

Light

Mark Scheme 5

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 5

Time Allowed: 63 minutes

Score: /52

Percentage: /100

- 1 (a) $u = 3.9(\text{cm})$ and $d = 16.2(\text{cm})$
 $m = 3.15/3.2$ and no unit allow e.c.f. [1]
- (b) $h_o = 2.0(\text{cm})$ and $h_i = 6.5(\text{cm})$
 $M = 3.25$ (2 or 3 sig. figs.) and no unit allow e.c.f. [1]
- (c) statement matching results (expect 'Yes' but allow e.c.f.) [1]
justification matching statement
(expect 'within the range of experimental accuracy' o.w.t.t.e.) [1]
- (d) (blurred edge / hand in way of light [1]
ensure focused properly / screen etc. vertical / attach scale/rule to screen /
use translucent screen, measure at back [1]
- (ii) one suitable precaution (not used in (d)(i)) e.g.
darkened room
mark position of lens on holder
object and lens same height
ruler fixed to bench
all apparatus vertical/right angle to bench
move screen back and forth (to obtain sharp image) [1]

[Total: 9]

- 2 (a) (i)(ii) $u = 26$ (mm) or 2.6 (cm) [1]
 $v = 44$ (mm) or 4.4 (cm) [1]
- (b) (i) 1144 mm^2 and 70 mm
OR 11.44 cm^2 and 7.0 (or 7) cm []
e.c.f. from (a)
- (iii) $x = 16$ or 16.3 or 16.34 (1.6 or 1.63 or 1.634)
e.c.f. from (b)(i) and (ii) [1]
- (c) $f = 16$ or 16.3 or 16.34 cm (160 or 163 or 163.4 mm) [1]
 f given to 2 or 3 significant figures [1]
- (d) up to 0.5 cm either side of 18.2 cm []
- (e) any two from:
use of darkened room / brighter lamp / no other light interfering
mark position of centre of lens on holder
place metre rule on bench (or clamp in position)
ensure object and lens are same height from the bench
lens / object / screen perpendicular to bench
repeats
avoidance of parallax with action and reason [2]

[Total: 9]

- 3 (a) (i)(ii) $u = 25(\text{mm})$, $v = 42(\text{mm})$ [1]
- (iii)(iv) $uv = 1050(\text{mm}^2)$, $u + v = 67(\text{mm})$ allow e.c.f. [1]
- (v) $f_1 = 15.7(\text{mm})$ 2 or 3 significant figures only allow e.c.f. [1]
- (b) (i) $uv = 1050(\text{mm}^2)$, $u + v = 67(\text{mm})$, c.a.o.
- (iii) $f_2 = 15.7(\text{mm})$ accept any significant figures [1]
- (c) statement matches results (expect YES) [1]
justification in terms of within or beyond limits of experimental accuracy (o.w.t.t.e.)
accept values are equal without mention of experimental accuracy [1]
- (d) 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 (or clamp in position)
ensure object and (centre of) lens are same height (from the bench)
lens / object / screen vertical/perpendicular to bench
repeat (and average)
move lens slowly (backwards and forwards when focusing) [2]
- (e) image drawn inverted [1]

[Total: 9]

- 4 (a) normal correct and pin separation at least 5 cm [
- (b)(c) both reflected lines in correct place (through $P_3, P_4 / P_5, P_6$) and thin/neat [1]
 $\theta = 40^\circ$ within 1° [1]
 $\theta = 62^\circ$ within 1° [1]
- (d) definite statement matching results (expect 'Yes' but allow e.c.f. if difference >10%)
and justification matching statement [1]
 (expect 'within the range of experimental accuracy' or o.w.t.t.e.) [1]
 values from results shown/used (correctly w.r.t statement) [1]
- (e) any two suitable precautions:
 thin lines / fine pencil
 view protractor perpendicularly/parallax explained
 lines through centre of pin holes
 pins well separated
 pins vertical/not bent/viewed at base
 place mirror so that reflecting surface is on line o.w.t.t.e. [2]
- [Total: 8]**
- 5 (a) d in range 79 to 80 (mm), 7.9 to 8.0 (cm) [1]
 $x = 61$ (mm) and consistent correct unit for both (mm or cm) [1]
 $D = 80$ (cm), $X = 61$ (cm) ecf from (i) and (ii)
- (b) $f = 14.5$ (cm) allow ecf from (a) [1]
 2 or 3 significant figures and correct unit [1]
- (c) Correct statement for results (expect Yes or wtte) [1]
 Idea of within (or beyond) experimental accuracy or wtte [1]
Can only score if previous mark is scored
- (d) Any one from:
 Use of darkened room
 How to avoid parallax when taking readings
 Movement of lens back and forth to obtain clearest image
 Mark lens holder to show position of centre of lens
 Metre rule clamped or on bench
 Object, lens and screen all perpendicular to bench
 Object and lens same height above bench [1]
- [Total: 8]**

- 6 (a) Trace:
- Normal at 90° in correct position [1]
 - N at 4 cm above AB and angle of incidence 20° [1]
 - a value $4.3 \text{ cm} \pm 1 \text{ mm}$ correct answer only [1]
- (b) All correct lines drawn, thin and continuous [1]
- a and b both with consistent, correct unit which matches figures [1]
 - b value $6.2 \text{ cm} \pm 3 \text{ mm}$ correct answer only [1]
 - n value range $1.4 - 1.5$ after rounding [1]
 - to 2 or 3 significant figures and no unit [1]
- (c) One from:
- Pins well spaced
 - Pins at least 5 cm apart
 - View bases of pins
 - Ensure pins vertical
 - Use thin lines
 - Sharp pencil
 - Use thin pins [1]

[Total: 9]