

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

**0625 PHYSICS**

**0625/21**

Paper 21 (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 must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

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### Notes about Mark Scheme Symbols and 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.  
NOTE: In this paper, note the M marks in questions.
- 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. e.g. 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.
- 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".
- 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.
- underlining** indicates that this must be seen in the answer offered, or something very similar.
- un.pen.** means "unit penalty". An otherwise correct answer will have one mark deducted if the unit is wrong or missing. This **only** applies where specifically stated in the mark scheme. Elsewhere, incorrect or missing units are condoned.
- OR/or** indicates alternative answers, any one of which is satisfactory for scoring the marks.
- Spelling** Be generous about spelling and use of English. If an answer can be understood to mean what we want, give credit.
- Significant figures** Answers are acceptable to any number of significant figures  $\geq 2$ , except if specified otherwise, or if only 1 sig.fig. is appropriate.
- Units** Ignore units, except where a mark is specified for a particular unit.
- Fractions** These are only acceptable where specified.
- Extras** Ignore extras in answers if they are irrelevant; if they contradict an otherwise correct response or are forbidden by mark scheme, use right + wrong = 0

Work which has been crossed out, but not replaced, should be marked as if it had not been crossed out.

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|   |                                                                                                     |                                                                               |                  |
|---|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------------------|
| 1 | (a) distance                                                                                        | tape measure, trundle wheel, metre wheel<br>OR laser measure NOT (metre) rule | B1, B1           |
|   | time                                                                                                | <u>stopwatch</u> /clock IGNORE just watch/clock<br>IGNORE just chronometer    | B1, B1           |
|   | (b) speed = distance/time<br>OR just distance/time                                                  | any arrangement, words or symbols<br>IGNORE magic triangles                   | B1               |
|   | (c) (i) idea of acceleration/deceleration<br>OR some distance at lower speed/lorry stops            |                                                                               | B1               |
|   | (ii) distance = speed × time in this form only, words, letters or numbers                           |                                                                               | C1               |
|   | 66 × 20 OR 66 × $\frac{1}{3}$ OR 66 × 20/60                                                         |                                                                               | C1               |
|   | 22 (km) c.a.o. condone 0.33 used to give appropriate answer                                         |                                                                               | <u>A1</u><br>[9] |
| 2 | (a) 62.8 – 29.8<br>33.0 (cm) OR 33 (cm)                                                             |                                                                               | C1<br>A1         |
|   | (b) (i) 5.5 = constant × 33 e.c.f.                                                                  |                                                                               | C1               |
|   | 0.166 recurring e.c.f. ignore units<br>accept 1/6 or 0.16 or 0.166 or 0.167 or 0.17 or 0.2 NOT 0.20 |                                                                               | A1               |
|   | (ii) N/cm OR N/m OR n/cm OR n/m seen in (ii)<br>nothing else – mark independently of (i)            |                                                                               | <u>B1</u><br>[5] |
| 3 | (a) I = U + W accept words or mixture of words/symbols                                              |                                                                               | B1               |
|   | (b) (i) 850 (N)                                                                                     |                                                                               | B1               |
|   | (ii) force needed to accelerate load/get it started<br>OR if forces equal, then no movement         |                                                                               | B1               |
|   | (iii) height OR distance (use ✓ + × = 0 for extras)                                                 |                                                                               | B1               |
|   | (iv) time (use ✓ + × = 0 for extras)                                                                |                                                                               | B1               |
|   | (c) greater than OR > OR stronger accept “double” etc                                               |                                                                               | <u>B1</u><br>[6] |

