CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 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.

Cambridge is publishing the mark schemes for the May/June 2014 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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NOTES ABOUT MARK SCHEME SYMBOLS & OTHER MATTERS

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 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 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 ( ) 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.

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

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

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

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 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.

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

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

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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 being penalised more than once for a particular mistake, but **only** applies to marks annotated ecf.

Significant figures

Answers are normally acceptable to any number of significant figures ≥ 2. Any exceptions to this general rule will be specified in the mark scheme.

Units Deduct one mark for each incorrect or missing unit from an answer that would otherwise gain all the marks available for that answer: maximum 1 per question. No deduction is incurred if the unit is missing from the final answer but is shown correctly in the working.

Fractions Allow these only where specified in the mark scheme.

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1 **(a)** **(i)** decreases / <u>average</u> speed 2 m / s B1

(ii) constant / speed 0.8 m / s B1

(b) **(i)** negative B1

(ii) zero B1

(c) uses $v = d / t$ in any form or d / t C1

(av. vel = 50 / 40 =) 1.3 m / s or 1.25 m / s A1

[Total: 6]

2 **(a)** metre rule, tape measure, (surveyor's) laser measurer, trundle wheel
tape is too vague, accept rule(r) B1

(b) $M = \rho V$ in any form or ρV in words, symbols or numbers C1

(mass = 1.2×76.4 =) 92 kg A1

(c) mass (of air) in room decreases B1

(because) air expands / vol of air increases / density of air decreases / appropriate use of $pV = nRT$ OR pressure argument e.g. pressure would have increased (with constant volume) if mass constant B1

any ONE from: B1
some air leaves room
molecules collide harder or more (often)
molecules move faster / have more energy
molecules move further apart NOT molecules expand

[Total: 6]

3 **(a)** **(i)** $\frac{1}{2}mv^2$ in words, symbols or numbers C1

($v = \sqrt{(2 \times \frac{1}{2} \times 16.2)}$ =) 4.0 m / s accept 4 A1

(ii) mgh or KE / mg or $v = \sqrt{(2gh)}$ or $v^2 = u^2 + 2as$ words, symbols or numbers C1

correct substitution e.g. $h = 16.2 / 2 \times 10$ C1

0.81 m allow e.c.f. from **3(a)(i)** A1

(iii) heating of <u>water</u> o.w.t.t.e. B2
compensation mark: award B1 for one of heat, internal energy, sound, KE of water
ignore intermediate states throughout **3(a)(iii)** e.g. KE / PE of splashed water

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(b) same height M1

m affects both KE and GPE (in same way) / $v^2 = u^2 + 2as$ applies in both cases
ignore "height doesn't depend on mass" A1
special case : M1 for logical argument about not all KE becoming GPE
A1 for consequent statement about height gained

[Total: 9]

4 (a) (thermal) energy / heat to heat unit mass / 1 kg / 1 g B1

by unit temperature / 1 °C / 1 K B1

(b) (i) SHC= $Q/(m\Delta T)$ in any form or $Q/(m\Delta T)$ words, symbols or numbers C1

(SHC = 8700 / 800 × 12=) 0.91 J / (g °C) or 910 J / (kg °C) A1

(ii) th. cap. = $Q/\Delta T$ in any form or $Q/\Delta T$ or $m \times$ SHC words, symbols or numbers C1

(th. cap. = 8700 / 12 or 0.906 × 800 or 906 × 0.8 =) 730 J / °C or 725 J / °C A1

(c) lag (cylinder) / wait after heating until temperature stable / at max. value M1

prevents / reduces heat losses or heat (energy) takes time to flow throughout block A1
throughout **4(c)**, reward correct alternative physics which answers the question
e.g. use greater power to reduce expt time and hence energy lost
ignore: repeats or use thermometer with low thermal capacity

[Total: 8]

5 (a) (i) reduces (rate of evaporation) NOT zero (rate of evaporation) M1

no / fewer evaporated molecules removed by wind
OR greater humidity / vapour pressure
NOT fewer molecules in liquid / puddle blown away A1

(ii) increases (rate of evaporation) M1

molecules move faster / have more energy OR more molecules have energy to escape A1

