CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0625 PHYSICS

0625/32 Paper 3 (Extended 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.

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NOTES ABOUT MARK SCHEME SYMBOLS AND OTHER MATTERS

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

M marks — 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 — C marks are compensatory marks in general applicable to numerical questions. These can be scored even if the point 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 substitution or working which shows he knew the equation, then the C mark is scored. A C mark is not awarded if a candidate makes two points which contradict each other. Points which are wrong but irrelevant are ignored.

A marks — 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. A marks are commonly awarded for final answers to numerical questions. If a final numerical answer, eligible for A marks, is correct, with the correct unit and an acceptable number of significant figures, all the marks for that question are normally awarded. It is very occasionally possible to arrive at a correct answer by an entirely wrong approach. In these rare circumstances, do not award the A marks, but award C marks on their merits. An A mark following an M mark is a dependent mark.

Brackets ( ) — 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.

<u>Underlining</u> — Underlining indicates that this **must** be seen in the answer offered, or something very similar.

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

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

o.w.t.t.e. — This means "or words to that effect".

Ignore — This indicates that something which is not correct or irrelevant is to be disregarded and does not cause a right plus wrong penalty.

Spelling — Be generous about spelling and use of English. If an answer can be understood to mean what we want, give credit. However, do not allow ambiguities, e.g. spelling which suggests confusion between reflection / refraction / diffraction or thermistor / transistor / transformer.

Not / NOT — This 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.

ecf meaning "error carried forward" is mainly applicable to numerical questions, but may in particular circumstances be applied in non-numerical questions. This indicates that if a candidate has made an earlier mistake and has carried an incorrect value forward to subsequent stages of working, marks indicated by ecf may be awarded, provided the subsequent working is correct, bearing in mind the earlier mistake. This prevents a candidate from being penalised more than once for a particular mistake, but **only** applies to marks annotated ecf.

Sig. figs. Answers are normally acceptable to any number of significant figures ≥ 2. Any exceptions to this general rule will be specified in the mark scheme. Rounding errors in the second or third significant figure will be penalised.

Arithmetic errors

Deduct one mark if the **only** error in arriving at a final answer is clearly an arithmetic one. Regard a power-of-ten error as an arithmetic error.

Transcription errors

Deduct one mark if the only error in arriving at a final answer is because previously calculated data has clearly been misread but used correctly.

Fractions Allow fractions only where specified in the mark scheme.

Units Deduct one mark for an incorrect or missing unit, but only if the answer would otherwise have gained all the marks available for that answer. Maximum one unit penalty per question.

1 **(a)** no resultant/net force (acting) B1

no resultant/net moment (acting)
OR clockwise moment = anticlockwise moment B1

(b) **(i)** $W = P + Q$ in any form
OR (total) upward force = (total) downward force B1

$P = W - Q$ so P must be less than W
OR P is not the only upward force B1

(ii) $P \times$ its distance (from C)$= W \times$ its distance (from C)
OR P and W have equal moments (about C)
OR clockwise moment = anticlockwise moment B1

P is farther from C/pivot (than W so P must be less than W) B1

(c) clockwise moment = 75×0.24 C1
anticlockwise moment = $F \times 0.75$ C1
(moments equated gives F =) 24 N A1

[Total: 9]

2 **(a)** **(i)** less (1st box ticked) B1

(ii) any mention of mass/inertia B1
well-reasoned explanation involving less mass B1
special case B2: more weight/heavier **AND** more friction

(b) (resultant force =) 4000 N C1
(M = 50 000/10 =) 5000 kg C1
(a = 4000/5000 =) 0.80 m / s^2 e.c.f previous lines, accept 1 sig. fig. A1

[Total: 6]

3 **(a)** **(i)** 10 m / s^2 ignore sign B1

(ii) (same as) acceleration (of rocket at B) **OR** gravitational acceleration B1

(b) same area B1
area represents distance travelled B1

distance up = distance down
OR overall displacement = 0
OR area above = distance up **AND** area below = distance below B1

(c) any three from:
- all of graph below *x*-axis after B
- final section horizontal and above CD **AND** gradient always ⩽ 0
- continuous graph from B until time > at DE
- new area not clearly different from old B3

[Total: 8]

4 (a) (i) KE = ½mv^2 in any form **OR** ½mv^2 C1
(KE = 24.5 × 6.7 =) 164 J **OR** 160 J A1

(ii) efficiency = output (power) ÷ input (power)
OR useful power ÷ input (power) C1

