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 should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2015 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.
NOTES ABOUT MARK SCHEME SYMBOLS & OTHER MATTERS

B marks are independent marks, which do not depend on any other marks. For a B mark to be scored, the point to which it refers must actually be seen in the candidate's answer.

M marks are method marks upon which accuracy marks (A marks) later depend. For an M mark to be scored, the point to which it refers must be seen in a candidate's answer. If a candidate fails to score a particular M mark, then none of the dependent A marks can be scored.

C marks are compensatory method marks which can be scored even if the points to which they refer are not written down by the candidate, provided subsequent working gives evidence that they must have known it. For example, if an equation carries a C mark and the candidate does not write down the actual equation but does correct working which shows he knew the equation, then the C mark is scored.

A marks are accuracy or answer marks which either depend on an M mark, or which are one of the ways which allow a C mark to be scored.

Brackets ( ) around words or units in the mark scheme are intended to indicate wording used to clarify the mark scheme, but the marks do not depend on seeing the words or units in brackets, e.g. 10 (J) means that the mark is scored for 10, regardless of the unit given.

c.a.o. means "correct answer only".

e.c.f. means "error carried forward". This indicates that if a candidate has made an earlier mistake and has carried his incorrect value forward to subsequent stages of working, he may be given marks indicated by e.c.f. provided his subsequent working is correct, bearing in mind his earlier mistake. This prevents a candidate being penalised more than once for a particular mistake, but only applies to marks annotated "e.c.f."

e.e.o.o. means "each error or omission".

Underlining indicates that this must be seen in the answer offered, or something very similar.

OR / or indicates alternative answers, any one of which is satisfactory for scoring the mark.

AND indicates that both answers are required to score the mark.

Spelling Be generous with spelling and use of English. However, do not allow ambiguities e.g. spelling which suggests confusion between reflection/refraction/diffraction or thermistor/transistor/transformer.

Sig. figs. On this paper, answers are generally acceptable to any number of significant figures ≥2, except where the mark scheme specifies otherwise or gives an answer to only 1 significant figure.

Units On this paper, incorrect units are not penalised, except where specified. More commonly, marks are awarded for specific units.

Fractions Fractions are only acceptable where specified.
Extras: If a candidate gives more answers than required, irrelevant extras are ignored; for extras which contradict an otherwise correct response, or are forbidden by the mark scheme, use right plus wrong = 0.

Ignore: indicates that something which is not correct is disregarded and does not cause a right plus wrong penalty.

NOT: indicates that an incorrect answer is not to be disregarded, but cancels another otherwise correct alternative offered by the candidate i.e. right plus wrong penalty applies.
1  (a) any two from:  
   • gap between ruler and stack  
   • eye not perpendicular/ level with top of stack  
   • zero error of ruler

   (b)  \( \frac{7.7}{20} \) OR \( 0.385 \text{ cm} \) \( \text{OR} \) \( 0.39 \text{ cm} \)  

   (c) 0.012 (kg) c.a.o.

   [Total: 5]

2  (a) 40 (km)

   (b) speed = distance ÷ time in any form  
       0.5 ÷ 0.04  
       12.5 m/s

   (c) (i) distance travelled = area under slope OR \( 0.5 \times 15 \times 6 \)  
       45 (m)

   (ii) (straight) line from 15 m/s to 0 in 2.0 seconds

   [Total: 7]

3  (a) (i) any answer in range 40 to 100 kg OR equivalent in g

   (ii) mass of chair is the same on the moon

   (b) (i) pressure greater in Fig. 3.2 OR reverse argument  
         force/weight is the same  
         smaller (contact/surface) area

   (ii) vertical line through centre of mass drawn or explained  
         centre of mass outside base area of chair/beyond back leg of chair

   [Total: 7]

4  chemical  
    kinetic  
    thermal  
    sound

   [Total: 4]
5 (a) (i) C in box  
(ii) A AND C in any order  

(b) any 5 points in any order from:  
- starting pistol fired  
- stopwatch started on seeing smoke/signal  
- stopwatch stopped on hearing bang  
- time taken (between flash and bang) calculated/recorded  
- distance measured OR at least 100 m apart, IGNORE distances less than 100 m  
- speed = distance ÷ time  

[Total: 7]

6 (a) (i) \(380\) (mm) AND \(220\) (mm)  
(ii) \(380 - 220\) OR \(160\) OR ecf from (a)(i)  
\(760 + 160\) OR ecf from (a)(i)ECF  
\(920\) (mmHg) OR ecf from (a)(i)  

(b) (i) decreases  
(ii) molecules slow down OR (average) speed/movement decreases  
OR molecules have less (average kinetic) energy  
molecules closer  

[Total: 7]

7 (a) (i) conduction  
(ii) 1. water expands when heated  
density (of warm water) decreases OR reverse argument  
warm water rises  
2. convection  

(b) (i) reduce heat losses OR to act as insulation  
(ii) any two from:  
- economic reason: lower costs OR cheaper OR more efficient  
- environmental reason: less greenhouse gases OR maintain fuel reserves  
- reason to do with system: maintain temperature of water OR less energy needed to keep water hot OR water stays hotter for longer  

[Total: 8]
8 (a) (i) angle of refraction correctly labelled B1

(ii) normal B1

(b) (i) light ray shown undergoing TIR/turns through 90° B1

(ii) total internal (reflection) B1

(iii) angle of incidence = angle of reflection OR angle of incidence greater than critical angle B1

[Total: 5]

9 (a) alternating voltage OR a.c. (supply) B1

(b) motor (accept fan) AND lamp B1

(c) line 1 tick and then tick
line 2 cross/nothing and then tick
line 3 tick and then cross/nothing B3

(d) \[ V = IR \] in any form B1

(e) \[ 50 \times 5 \]
\[ 250 \, V \] C1

(f) any two from:
- current too large
- fuse wire melts/"blows"
- breaks circuit
- prevents overheating/fires/damage to other components B2

[Total: 10]

10 (a) iron clearly indicated
steel clearly indicated B1

(b) test to see if there is repulsion/attraction
clear indication that repulsion identifies the magnets C1

(c) steel B1
(d) (i) iron filings OR (plotting) compass
(ii) at least two complete concentric circles around wire

[Total: 7]

11 (a) transverse waves OR travel at same (high) speed OR travel across a vacuum

(b) infra-red next to visible
microwaves next to radio waves

(c) gamma rays

(d) (i) medical imaging OR security scanning (at airports etc.) OR dentistry
OR finding defects in welding
(ii) use of shielding OR monitor exposure

[Total: 6]

12 (a) 3 plots all correct
good best-fit single line curve

(b) point at 40 days indicated
775 ± 75 A1

(c) initial count rate halved OR pair of count rates indicating halving
at least one corresponding time from graph
20 days ± 2 days A1

[Total: 7]