

Light

Mark Scheme 3

Level	IGCSE
Subject	Physics
Exam Board	CIE
Topic	Properties of Waves. Including Light and Sound
Sub-Topic	Light
Paper Type	Alternative to Practical
Booklet	Mark Scheme 3

Time Allowed: 54 minutes

Score: /45

Percentage: /100

- 1 (a) normal correct, through **N** [1]
- (b) (i) line in correct place, **F**, labelled AND line and normal both thin, continuous and straight lines [1]
- (ii)(iii) one measurement of a or b correct ($a = 7.3$, $b = 4.1-4.2$) AND unit of cm or mm [1]
both measurements correct AND unit of cm or mm [1]
- (c) 1.7–1.8 AND no unit [1]
- (d) any one from: [1]
- ensure pins are vertical/view bases of pins
 - pins far apart (or > 5 cm)
 - thin lines/sharp pencil/thin pins
 - view from small angle (to normal)
- (e) less reliable AND reference to smaller block depth owtte [1]
measuring smaller lengths gives greater (%) uncertainties owtte

[Total: 8]

- 2 (a) angle of incidence 30° and **AB** 8.0 cm single, continuous, straight line [1]
- (b) P_3P_4 line correct and neat [1]
- $\alpha_o = 30 \pm 1^\circ$ [1]
- (c) **graph:**
axes correctly labelled and correct way round [1]
- suitable scales, i.e. y-axis 2 cm = 20° , x-axis 2 cm = 10° [1]
- all plots correct to $\frac{1}{2}$ small square [1]
- good line judgement [1]
- single, thin, continuous line, neat points [1]
- (d) triangle method seen on graph with triangle using at least half of line [1]
- G between 1.9 and 2.1, ecf for axes wrong way round [1]
- (e) $(\alpha - \alpha_o) = 2\theta$ or words to that effect, no ecf [1]
- (f) any one from:
large(r) pin separation
view bases of pins (or ensure pins vertical)
repeat and average
thin(ner) pins
thin(ner) lines/sharp(er) pencil [max 1]

[Total: 12]

- 3 (a) (i) x and y clearly and correctly labelled to centre of lens [1]
- (ii) $d = 40.9(\text{cm})$ no mark
- (iii) $d^2 = 1673(\text{cm}^2)$ no mark
- (iv) $f = 14.8/14.77$ correct answer only [1]
ignore sig. figs, but penalise incorrect rounding
- cm **and** 2 or 3 sig. figs. [1]
- (b) any two from:
- use of darkened room/brighter lamp/no other lights
 - mark position of centre of lens on holder
 - place metre rule on bench/clamp in position
 - ensure object and (centre of) lens are same height (from the bench)
 - repeat (and average)
 - move the lens slowly/to and fro
 - lens, object and screen all vertical/perpendicular to bench [max 2]
- (c) (i) **two points in either order:**
- one magnified, other diminished owtte [1]
- one brighter than the other [1]
- (ii) both inverted/both real [1]
accept same way up/same shape
- (d) distance between object and screen/ D /change position of screen [1]

[Total: 9]

- 4 (a) (i) $w = 2.6$ to 2.5 and $h = 2.5$ to 2.4 [1]
- (ii) $s = 2.6$ or correct rounding from candidate's values [1]
- (iii) appropriate reason e.g.
- w and h not always the same (NOT 'increase at different rates') (need reference to square shape – NOT just 'distorted')
 - difficult to measure shadows/edges not distinct
 - card might not be perpendicular / card might be tilted
 - lamp is not a point source
 - improve reliability [1]
- (b) axes labelled with quantity and unit [1]
- scales appropriate, plots covering at least $\frac{1}{2}$ grid [1]
- plots correct to $\frac{1}{2}$ small square [1]
- well judged curve [1]
- thin, continuous line, precise plots [1]
- (c) large gap between plots for 25 and 15 cm
allow gaps becoming larger / to ensure curve is consistent [1]
NOT 'more plots, more accurate', 'make line more accurate'
- (d) any suitable reason e.g.
- shadow would be too big (for screen)
 - difference between w and h becomes larger
 - shadows become less distinct / more blurred / too distorted [1]

[Total: 10]

- 5 (a) normal at 90° , straight, at centre [1]
- (b) incident ray at 30° on left of normal, straight [1]
- (c) ray box near beginning of incident ray and pointing along it [1]
- (d) reflected ray at angle of reflection approximately 30° [1]
- (e) any two from:
darkened room / brighter ray box
mark rays at centre / edge of beam
use sharp pencil
thin ray / small slit in ray box
perpendicular viewing of protractor [2]

[Total: 6]