

**MARK SCHEME for the October/November 2009 question paper
for the guidance of teachers**

5054 PHYSICS

5054/04

Paper 4 (Alternative to Practical), maximum raw mark 30

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2009	5054	04

- 1 (a) mass / weight difference between two halves / rule not uniform / C of G or C of M not in centre of rule / not at 50 cm mark / one end (not A) worn away / damaged / holes drilled in one end (ignore comments on forces / moments / fulcrum / prism) B1 [1]
- (b) (i) 88.4 ± 0.2 (cm) unit not required B1
- (ii) 38.4 ± 0.2 cm OR (b) (i) – 50 correct unit required B1 [2]
- (c) axes: correct way round, labelled quantity and unit minimum two values (excluding 0,0) on each axis B1
- scales: more than $\frac{1}{2}$ page, sensible, linear B1
x-axis: 2 cm = 100g or 80g y-axis: 2 cm = 10 cm or 8 cm
- 5 given points plotted accurately, $\pm \frac{1}{2}$ smallest square (for sensible scales only) / ignore point at 50g B1
- reasonable attempt at best fit curve neatly drawn from 75g to 400g, not going below 4cm / ignore line outside points B1 [4]
- (d) (i) points on graph should be evenly spaced/uniform / large gap (between 200g and 400g) explained somehow B1 [1]
allow more accurate with reference to graph / curve / results / experiment / conclusion / allow clearer graph / fewer gaps in graph
- (ii) 6.5 ± 0.5 cm or answer correct from their graph correct unit required B1
allow 6-7 cm / allow even if scale not sensible
- marking clearly shown on graph at their value B1 [2]
minimum requirement: clear mark on curve at 300g
- (e) $d > 50$ cm / metre rule not long enough B1 [1]
allow distance too large/ too close to end of ruler / value of d too high
ignore distance large / cannot balance ruler / comments relating to graph
- [Total: 11]**
- 2 (a) trundle wheel / measuring tape / more than one metre rule / metre tape ignore 10 m ruler B1 [1]
- (b) know when to start stopwatch / when sound is made / when pistol fired B1 [1]
- (c) avoid echoes / reflections / sound bouncing off buildings ignore noise from surroundings / sound hits buildings B1 [1]

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2009	5054	04

(d) mark 1 and 2 together any TWO sensible suggestions, e.g.

reactions too slow

ignore just human error

stopwatch faulty / failed to start / stop / not at zero

time interval too short / speed too fast / distance too short

poor hearing / could not hear the bang

poor eyesight / could not see the smoke

different distances (from teacher)

lack of concentration / not paying attention

ignore faulty pistol

B2 [2]

NOT parallax error

(e) faster / larger / speed quicker

ignore takes less time / hears sound quicker

B1 [1]

[Total: 6]

3 (a) uses light from a distant object

allow parallel light mentioned / at least 2 parallel rays drawn (not including axis unless arrow shown)

B1

moves lens/focuses light onto a screen

allow $f/F/15$ correctly marked on ray diagram

B1

measures from lens to screen / image / repeats for all 3 lenses

max 2 if concave lens drawn

B1 [3]

(b) N increases, f decreases / inverse relationship

C1

inversely proportional / $N \times f = \text{constant}$

allow max 1 mark if focal point used for focal length

A1 [2]

allow one mark if inversely proportional stated then incorrect description

[Total: 5]

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2009	5054	04

- 4 (a)** circuit containing power supply, wire, resistor (allow variable R), (switch) and
- ammeter drawn in series with wire B1
voltmeter drawn in parallel with wire B1 [2]
- allow any representation clearly ammeter and voltmeter / meters drawn on Fig 4.1
ignore gaps in circuit
max 1 if resistor drawn as fuse
- (b)** makes current small / stops wire heating up / overheating / melting B1 [1]
allow controls / limits current / protects ammeter
ignore resists the current / varies the current / no damage to wire / comments on safety
- (c) (i)** 1.4 V cao unit required B1
(ii) 78 mA / .078 A cao unit required B1 [2]
- (d)** 0.33 (0.326) (mm) ecf **(c) (i)** and **(ii)** B1
Their answer correctly rounded to 2 s.f. B1 [2]
ecf 78 A in **(c) (ii)** gives 10(.3) mm so 10 scores 2 marks
- (e)** micrometer / screw gauge B1 [1]
allow caliper ecf (d) ≥ 9 mm

[Total: 8]