

Mark Scheme Diffraction Past Paper Questions

Jan 2002 to Jan 2009

1

(a)(i) $0, 2\pi$ or 4π [or $0, 360^\circ$ or 720°] ✓

Q1 Jun 2004

(ii) 4λ ✓

(iii) $\sin \theta = \frac{CE}{AC}$ ✓

[or $\sin \theta = \frac{BD}{AB}$]

$CE = 4\lambda$ and $AC = 2d$ ✓ (hence result)

[or $BD = 2\lambda$ and $AB = d$]

max (3)

(b) (limiting case is when $\theta = 90^\circ$ or $\sin \theta = 1$)

$n \left(= \frac{d \sin \theta}{\lambda} \right) = \frac{2.22 \times 10^{-6} (\times 1)}{486 \times 10^{-9}}$ ✓ (= 4.6)

highest order is 4th ✓

(2)

(5)

Question 2		
(a)	light waves diffract on passing through slits ✓ narrow slits (or $d \approx \lambda$) give wide diffraction ✓ diffracted waves meet or overlap or interfere ✓ maxima when waves are in phase or when path difference is $n \lambda$ ✓	max 3
(b) (i)	$n_1 \lambda_1 = n_2 \lambda_2$ (or $3 \times 420 = 2 \lambda$) ✓ (gives $\lambda = 630 \text{ nm}$)	<p style="text-align: right;">Q2 Jan 2007</p> <p style="text-align: center;">5</p>
(ii)	$d \left(= \frac{n \lambda}{\sin \theta} \right) = \frac{3 \times 420 \times 10^{-9}}{\sin 44^\circ}$ (= $1.81 \times 10^{-6} \text{ m}$) ✓ no of lines $\text{m}^{-1} = 1/1.81 \times 10^{-6} = 5.5 \times 10^5$ (5.51×10^5) ✓	
(iii)	when $\sin \theta = 1$, $n \left(= \frac{d}{\lambda} \right) = \frac{1.81 \times 10^{-6}}{420 \times 10^{-9}}$ (= 4.31) ✓ ∴ highest order maximum is 4 th ✓	
	Total	8

Section A**Q7 Jun 2007**

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

	Keys to Objective Test Questions															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
	C	B	A	C	A	B	D	C	B	C	D	B	D	C	A	

Section A**Q7 Jan 2008**

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

	Keys to Objective Test Questions															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
	D	B	C	B	A	C	B	C	D	C	A	C	D	B	A	

Section A**Q5 Jun 2008**

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

	Keys to Objective Test Questions															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
	C	A	A	D	B	A	C	D	D	C	A	B	D	C	B	

Section A: Objective test keys**Q6 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**Q6 Jun 2002****Key to Objective Test Questions**

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

Q7 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

Q5 Jan 2004

Key to Objective Test Questions

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.

PA04 Section A Waves, Fields and Nuclear Energy

Key to Objective Test Questions

Q6 Jun 2005

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

PA04 Section A: Waves, Fields and Nuclear Energy **Q6 Jun 2006**

	Keys to Objective Test Questions															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
	B	C	A	C	A	D	B	C	D	D	B	C	D	B	B	