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- 4 (a) (i) 1 nothing OR no change B1  
2 quieter/softer OR loudness less/decreases B1
- (ii) frequency control: none OR no adjustment no e.c.f. B1  
amplitude control: increase (amplitude) no e.c.f.  
allow turn clockwise/to right B1
- (b) (i) echo OR reflection (of sound) OR bounced (back) B1
- (ii) idea of sound taking a finite time to travel  
OR idea of sound doesn't travel infinitely fast  
IGNORE sound has to travel to rock face and back B1  
[6]
- 5 (a) X marked anywhere, above or below, on vertical anywhere through rod B1
- (b) Y marked anywhere to right of X, but not beyond R.H. tip of parrot B1
- (c) idea of topples/falls/loses balance C1  
topples clockwise/to the right/to the front/forwards A1  
[4]
- 6 (a) (i) radiation } any 2 B1, B1  
evaporation }  
convection }
- (ii) cardboard/it is a poor conductor/(good) insulator } any 2 B1, B1  
air is trapped OR air is a poor conductor/(good) insulator }  
reduced surface in contact with fingers }
- (b) (i) heat/energy to raise/lower/change temperature of a body  
OR heat/energy to heat up a body B1  
by 1 °C OR by 1K OR unit temp B1
- (ii) low thermal capacity M1  
less heat needed to raise temperature OR absorbs less heat A1  
[8]

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- 7 (a) (i) idea of heat concentrated in a small space  
OR lots of wire in small space  
OR to get required resistance in a small place B1
- (ii) radiation B1
- (b) (i) **mark 1 and 2 together**  
240 and 100 in correct order B1  
V and W in correct order B1
- (ii)  $I = V/R$  OR  $I = W/V$  in any form, symbols or numbers C1  
240/576 OR 100/240 C1  
0.416 recurring,  
accept 0.4 or 0.416 or 0.417 or 0.41 or 0.42 NOT 0.40 C1  
A OR a OR amp(s) OR ampere(s) A1  
[8]
- 8 (a) 10 (cm) B1
- (b) gets smaller NOT gets lower B1  
gets closer to lens/moves to left/moves closer to  $F_1$  B1
- (c) (i) principal focus/foci OR focal/focus point(s)  
NOT focal length NOT focus B1
- (d) (ii) (ignore any arrows)
- ray drawn from top of object, through  $F_2$ , to lens  
**must** pass through the stroke indicating  $F_2$  B1  
single refraction clearly at centre line  
OR two appropriate refractions at surfaces B1  
travels parallel to axis after lens, by eye **must** be drawn with ruler B1  
reaches top of image B1  
[8]
- 9 (a) (i) water conducts/water lowers resistance B1  
could get a shock (however expressed) B1
- (ii) idea of cord insulating you from electricity OR cord not a conductor  
OR idea of separates you from the electrics/live parts B1
- (b) 10A ticked B1
- (c) (i) large(r) current NOT more electricity B1
- (ii) it/insulation/cable would overheat/melt OR cause fire  
NOT blow up/damaged NOT fuse blows B1  
[6]

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- 10 (a)  $V_1/V_2$  or  $N_1/N_2$  or  $V_1/N_1$  or  $V_2/N_2$  in any form  
substitution correct **and seen**  
25 turns } Allow full credit for use  
of 25 turns to give 12V,  
with working seen
- Y and Z (either order)
- (b) 240 (V)
- (c) core  
iron NOT steel
- (d) good conductor OR low resistance OR to reduce heating  
OR for high efficiency IGNORE good/bad conductor of heat
- 11 (a) refraction OR slows down OR changes speed/wavelength OR bends  
NOT reflection or refraction  
dispersion OR divides/splits into colours/wavelengths/frequencies
- (b) (i) red  
(ii) violet NOT blue NOT purple } If red and violet interchanged,  
allow B1 only
- (c) (i) X at or above top of visible spectrum  
middle of X clearly above top of visible spectrum but no more than  
twice height of the letter A from top of visible spectrum, by eye
- (ii) infra-red OR IR OR ir OR heat/thermal (radiation)
- 12 (a) (i) beta, gamma –1 e.e.o.o.
- (ii) idea that radiation (from watch) can enter the body
- (b) (i) bottom left box ticked –1 e.e.o.o.
- (ii) locked cupboard OR lock (it)  
OR storage in lead/suitable containers  
IGNORE protective clothing/tongs etc