

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

5054 PHYSICS

5054/31

Paper 3 (Practical Test), 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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- 1 (a) L measured to the nearest mm or better with unit and in the range 20.0cm to 40.0cm. B1 [1]
- (b) Use of set squares at each end of channel to take scale readings/narrow channel so that spheres are touching. B1 [1]
- (c) d calculated from $L / 20$ with unit. B1
- (Penalise unit error once only in (a) and (c))
- m determined from ≥ 10 spheres either by taring the balance or by finding the mass of the sphere holder.
(ignore unit of m) B1
- Correct calculation of density with unit and in the range 2.2 to 2.8 g / cm³ (ignore s.f.) B1 [3]
- [Total: 5]**
- 2 (a) $y \geq 60.0$ cm (allow values to the nearest cm) and less than the height of the bench with unit. B1 [1]
- (b) Set square between floor and metre rule.
Allow alignment with vertical object, e.g. window frame or door frame or clamp stand. B1 [1]
- (c) (i) $30 \text{ g} \leq m \leq 100 \text{ g}$ with unit. B1
- (ii) t measured to 0.1 s or better, found from ≥ 2 readings and in range $1.0 \text{ s} \leq t \leq 5.0 \text{ s}$ with unit. B1 [2]
- (d) Correct calculation of a with unit (ignore s.f.) and $\leq 10 \text{ ms}^{-2}$ B1 [1]
- [Total: 5]**
- 3 (a) d found from a minimum of 2 readings to 0.1 cm or better (allow 2cm) with unit and in the range 1.7cm to 2.3cm. B1 [1]
- (b) (i) v to 1 cm or better with unit and in range 45.0cm to 80.0cm. B1
- (ii) D found from a minimum of 2 readings to 0.1 cm or better with unit and in the range 4.0cm to 9.0cm. B1 [2]
- In parts (a) and (b) penalise unit error once only.
- (c) Correct calculation of m and f (ignore unit on m). M1
- f in the range 13.0cm to 17.0cm with unit. A1 [2]
- [Total: 5]**

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4 Preliminary Results

- (a) Circuit diagram showing power supply, resistor and capacitor in parallel. If the switch is present it must be between the power supply and the capacitor. B1 [1]
- (b) V_0 recorded to 0.1 V or better with unit and in range 2.0 V to 6.5 V. B1 [1]
- (c) V_R recorded to 0.1 V or better with unit and \leq the value in (b) (within 0.5 V). B1 [1]

Penalise unit error once only in (b) and (c).

Table

- (d) Table with units for V_R and t . B1
- In awarding the next marks good results should be judged by checking $V_R \pm 0.1$ V from the Examiner's best line.
- Five good values for V_R B1
- Six or more good values for V_R B1
- Nine results or repeats B1 [4]

Graph

- (e) Axes labelled with units and correct orientation. B1
(Allow e.c.f. from wrong unit in table but not no units.)
- Suitable scale, not based on 3, 6, 7, etc. with data occupying \geq half the page in both directions. B1
(Allow the graph to start at the origin.)
- Two points plotted correctly – check the two points furthest from the line. This mark can only be scored if the scale is easy to follow. B1
(Points must be within $\frac{1}{2}$ small square of the correct position.)
- Best fit fine line and fine points or crosses. B1 [4]
(Line thickness to be no greater than the thickest lines on the grid.)

Calculations

- (f) Good tangent drawn to curve at $V_R = 0.5 V_0$ B1
- Use of large triangle with base > 8 cm or height > 12 cm or as large as possible. B1
(Base should be greater than 12 cm if grid is used landscape rather than portrait.)
Correct calculation $2/3$ s.f. (ignore unit). B1 [3]
- (g) Time correctly read off graph and in range 25s to 70s. B1 [1]

[Total: 15]