Light

Mark Scheme 4

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 4

Time Allowed: **54 minutes**

Score: **/45**

Percentage: **/100**

1 **(a)** u = 20 mm AND v = 58 mm [

(b) v / u = 2.9 e.c.f. from **(a)** no unit [1]

(c) U = 200, V = 580 e.c.f. from **(a)** [1]

(d) 1.5 cm OR 15 mm [1]

(e) statement to match results (expect yes) [1]

justified by reference to results, communicating idea of within (beyond, ecf) limits of experimental accuracy [1]

(f) any two from:
use of darkened room / brighter lamp
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)
repeats and average
moving lens / object / screen back and forth (to find sharpest image) owtte
screen and lens and object all perpendicular to bench [2]

(g) image inverted [1]

(h) any one from:
darkened room / brighter lamp
moving lens / object / screen back and forth owtte
use object with fine detail e.g. cross-wires
measure at middle of range where image is sharp [1]

[Total: 10]

2 **(a** refracted ray in correct position and at 20°±1 [1]

(b) emergent ray in correct position and approximately parallel with incident ray [1]
note: allow a 3° tolerance

all lines present and neat [1]

(c) P_3P_4 distance far apart, at least 5.0 cm [

(ii) any two from:
viewing bases of pins / ensure that pins are vertical/not bent
large pin separations
use of repeats
use of thin pencil lines (or equivalent comment)
close one eye (when aligning pins)
use thin/sharp pins [2]
ignore parallax error
NOT dark room

(d) idea of within / beyond limits of experimental accuracy [1]

[Total: 7]

3 **(a** h_o = 2.0 (cm) [1]

(b)(c) h_I = 1.9 (cm) [1]

S values round to 1.1 (allow ecf), 1.3, 1.7, 2(.0), 2.2, 2.5 [1]

(d) graph:
axes labelled with quantity and unit and in correct orientation [1]
appropriate scales [1]
plots correct to ½ small square [1]
well-judged straight line and thin continuous line, precise plots [1]
triangle method/information for gradient seen marked on graph [1]

(e) **(i)** *G* calculated from at least ½ line [1]

(ii) *f* in range 15 – 19 (cm) [1]

[Total: 10]

4 on ray trace:
one line drawn accurately through P_3P_4 or CD [1]
both lines in correct place, neat, thin and intersecting [1]
normals Y to MR and P_1 to MR correct [1]
b = 55 – 65 (mm) [1]

(d) statement matches results (expect Yes) [1]
idea of within (or beyond) experimental accuracy [1]

(e) any one from:
large spaces between pins
make sure pins are vertical
observe bases of pins [1]

[Total: 7]

5 **(a)** axes correctly labelled [1]
suitable scales (at least half the grid used) [1]
all plots correct to ½ small square [1]
good line judgement [1]
thin continuous line and fine plots [1]

(b) triangle method used and shown [1]
using at least half of line [1]

(c) f = 14.0 – 16.0 (cm) [1]
f to 2 or 3 significant figures with unit [1]

(d) any two from:
darkened room / brighter lamp / no other lights
(centre of) lens and object same vertical height from bench
mark block at centre of lens
clamp rule or place on bench
lens, object and screen are vertical / perpendicular to bench
repeat the measurements
move the screen backwards and forwards (to get sharpest image) [2]

[Total: 11]