

**MARK SCHEME for the October/November 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.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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- 1 (a) use of spirit level / plumb line and set-square /  
check height at two points on rule (at least 50 cm apart) same distance  
above the bench B1  
allow answers on diagram
- (b) checks strings at  $50 \text{ cm} \pm d$  / measure both  $d$  from centre / ends of rule (B) B1
- (c) (i) answers on Fig. 1.2 either side  
eye level with rule B, looking towards B  
accept between bench label and metre rule B label  
above rule A, looking down close to end of rule A B1
- OR answers on Fig. 1.3 either side  
looking toward fixed rule A from end NOT B  
eye drawn on top of rule A close to end B1
- (ii) time several /  $N$  oscillations (allow  $5 < N < 40$  if value given) **and** divide by  $N$  B1  
repeat and average B1  
use fiducial marker / time from centre / where speed max /  
smooth swings e.g. no obstructions / same amplitude B1  
ignore avoid parallax error / use stopwatch / plot graph of results
- (d) (i) axes: labelled both quantity and unit;  $T$  on  $y$ -axis B1  
scales: at least  $\frac{1}{2}$  grid in both directions and sensible  
start at (10,1)  $x$ :  $2 \text{ cm} \equiv 5 \text{ cm}$   $y$ :  $2 \text{ cm} \equiv 0.2$  or  $0.25 \text{ s}$  B1  
plotting: neat, to  $\pm \frac{1}{2}$  small square, max size dot 1 mm B1  
not awarded if scale not sensible  
reasonable attempt at smooth curve B1
- (ii) doubling and halving attempted /  $T \times d$  seen /  $T \propto 1/d$  C1  
numerical support for doubling and halving / two values  $T \times d$  seen A1  
must be correct use of data
- (iii) long time to take readings / unstable swings / difficult to oscillate / rotate B1  
allow  $T$  increases  
ignore difficult to time / does not oscillate / rotate
- [Total: 13]**
- 2 (a) wall clock + only need to measure to nearest second / accurate enough /  
time measured is large  
stopwatch + easier to hold / closer to apparatus B1  
ignore easier to use / read / reaction errors  
NOT stopwatch as it is more accurate
- (b) quantities time or  $t$  and temperature or  $\theta$  or  $T$  B1  
allow temperature change but no ecf to graph (c)(i)  
units minutes or min (NOT m or s) and  $^{\circ}\text{C}$  correct (NOT K) B1  
allow  $T$  or  $t$  for either temperature or time, but not same for both

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- (c) (i) shape of curve correct B1  
allow two straight lines joined by small curve  
NOT just two straight lines  
line starts from  $t = 0$  and  $\theta$  above 0 (room temp) B1  
(approx) horizontal from (approx)  $t = 20$  min at  $\theta = 60^\circ\text{C}$  B1  
20 min and  $60^\circ\text{C}$  must be labelled

- (ii) heat gained from heater = heat lost to surroundings / reaches equilibrium  
heater not powerful enough B1

[Total: 7]

- 3 (a) 1.5 (N) cao B1

- (b)  $2.6 \text{ (cm)} \pm 0.05 \text{ (cm)}$  B1

- (c) measure  $N$  and  $\div N$  / repeat / check B1  
vernier calliper / micrometer screw gauge B1

OR

- rule (with millimetre markings)  
measure pile of at least 10 coins and divide by 10 A2

- (d)  $7.4(348) \text{ (g/cm}^3\text{)}$  ecf (a) and (b) B1

- (e) allow ecf (d)  
No + density is different  
Yes + densities similar only if answer (d)  $8.0$  to  $10.0 \text{ g/cm}^3$   
Not sure + suitable comment, e.g. densities close but uncertainties in expt B1

[Total: 6]

- 4 (a) experiment that would work M0  
diagram of apparatus A1  
not if major error e.g. paperclips hanging from middle of magnet  
how the apparatus is used (some detail required) A1  
e.g. point of procedure or fair test  
how it shows which is stronger A1  
NOT plotting field lines with a compass

- (b) use of repulsion to identify magnets / use of attraction to identify soft iron B1

[Total: 4]