UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2006 question paper

5054 PHYSICS

5054/02 Paper 2 (Theory), 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 instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began.

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.

The grade thresholds for various grades are published in the report on the examination for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses.

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

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Max. 1 unit penalty per question, no excess sig. fig. penalty unless stated.

Section A

1	**(a)**	**(i)**	12 m/s	B1
		(ii)	16 s	B1
		(iii)	192 m **or** (i) × (ii)	B1
	(b)		a = (v-u)/t in any format e.g. numerical (allow 4 clearly attributable wrong numbers) **or** gradient of v-t/the graph	C1
			2.7 (2/3 sig. fig. only, do not accept fraction, **cao**)	A1
			m/s^2	B1 6
2	**(a)**		9.8 **or** 10 **or** 9.83 to 9.79. (m/s^2), ignore wrong unit	B1
	(b)	**(i)**	air resistance balances/equals/is same as weight (accept gravity) no resultant force **or** upwards force = downwards force	
		(ii)	weight larger than air resistance (accept gravity) resultant force (down**) or** downwards force greater **or** upwards force less ANY 3	B3
	(c)		coin and/or paper fall faster **or** hit base sooner coin and/or paper accelerate at g coin falls with paper **or** at same rate **or** same av. speed **or** same acceleration **or** hit bottom together **or** at same time (NOT fall at same speed/same time) ANY 2 lines	B2 6
3	**(a)**		time **or** observe when wax melts/falls **or** states first to melt/fall	B1
			first to do so **or** less wax left (after given time) (transfers heat best)	B1
	(b)		black **or** black cools quickly	**M**1
			better emitter (of heat) A1 **OR** better radiator/black radiates white doesn't	A1
			radiation/infra-red A1 of heat/infra-red	A1 5
			Accept in terms of white teapot (NOT better emitter and absorber/conductor)	
4	**(a)**	**(i)**	reflected ray correct by eye **and** normal	B1
		(ii)	40 °	B1
			40 ° **or** same as angle of incidence	B1
	(b)		**diagram** with object, mirror, image in approx. correct position	B1
			at least 1 ray drawn from object/ray-box correctly reflecting from mirror	B1
			at least 2 rays extrapolated back to image position	B1
	OR(b)		**diagram** with object, mirror, image in approx. correct position **OR**	B1
			Use of search pin behind mirror shown/stated	B1
			no parallax used to locate image **or** described (ignore arrows/do not insist on dotted lines)	B1 6
5	**(a)**		each horizontal towards S – allow gentle curve only on upper compass	B2
	(b)		N-S N-S B1 **OR** S-N S-N	B2
	(c)		**diagram** showing nail/coil **or** hammer/nail **or** appropriate heater/nail **or** nail/floor	B1
			a.c supply **and** remove/turndown slowly **or** repeatedly hammer **or** heat red-hot **or** drop repeatedly (second mark consistent with first)	B1 6

6 (a) P.E. (of water) to K.E. (of wheel or water**)/**K.E. (of wheel) to electrical energy/
KE **of water** to KE **of wheel** /PE to electrical energy
ANY 2 (-1 each clearly wrong answer beyond 2) B

(b) 1200/2000 **or** energy output/ energy input **or** power output/power input (NOT output/input) C1
0.60 **or** 60% (NOT fractions; 0.6 YES) A1

(c) friction in wheel or generator (bearings/axle) **or** water out has K.E. **or** produces heat in windings/in resistance **or** heat (in bearings) due to friction (ignore sound) ANY 2 (-1 each clearly wrong answer beyond 2) B2 6

7 (a) electromagnetic/em induction **or** induced current/e.m.f.
(NOT magnetic/electric induction) B1

(b) deflects to left/opposite deflection B1

(c) nothing **or** no deflection/current/e.m.f. **or** needle stationary B1
no lines of flux are cut **or** no change in magnetic field B1 4

8 (a) 0 (V) B1

(b) (i) 8 Ω (i.e. accept 1 sig.fig.) B1

(ii) R = V/I any algebraic form in (ii) or (iii) B1
2 A (i.e. accept 1 sig.fig.) ecf (i) B1

(iii) 16/8 in (ii) **or** (ii) × 6 C1
12 V ecf (ii) A1 6

Section B

9 (a)

set wood swinging/let metal pivot **or** fall **OR**		balance on sort of edge
allow to come to rest		clearly a sharp edge
use of plumb line **from hole**		mark line of edge
mark line along plumb line (on metal)		repeat in new position
hang from another hole		intersection is centre of mass
line intersection is centre of mass		repeat for 3rd position
hang from 3rd hole		
	OR	balance on point
		sharp (compass) point
		move till balanced
ANY 6 consistent lines max.		point is centre of mass B6

(b) (i) force × distance **M**1
perpendicular (accept symbol) distance **or** shortest distance to line of action of force A1

(ii) correct perpendicular distance (2.9 – 3.1 cm) B1
worked out value of: 0.1 × distance reading B1
Ncm (or Nm if conversion of distance to m clear) B1

(c) (i) moment **or** turning effect of weight C1
anticlockwise and clockwise moment **or** weight to right **and** left of corner A1

(ii) moments balance/cancel **or** weight inside base B1

(iii) thicker more stable/thinner less stable B1 15

10 (a)		yellow/green to earth blue to neutral **and** brown to live tighten terminal screws cable (outer cover) under grip no bare metal on wires earth wire longest put cover back on ANY 4 (-1 each clearly wrong answer beyond 4)		B4
(b)	**(i)**	earth		B1
	(ii)	plastic/lamp/cover/base made from insulator/does not conduct electricity		B1
		doubly insulated **or** plastic/lamp/cover/base cannot be live **or** cannot electrocute/shock		B1
	(iii)	100 J (100 J/s first mark only)		B1
		(electrical)(energy) used/transformed/converted/delivered/arrives **per second**		B1
	(iv)	P = VI (in any form numerical or algebraic)		C1
		0.43(48) (accept 1 sig.fig.)		A1
		Fuse: 0.5/1.0/2.0/3.0 A		B1
	(v)	VIt **or** Pt (in any form numerical or algebraic)		C1
		30 × 60 **or** 1800 (s) seen		C1
		180 000 J (3000 J 2/3; 0.05 kWh 3/3)		A1 15
11 (a)	**(i)**	d = speed × time in any format		C1
		600/300 000 **or** 600 000/300 000 000		C1
		0.002 s		A1
	(ii)	**similarities:** same speed (in vacuum) travel in a vacuum travel in straight lines refract/reflect/diffract/interfere carry energy transverse/polarisable ANY 2 (-1 each clearly wrong answer beyond 2) (NOT both obey c = fλ/waves/invisible/undeflected by magnetic/electric field)		B2
		differences: wavelength frequency microwave received by aerials ANY 1 line (wavelength of IR different YES; wavelength of IR longer NO)		B1
(b)	**(i)**	gravity		B1
	b	potential energy to kinetic energy		B1
		kinetic energy to heat/thermal energy		B1
		OR potential energy to heat/thermal energy	**OR**	B2
		-1 each clearly wrong answer beyond 2		
	(iii)	nuclei repel **or** nuclei are positive		B1
		nuclei need high speed/ K.E. (so high temperature)		B1
	(iv)	1 proton **or** proton number = 1		B1
		2 neutrons **or** neutron number = 2 (electron(s) **max 1**)		B1
	(v)	He **or** helium		B1
	(vi)	energy/heat produced **or** raises temperature **or** becomes hot **or** causes star to expand **or** counters gravitational collapse **or** loses mass		B1 15