Mark scheme

Light

Physics 0625 · Questions from Paper 3, Paper 4 and Paper 6

Total marks

78

MARKS FOR EACH QUESTION

1	2	3	4	5	6	7	8	9	10	Total
5	7	7	9	7	7	8	8	9	11	**78**

Question 1 [5]

1 **(a)** **(i)** refraction
accept refracted ray, ignore bends B1

(ii) 45 (°) condone no/incorrect unit B1

(b) **(i)** refracted down at first surface B1
refracted down at 2nd surface B1

(ii) X marked above point where candidate's blue light hits screen B1

[Total: 5]

Question 2 [7]

2(a)(i)	(principal) axis ignore X-axis	**B1**
2(a)(ii)	F marked near intersection of ray and principle axis	**B1**
2(b)(i)	Either: ray from top of object towards centre of lens	**B1**
	continues from centre and crosses initial ray	**B1**
	OR 1st ray through F on left of lens (needs to be added by candidate)	**(B1)**
	2nd ray parallel to principle axis and crosses initial ray	**(B1)**
2(b)(ii)	inverted arrow drawn from axis to point where rays cross	**B1**
2(b)(iii)	diminished circled	**B1**
	inverted circled	**B1**

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Question 3 [7]

3(a)(i)	ray continues normally into glass	**B1**
3(a)(ii)	one correct normal seen	**B1**
3(a)(iii)	ray is totally internally reflected at a glass / air boundary	**B1**
	ray emerging from hypotenuse	**B1**
3(b)(i)	orange – between red and yellow	**B1**
	blue – between green and indigo	**B1**
3(b)(ii)	wavelength	**B1**

Question 4 [9]

4(a)(i)	normal	**B1**
4(a)(ii)	20°	**B1**
4(b)	d	**B1**
	g	**B1**
	f	**B1**
	R **OR** S	**B1**
4(c)	any two rays correctly drawn from top of O: ray parallel to axis, through lens, and beyond F ray undeviated through centre of lens and beyond ray through F, through lens, then parallel to axis	**M2**
	inverted image correctly drawn and positioned at intersection of two rays	**A1**
		Total: 9

Question 5 [7]

5(a)	sin *i* / sin *r* = n in any form	**C1**
	r = 18°	**A1**
5(b)	light travelling from optically dense medium to optically less dense medium	**B1**
	all light reflected OR no light refracted	**B1**
	angle of incidence is greater than the critical angle	**B1**
5(c)	ray reflected at face AB with *i* = *r* by eye	**B1**
	ray refracted at face BC and bent away from the normal	**B1**

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Question 6 [7]

6(a)	any **two** from: • all light is reflected • no light is refracted • (occurs) when light travels in a more dense medium towards a (boundary with a) less dense medium	**B2**
6(b)(i)	(x =) 48°	**A3**
	$n = 1 / \sin c$ **OR** $c = \sin^{-1}(1 / n)$ **OR** $\sin c = 1 / 1.5$ **OR** $c = \sin^{-1}(1 / 1.5)$	C1
	$c = 42$(°)	C1
6(b)(ii)	(speed =) 2.0×10^8 m / s	**A2**
	$n = \frac{\text{speed of light in vacuum}}{\text{speed of light in liquid}}$ **OR** $n = \frac{\text{(approx.) speed of light in air}}{\text{speed of light in liquid}}$ **OR** $n = c / v$ **OR** (v =) c / n **OR** $1.5 = \frac{3\times10^8}{\text{speed of light in liquid}}$	C1

Question 7 [8]

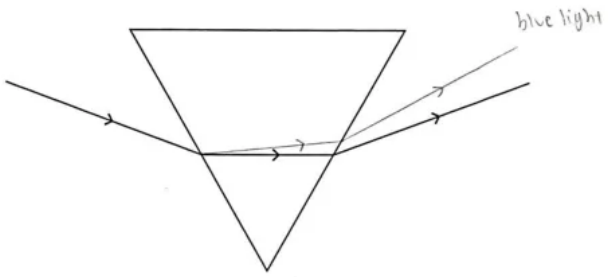
7(a)	principal focuses marked in correct position	**B1**
7(b)	1 mark for each of: • 1 correct ray • 2nd correct ray • 3rd correct ray and image, labelled I, in correct position with arrow at bottom	**B3**
7(c)	real	**B1**
	inverted and enlarged	**B1**
7(d)(i)	(image produced by a magnifying glass is) upright OR NOT inverted OR virtual	**B1**
7(d)(ii)	position marked between principal focus and lens	**B1**

Question 8 [8]

8(a)	Any **two** from: • high rates (of data transmission) / faster (data transmission) • carry large amounts (of data / information) • secure • Little data / signal loss • glass is transparent to (some) infrared	**B2**
8(b)(i)	(c =) 46°	**A3**
	$N = 1 / \sin c$, $1.4 = 1 / \sin c$ **OR** (c =) $\sin^{-1}(1 / 1.4)$	C1
	Equation in this form only (c =) $\sin^{-1}(1 / n)$ **OR** (c =) $\sin^{-1}(1 / 1.4)$ **OR** (c =) 46	C1
8(b)(ii)	angle of incidence (of light) at which the angle of refraction is (exactly) 90°	**B1**
8(b)(iii)	angle of incidence marked **AND** TIR of ray inside glass **AND** light ray leaves end of fibre after two **or** three reflections	**A2**
	angle of incidence marked **OR** TIR drawn until ray leaves end of fibre	C1

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Question 9 [9]

9(a)(i)	*two correct rays from*: • ray from X through centre of lens • ray from X to lens, parallel to principal axis, refracted through RH focus F • ray from X (that would pass through LH focus) refracted parallel to principal axis.	**M2**
	two rays correctly extended back, intersecting to left of object and image labelled	**A1**
	IY drawn **AND** 36 mm ≤ distance ≤ 44 mm	**A1**
9(a)(ii)	*any two from:* • object closer to lens than (one) focal length • (actual) rays do not meet (at image) • image cannot be formed on a screen **OR** image only visible through lens • object and image on same side (of lens) **OR** image on LHS of lens/object.	**B2**
9(b)		**A3**
	blue ray refracted closer to the normal than the green ray as it enters the prism	C1
	blue ray refracted away from the normal as it leaves the prism	C1

Question 10 [11]

10(a)	normal correct (by eye), extended to cross PR and Q labelled	**1**
10(b)	$\theta = 10° \pm 1°$ and end of line labelled O MO = 14.0 ± 0.2 cm	**2**
10(c)(i)	line joining M to the crosses, continued to cross PR	**1**
10(c)(ii)	a = 1.7 ± 0.1 cm b = 10.3 ± 0.1 cm	**1**
10(d)	r correct answer to 2 significant figures	**2**
10(e)	statement to match results (expect YES) values from table used to justify statement	**2**
10(f)	extend the investigation for different values of θ	**1**
10(g)	reflecting surface of the mirror is at the back/thickness of mirror/small variations in protractor angle have a much larger effect on a and b/ thickness of light ray/difficult to locate centre of light ray/experiment not done in a dark room	**1**

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