

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE O Level

MARK SCHEME for the May/June 2006 question paper

5054 PHYSICS

5054/02

Paper 2

maximum raw mark 75

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

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Section A

- 1 (a) (i) mass or weight B1
time (to run up steps) **or** speed B1
height **or** number of steps and height of each B1
- (ii) mass – ensure balance reads zero without person
time – have two timers (or repeat) **or** use stopclock to better than 0.1 s
height – use callipers for step height **or** ensure rule vertical **or** tape taut
ANY 1 sensible comment B1
- (b) work = force x distance **or** power = work/time **or** K.E. = $\frac{1}{2} mv^2$ C1
mass x g x height/time **or** weight x height /time A1 [6]
(accept distance for height for both marks only if clear in (a)(ii))
- 2 any position before 50 m B1
- (b) points plotted correctly at 4,8 and 12 s ($\pm \frac{1}{2}$ square) B1
from origin to 4 sec **curve** drawn B1
from 4 to 12 sec straight line positive gradient B1
from 12 to 16 sec gradient decreases (but not -ve) B1
- (c) speed/time C1
3 m/s A1 [7]
- 3 (a) any mention of magnetic field C1
coil cuts lines of (magnetic) flux/field lines A1
- (b) pass current / connect coil to output / prevent wires tangling B1
- (c) (induced) voltage **or** current opposes the change (producing it) B1
- (d) large(r) coil, strong(er) magnet, iron inside coil, more turns (on coil) B1 [5]
- 4 (a) 46 ($^{\circ}$) B1
- (b) angle of incidence B1
when refracted ray is along surface
or minimum angle of incidence for Total Internal Reflection B1
- (c) $\sin i/\sin r$ **or** $1/\sin C$ B1
 $\sin 63/\sin 40$ **or** $1/\sin 46$ C1
1.39 (accept 1.3860 –1.3902) A1
- (d) correct reflected ray by eye B1 [7]
- 5 (a) (electrons) move onto negative/right sphere **and** off positive/left sphere B1
- (b) 3 or more (approx. correct none wrong) lines from one sphere to the other C1
arrow on at least 3 lines from + to – sphere A1
- (c) $Q = It$ in any format algebraic or numerical C1
 9×10^{-11} A A1 [5]

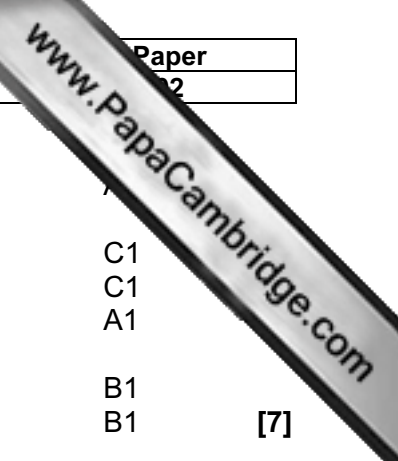
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- 6 (a) (i) high voltage/where voltage (**not** current) arrives/dangerous (wire) B1
(ii) zero voltage/safe wire B1
(iii) zero voltage / connected to ground B1
(b) (i) (wire) heats up/current increases/electrons move faster C1
(ii) (wire) melts/causes fire (**not** blows/melts fuse) A1
(c) avoids electrocution/current through person/water is a conductor B1 [6]
- 7 (a) Y input and ground connected across resistor B1
(b) 3 squares or 3 x 2 C1
6V A1
(c) line drawn at 1.5 squares B1 [4]
- 8 (a) emission of at least one of alpha, beta, gamma (particles) M1
from the nucleus **or** at random A1
(b) (i) background stated or explained B1
(ii) not radioactive B1
average the same **or** 93 total on both sides
or two increase and one decreases **or** variation explained B1 [5]

Section B

- 9 (a) **change 1** increases evaporation B1
water molecules have more K.E./move faster/more have enough energy B1
change 2 decreases evaporation B1
less surface for molecules to escape (through) B1
change 3 increases evaporation B1
liquid molecules leaving surface removed by collisions with air molecules B1
change 4 decreases evaporation B1
heat/light/infra-red reflected by white surface **or** tank cooler B1 [8]
- (b) (i) 0.015 m^3 B1
(ii) $M = D \cdot V$ in any form C1
15 kg (ecf (i)) A1
(iii) $m \cdot L$ C1
 $3.3 \times 10^7 \text{ J}$ (ecf (ii)) A1
(iv) energy/time in any form C1
825 J/s **or** W (ecf (iii)) A1 [7] (15)



<p>10 (a) (i) Force/area (force of) 1N acting on (area of) 1m²</p> <p>(ii) 600 (N) seen force/area in any form e.g. 600/2.4 x 10⁻³ 2.5x 10⁵ Pa</p> <p>(iii) increases less surface area (in contact with ground)</p> <p>(b) (i) PV = constant in any form 1.9 x 10⁵ . 0.016 = 2.1 x 10⁵ . V 0.014(476) m³ temperature or amount of gas constant</p> <p>(ii) (pressure) increases speed/K.E. of molecules increases (molecules) hit walls harder or with more force hit more often /more frequently</p> <p>11 (a) fuse limits the current (not controls current) switch turns current/bulbs/circuit on and off</p> <p>(b) (i) I = P/V or 60/240 0.25 (A)</p> <p>(ii) 0.42-(i) 0.17 (A)</p> <p>(iii) R = V/I or 240/(i) 960 (Ω) units correct in (i), (ii) and (iii)</p> <p>(c) (i) supply and two lamps in series</p> <p>(ii) smaller than higher resistance in series or lamps have less than 240V across them</p> <p>(d) 2 x (iii) or twice as large or 1920 Ω</p>	<p>C1 C1 A1</p> <p>B1 B1</p> <p>C1 C1 A1 B1</p> <p>B1 B1 B1 B1</p> <p>B1 B1 B1 B1</p> <p>B1 B1 B1 B1</p> <p>C1 A1</p> <p>C1 A1</p> <p>C1 A1 B1</p> <p>B1</p> <p>B1 B1</p> <p>B1</p>	<p>[7]</p> <p>[8] (15)</p> <p>[4]</p> <p>[7]</p> <p>[4] (15)</p>
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Mark Scheme Code

- B1 Independent mark
- C1 Compensation mark; given automatically if the answer is correct, i.e. the working need not be seen if the answer is correct; also given if the answer is wrong but the point is seen in the working.
- M1 Method mark: if not given subsequent A marks fall (up to next B, M or C mark).
- A1 Answer mark.
- c.a.o. correct answer only (including unit)
- e.e.o.o. each error or omission
- e.c.f. error carried forward; it usually is even where not specifically indicated, i.e. subsequent working including a previous error is credited, if otherwise correct.