(b) greater (rate of evaporation) OR rate is less in <u>small</u> puddle
ignore rate of disappearance of puddle B1

surface areas correctly compared B1

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(c) description of viable experiment NOT absorption expt M1

statement of measurements to be made A1

good detail e.g. thermometers in comparable positions OR pyrometer same position relative to different surfaces A1

[Total: 9]

6 **(a)** reflected ray in correct quadrant B1

34° ⩽ angle from surface ⩽ 42° B1
ignore refracted ray for both marks

(b) angle of incidence: any mark in v box only B1

angle of refraction: any mark in y box only B1

(c) sin *i* / sin *r* = *n* or sin *i* / sin *r* = 1 / *n* in any form C1

sin *r* = 1.33 sin 30 or (sin 30) / 1.33 or 0.665 or 0.376 C1

(r =)42° A1

(d) refracted down compared to incident ray ignore emerging ray M1

between dashed line and 25° above it ignore emerging ray A1

[Total: 9]

7 **(a)** 3rd box only indicated, reverses direction B1

(b) **(i)** straight line up / down page B1

arrow pointing down page B1

(ii) to the right or left e.c.f. **(b)(i)** B1

to the right e.c.f. **(b)(i)** B1

(c) *F*=*ma* in any form or *F* / *m* symbols, words or numbers
OR final answer 6×10^{-4} m / s^2 C1

(a = 0.21 / 0.35 =) 0.6 m / s^2 A1

[Total: 7]

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8 **(a)** 4.5 V ignore sign B1

(b) $1/R_p = 1/R_1 + 1/R_2$
OR (R_p =) $R_1R_2/(R_1 + R_2)$ words, symbols or numbers C1

R = (1/(1/1 + 1/5)) = 0.83 Ω A1

(c) $V = IR$ in any form OR V/R words, symbols or numbers C1

use of total e.m.f. as V AND series resistance as R
OR 4/5 of total emf seen OR 1/6 of total current seen C1

(I = 4.5/5 =) 0.90 A accept 0.9 e.c.f. from **(a)** A1

(d) 1.5 V ignore sign B1

[Total: 7]

9 **(a)** more negatives in top half than bottom half M1

roughly same no of positives as negatives A1

(b) clearly more negatives than positives, anywhere in/on block B1

(c) wire removed first M1

charges kept in block OR so no charge can flow to or from block
NOT any mention of positive charges moving
accept reverse argument A1

(d) (charging by) induction NOT e.m. induction OR earthing B1

[Total: 6]

10 **(a)** row 1 0 0 accept low/off B1

row 2 0 1 accept low/off and high/on B1

row 3 1 1 accept high/on B1

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(b) 2 wires to flat (input) side, 1 wire from curved (output) side
do not accept pointed curved side or small circle B1

(c) NOT gate connected to output of AND gate
accept labelled boxes for gates
do not allow any extra gates or inputs M1

NOT gate correct way round
A1

[Total: 6]

11 (a) γ not deflected NOT extra(s) in γ column B1

α towards –ve or +ve AND β opposite NOT extra(s) in α or β column B1

α towards –ve AND β towards +ve NOT extra(s) in α or β column B1

(b) atoms / molecules (condone particles) lose / gain electrons OR become charged
NOT α or β particles lose / gain electrons OR become charged B1

(c) maximum three points (to include at least one explanation) from:
maximum two points from:
- α is charged / is a helium <u>ion</u> (is scored if 3rd explanation bullet point scored)
- γ is not charged
- α has mass
- γ does not have mass
- α has large size
- γ has negligible / no size
- γ is electromagnetic (wave) / photon
- α travels more slowly (than γ, but NOT more slowly than speed of light unless next bullet point is also scored)
- γ travels at the speed of light / faster (than α)

any explanation (maximum three) e.g.:
- α makes frequent collisions (with air molecules) so range short
- γ has few (successful) collisions (with electrons) so not very ionising / range long
- α more ionising because it has <u>greater</u> charge
- γ has no charge so less ionising
- α loses some energy with each collision so range short
- γ loses energy in single rare collision so takes longer distance before losing all energy
- γ faster so travels further before energy is lost
- different methods of ionisation make α more ionising

B3

[Total: 7]

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