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

UNIVERSITY *of* CAMBRIDGE
International Examinations

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 $5 \leqslant N \leqslant 40$ 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]

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° ± 3°   B1   [1]

(d) i = 0/arrives along normal/90° 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]