

**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**  
GCE Ordinary Level

**MARK SCHEME for the May/June 2010 question paper**  
**for the guidance of teachers**

**5054 PHYSICS**

**5054/42**

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 – May/June 2010	5054	42

- 1 (a) to obtain uniform temperature/heat spread (uniformly) throughout oil B1 [1]
- (b) temperature increase is slow/temperature change small/heats up slowly/  
oil doesn't become **too** hot/prevent overheating  
oil has low specific heat capacity/heats up quickly/oil has high boiling point/  
higher boiling point than water/above 110°C/may break thermometer B1 [1]
- (c) (i) axes: correct way round, labelled quantity and unit B1  
scales: more than ½ page, sensible 2 cm ≡ 2 s and 2 cm ≡ 10 °C B1
- points plotted accurately to within ½ small square; dots ≤ ½ small square B1  
reasonable attempt at smooth curve of best fit neatly drawn B1 [4]
- (ii) if line on graph not extrapolated to 80 °C 13.3 s ± 0.2 s unit required  
if reasonable extrapolation, correct value read from graph unit required B1 [1]
- (iii) 110 °C/100 °C unit required B1 [1]
- (d) **temperature** of oil will have changed/decreased B1 [1]
- (e)
- using two people to take the measurements 

✓

 B1
- pouring the oil quickly after taking its temperature 

✓

 B1 [2]
- [Total: 11]**
- 2 (a) time several/ $N$  oscillations (allow  $5 \leq N \leq 40$  if value given) **and** divide by  $N$  B1  
repeat reading **and** average B1
- any one** from  
view perpendicular to swing  
time from centre/use fiducial marker/view at bottom of ruler/where speed max  
smooth swings/same amplitude B1 [3]
- (b) (i) initially  $T$  decreases (as  $d$  increases) B1  
(then)  $T$  increases (as  $d$  increases) B1 [2]  
minimum  $T$  at  $d = 20$  cm scores 2 allow just  $T$  increases for one mark
- (ii) 1.58 to 1.70 (s) unit NOT required B1 [1]
- (iii) at centre of mass of ruler/no moment/in equilibrium/balanced/does not move  
ruler will not oscillate/swing  
ruler spins/rotates  
 $T$  too large/very large B1 [1]
- [Total: 7]**

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
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- 3 (a) (i) slow reactions stopping stopwatch/started stopwatch early  
faulty stopwatch/string wound incorrectly B1 [1]
- (ii) 4.488 C1  
4.49 accept 4.5 c.a.o. 3 / 2 s.f. only A1 [2]
- (b) 15 / 14.8 / 14.9 / % unit required no s.f. penalty e.c.f. (a) (ii) B1 [1]
- (c) use a marker at 1 m/metre rule vertical/avoid parallax error/rule close to string/  
parallax error described accurately B1 [1]
- [Total: 5]**
- 4 (a) so can be replaced (exactly) if moved/knocked/so rays can be drawn through  
the block/to know where the ray changes direction/marks air-glass boundary B1 [1]
- (b) views  $P_1$  and  $P_2$  through block M0  
puts  $P_3$  and  $P_4$  **in line with**  $P_1$  and  $P_2$  B1 [1]
- (c) (i) ray drawn accurately within block with ruler B1 [1]
- (ii) normal drawn correctly  
direction from centre of block B1 [1]
- (iii)  $34^\circ \pm 3^\circ$  B1 [1]
- (d)  $i = 0$ /arrives along normal/ $90^\circ$  to surface/passes through centre of block B1 [1]
- (e) ray 3 completed to match ray 1 inside block e.c.f. (c) B1 [1]
- [Total: 7]**