MARK SCHEME for the May/June 2015 series

0625 PHYSICS

0625/23 Paper 2 (Core Theory), maximum raw mark 80

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.**
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 marks.

**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.

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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) volume = length × cross-sectional area  
words, symbols or numbers  
8.0 accept 8 (cm$^3$)  

(b) time of burning: 2 hours 15 minutes  
2.25 hours, accept 2¼ hours  

(c) (speed = ) distance ÷ time in any form: symbols, words, numbers, ecf from (b)  
0.8(0) cm/hour, ecf from (b)  

(d) correct deduction from candidate’s (c)  
correct reasoning from candidate’s (c)  
e.g. 24 cm candle would burn for 30 h OR 19.2 cm will burn in 24 h  

[Total: 8]

2 (a) (i) rule(r)  
(ii) balance  

(b) (i) (density =) mass ÷ volume in any form: symbols, words, numbers  
15.2 ÷ 1.36  
11.2 (g/cm$^3$) accept 11  
(ii) lead, ecf from (b) (i)  

[Total: 6]

3 energy  
resistance  
speed  
temperature  

°C  
m/s  
J  
Ω  

note: 1 mark for 1 or 2 lines correct, 2 marks for all 3 lines correct
4 (a) 4 (N) up the slope B1
(b) idea of changes speed reduces speed / slows down / decelerates / retardation C1

[Total: 4]

5 (a) 1100 (m) ± 20 B1
(b) stationary / not moving / at rest B1
(c) (i) C AND D B1
   (ii) D AND E B1
(d) (speed =) distance ÷ time, in any form: symbols, words, numbers, ecf from (a) use of 300 s OR conversion of time to s OR ÷ 60 C1
   3.7 OR 3.67 (m/s) A1

[Total: 7]

6 (a) line from fossil fuel to coal-fired B1
    line from hot rocks underground to geothermal B1
    line from uranium fuel rods to nuclear B1
(b) D, C, B, A max. B3
   note: all correct order = 3 marks, 2 or 3 correct = 2 marks, 1 correct = 1 mark

[Total: 6]

7 (a) melting evaporating / boiling max. B3
    freezing / solidification condensing
   note: 3 marks for all 4 correct, 2 marks for 3 correct, 1 mark for 2 correct
(b) tick in first box (particles move randomly)  
  B1

tick in third box (particles are much further apart...)  
  B1

tick in sixth box (particles move faster...)  
  B1

(c) any three from:  
  max. B3
  • nail varnish remover evaporates
  • energy needed to evaporate/most energetic particles escape
  • energy is transferred from student/heat flow gives sensation of cold
  • remaining liquid colder/average KE is less

[Total: 9]

8 (a) arrow from candle to mirror OR from mirror to eye  
  NOT contradictions  
  B1

(b) candle flame image drawn at same height as flame  
  B1
  candle flame image drawn same distance behind mirror as flame is in front  
  B1

(c) (i) further away (from mirror/eye)  
  B1
  (ii) same (size)/nothing/does not change  
  B1

[Total: 5]

9 (a) (i) 1. amplitude  
  B1

  2. D  
  B1

(ii) any named example of electromagnetic wave OR seismic ‘S’ wave  
  B1

(iii) speed = distance÷time OR 7.5 × 4.0 OR speed × time  
  C1
  30 (cm)  
  A1

(b) (i) at least one straight line in shallow water and at different angle,  
  accept refracted wrong way  
  B1
  line(s) show wave refraction away from normal  
  B1
  at least 3 lines drawn showing refracted wave of constant wavelength, different from  
  incident wavelength, and continuous with incident wavefronts  
  B1

(ii) refraction  
  B1

[Total: 9]
10 (i) 1. negative  
    2. electrons  

(ii) (both) strips have same (type of) charge  
    (and so) repel (each other)  

(iii) (idea of) shirt gaining/losing (electric) charge OR becomes charged 
    OR charge transferred between shirt and body  
    unlike charges attract  

[Total: 6]

11 (a) A: warm ticked  
    B: off ticked  
    C: hot ticked  

(b) \( V = I \times R \) in any form OR \( V \div I \)  
    \( (R = ) \ 10 \div 6.0 \)  
    1.7 OR 1.67 \( (\Omega) \)  
    accept 1.66 1.6 scores 2 marks  

(c) lamp  
    to indicate heater is on/working  

(d) any two from:  
    • fuse identified as the relevant component  
    • the fuse will melt/blow/break  
    • (this) breaks circuit/stops current  

[Total: 10]

12 (a) (i) proton  
    (ii) electron  

(b) nucleon number = 14  
    proton number = 7  

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(c) evidence of halving 20000

idea of three half lives

$3 \times 5800$ allow ecf for candidate’s no. of $\frac{1}{2}$ lives

17 400 (years)

[Total: 8]