4

**c** graph to show:  
maxima of similar intensity to central maximum ✓  
[or some decrease in intensity outwards from centre] ✓  
all fringes same width as central fringe ✓  

2

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**Section A: Objective test keys**

Q5 Jan 2002

1-D; 2-C; 3-B; 4-C; 5-B; 6-D; 7-B; 8-A; 9-D; 10-C; 11-B; 12-B; 13-A; 14-D; 15-B.
Section A

Key to Objective Test Questions

Q5 Jun 2002

1-B; 2-B; 3-D; 4- C; 5-A; 6-C; 7-B; 8-B; 9-D; 10-A; 11-C; 12-C; 13-D; 14-A; 15-C.

Key to Objective Test Questions

Q6 Jun 2003

1-A; 2-B; 3-A; 4-B; 5-A; 6-B; 7-A; 8-A; 9-D; 10-C; 11-C; 12-D; 13-A; 14-C; 15-D.

Unit 4: Section A

Key to Objective Test Questions

Q4 Jan 2004

1-C; 2-A; 3-D; 4-D; 5-B; 6-A; 7-C; 8-D; 9-C; 10-C; 11-A; 12-C; 13-C; 14-B; 15-B.

Section A

Q5 Jan 2006

This component is an objective test for which the following list indicates the correct answers used in marking the candidates’ responses.

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Unit 4: PA04 Section A

Waves, Fields and Nuclear Energy

Q5 Jan 2005

Key to Objective Test Questions

1-B; 2-A; 3-D; 4-A; 5-C; 6-C; 7-D; 8-D; 9-C; 10-D; 11-C; 12-B; 13-B; 14-A; 15-C.
PA04 Section A: Waves, Fields and Nuclear Energy  Q5 Jun 2006

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Section A  Q5 Jan 2008  Q6 Jan 2008

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Section A  Q5 Jun 2007  Q6 Jun 2007

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