Light

Mark Scheme 2

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 2

Time Allowed: **62 minutes**

Score: **/51**

Percentage: **/100**

1   **(a** f = 15.06(387)   [1]

     final answer given to 2 or 3 significant figures AND unit   [1]

  (b) any two from:
- darkened room / bright(er) lamp / no other lights
- moving screen slowly / back and forth to obtain best image
- mark block to show centre of lens
- place rule on bench/ clamp rule;
- lens and object same (vertical) height/level (from bench)
- lens, object and screen vertical/perpendicular to bench;
- repeat measurement/experiment (and average)   [max.2]

  (c) any two from:
- upside down/inverted
- size/bigger
- brightness/brighter/dimmer
- colours seen round edge/edges blurred   [max.2]

[Total: 6]

2 **(a (i)** f = 3.1 [1]

  (ii) F = 15.5 allow ecf [1]

(b) F_1 = 15.6 allow ecf [1]

(c) F_2 = 15.7 [1]

  statement matching results [1]

  appropriate justification, including idea of within limits of experimental accuracy owtte [1]

(d) appropriate precaution e.g: [1]
- carry out experiment in dark room/no direct (sun)light/bright lamp
- lens and object same height (above bench)
- lens, object and screen/mirror vertical/perpendicular
- move screen/lens back and forth/slowly to obtain sharp image
- fix/place rule on bench/clamp rule
- mark centre of lens <u>on holder</u>
- readings/expt repeated (and average taken)

[Total: 7]

3 **(a (i)** θ = 30° and 65° both to ± 2° [1]

  (ii) suitable procedure e.g.: [1]
- use of plumb line
- measure from line of stand
- use of spirit level
- attach protractor behind solar panel

(b) any one reason from: [1]
- ambient light owtte
- zero error on meter

  corresponding solution: [1]
- do experiment in complete darkness
- subtract zero reading (from each voltage measurement)

(c) any two aspects <u>relating to apparatus</u> e.g.: [2]
- same distance between panel and lamp
- lamp at same height
- panel at constant height
- same pd across lamp OR same current in lamp OR same brightness of lamp

[Total: 6]

4 **(a** **(i)** u_1 = 5.0(cm)/50(mm) [1]
v_1 = 8.7(cm)/87(mm) [1]

(ii) correct calculation of f, expect 3.1 to 3.2 (cm)/31 to 32 (mm), e.c.f.**(a)(i)** [1]
matching unit [1]

(b) u_2 in range 8.8 to 8.9(cm)/88 to 89(mm) AND statement matching results [1]
appropriate justification e.g. within limits of experimental accuracy owtte [1]

(c) two appropriate precautions, e.g. [2]
- carry out experiment in dark room/no direct (sun)light/bright lamp
- lens and object same height above bench
- lens, object and screen vertical
- move screen/lens back and forth/slowly to obtain sharp image
- fix/place rule on bench
- mark centre of lens <u>on holder</u>
- readings repeated

[Total: 8]

5 **(a)(i)(ii)** ray-trace:
- normal at 90° and crossing **MR** at intersection with P_3P_4 line [1]
- incident ray at 30° ± 2° in correct quadrant [1]
- incident ray 8.0 cm long [1]

(b) **B** to **X** at least 5.0 cm [

(c) **(i)** P_3P_4 line correctly drawn AND all lines single, thin, continuous lines [1]

(ii) r =31(°)–33(°)

(d) any two from:
- ensure pins are vertical / view bases of pins
- pins far apart (or > 5 cm)
- ensure mirror exactly on **MR** / ensure mirror does not move
- thin lines / sharp pencil / thin pins
- repeats [2]

(e) any one from:
- thickness of lines / pencil / mirror / pins
- difficulty of lining up pins and images [1]

[Total: 9]

6 **(a** in correct order: object, lens, screen [1]
all three components on bench and all perpendicular to bench [1]

(b) 50–100 (cm) [1]

(c) any two from:
- difficulty in deciding exact position of lens for best image / image not quite clear owtte
- difficulty in measuring to centre of lens
- room too bright / lamp too dim [2]

(d) image shown upside down [1]

[Total: 6]

7 **(a)(i)(ii)** ray-trace:
- normal drawn at centre of **MR** [1]
- incident ray at 30° (± 1°) [1]
- incident ray 8.0 cm long [1]

(b) P_1P_2 distance ⩾ 5 cm apart [1]

(c) (i) all lines correctly drawn AND all lines single, thin, continuous lines [1]

(ii) r = 27(°)–30(°) [1]

(d) any two from:
- ensure pins are vertical / view bases of pins
- pins far apart (or ⩾ 5 cm)
- thin lines / sharp pencil / thin pins [2]

(e) any one from:
- thickness of mirror / mirror glass silvered at back surface
- thickness of pins
- difficulty in lining up pins (and their images exactly) [1]

[Total: 9]