0.08 × candidate's **(a)(i)** correctly evaluated A1

(b) use of $\rho = m \div V$ in any form **OR** $m \div V$ C1
(ρ = 6.72÷5.6 =) 1.2 kg / m^3 A1

(c) rotation/movement of wire/coil **OR** rotation/movement of magnet B1

consistent with above mark: in magnetic field / between magnetic poles / cutting magnetic field **OR** in coil / near wire B1

[Total: 8]

5 (a) diagram shows (molecules) randomly positioned M1
diagram shows most (molecules) touching/very closely spaced A1

(b) (i) (temperature) decreases B1

(ii) more energetic/faster molecules escape from surface/overcome forces of attraction B1

(iii) $E = ml$ in any form **OR** ml C1
2900 J A1

(iv) any two from:
- cover/decrease surface area
- reduce temperature
- reduce draught owtte
- increase humidity of air B2

[Total: 8]

6 (a) (i) 1. range M1

2. correct link between stem length and range/top temperature/expansion A1

(ii) 1. sensitivity M1

2. correct link between capilliary diameter and sensitivity/movement of thread A1

(b) (i) (coloured) alcohol (note: no mark for this point, but must be present for subsequent marks to be awarded) M0

(ii) any two from:
- water will freeze / alcohol doesn't freeze
- coloured alcohol (clearly) visible
- alcohol has even expansion / water has uneven expansion
- alcohol expands more / water expands less
- alcohol has lower SHC/thermal capacity
- alcohol does not stick to glass B2

[Total: 6]

7 (a) longitudinal (2nd box) B1
frequency 100 – 10 000 Hz (6th box) B1
(note: –1 for e.e.o.o)

(b) (i) reflection B1

(ii) any two from:
- new wave(fronts/lets) generated
- same speed **OR** frequency
- angle of incidence = angle of reflection **OR** wavefronts make same angle (with boundary) B2

(iii) no change B1

(iv) v/λ **OR** $v = f\lambda$ in any form C1
(f = 3.0/0.07 =) 43 Hz A1

[Total: 8]

8 (a) one mark for each correct entry in table: B3

resistor	resistance	current	potential difference	power
			IR	
		I		$2I^2R$

(b) (i) ($P = IV = 750 \times 11000 =$) 8.3×10^6 W (8300 kW) B1

(ii) ($V = IR = 750 \times 1.5 =$) 1100 V B1

(iii) (voltage to factory = 11 000 – 1125 =) 9875 V C1
(power supplied to factory =) 9875×750 A1
7.4×10^6 W **OR** 7400 kW A1
OR
power loss in cables = I^2R **OR** $750^2 \times 1.5$ (C1)
(=) 8.44×10^5 (W) (A1)
(power to factory = $8.25 \times 10^6 - 8.44 \times 10^5 =$) 7.4×10^6 W **OR** 7400 kW (A1)

[Total: 8]

9 (a) changing (magnetic) flux B1
induces e.m.f. in secondary IGNORE induces current B1

no change of flux with constant supply voltage / d.c. B1

(b) (i) $I_1V_1 = I_2V_2$ in any form **OR** I_2V_2/V_1 C1
($I_2 = 1.2 \times 12/120 =$) 0.12 A A1

(ii) transformer 100% efficient **OR** has no (heat/energy) losses **OR** output power = input power B1

[Total: 6]

10 (a) (i) 1. electron B1

2. sensible mention of decay (of source) **NOT** decay of something inappropriate B1
half-life mentioned sensibly **OR** activity decreases **OR** fewer (radioactive/unstable) atoms / nuclei present B1

(ii) α-particles range < 10 cm **OR** short owtte B1

α more ionising (than β) **OR** have more mass / charge / size / collisions **OR** shorter range than β **OR** reading is background radiation B1

(b) no part of electron path from R to L (note: no mark for this point, but must be present for subsequent marks to be awarded) M0

curve starts at end of plates **AND**
curve up and only up **OR** down and only down **OR** 3 or more curves, all up or all down B1

deflection down **AND** only down B1

[Total: 7]

11 (a) internal reflection **AND** $i = r$ for 1st reflection
NOT any ray emerges from sides M1

ray reaches end of tube after 1 or 2 reflections only A1

(b) $\sin^{-1}1/n$ **OR** Snell's Law in any form C1
($c = \sin^{-1}1/1.52 =$) 41° B1

(c) (i) total internal reflection B1

(ii) angle of incidence > c
OR light must reach end of fibre with small losses o.w.t.t.e. B1

[Total: 6]