UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2008 question paper

5054 PHYSICS

5054/02 Paper 2 (Theory), maximum raw mark 75

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.

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.

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Do not accept fractions. No penalty for ⩾ 2 s. f. unless stated or for 1 s. f. where exact
Only one unit and only one fraction penalty per question.

Section A

1	**(a)**	diagram of two forces **and** resultant	B1	
		W / 6(N) **and** *T* / 8(N) marked on perp. forces **or** scale given	B1	
		10(.0 ±0.2) N	B1	
		35–39° from *T*/Y/horizontal or 51–55° from *W*/vertical **and** correct resultant	B1	
	(b)	10(.0) N **or** e.c.f.	B1	[5]
2	**(a)**	0.5(0) m	B1	
	(b)	rotates/tilts/unbalanced/one side down/one side up	C1	
		rotates anticlockwise/down on left **or** head down **or** foot up	A1	
		(net) anticlockwise moment **or** moment on left > moment on right **or** weight/CM on left of pivot	B1	[4]
3	**(a)**	*mgh* **or** *F* × *d* **or** 10 × 700	C1	
		(–)7000 J	A1	
	(b)	*Q/E/H* = *mc*Δ*T* **or** (Δ*T* =) 7000/(1) × 4200	C1	
		1.7 **or** 1.67 **or** 5.5	C1	
		8.9 °C e.c.f. **(a)**	A1	[5]
4	**(a)** **(i)**	(*a* = Δ)*v*/*t* **or** 84/35	C1	
		2.4 m/s²	A1	
	(ii)	speed **and** time axes correct **and** labelled	B1	
		straight line of positive gradient through origin	B1	
		84 (m/s) **and** 35 (s) marked	B1	
	(b) **(i)**	two arrows with forward force > backward force	B1	
	(ii)	air/wind resistance **or** friction **or** drag	B1	[7]

5 **(a)** Any **two** pairs – may be expressed in terms of the gas:

liquid **M1**	*molecules* **A1**	
dense(r)	close(r)/touching	
incompressible/volume fixed	close(r) **or** strong(er) forces	
fills bottom container	forces strong(er)	
expands less **when heated**	forces strong(er)	
more viscous/flows slower	forces strong(er)	
sound fast(er)	close(r) **or** strong(er) forces	
better **conductors** of heat	close(r)	M2
slower diffusion	close(r)	A2

(b) molecules **gain** speed/energy/heat **and** escape/leave cloth/break bonds **or** latent heat needed B1
fast(er)/high(er) (kinetic) energy molecules escape/evaporate B1
(average) speed / (kinetic) energy (of remainder) decreases **or** temperature related to (average) energy/speed of molecules B1 [7]

6 **(a)** red B1

(b) **(i)** equal to B1

(ii) less than B1

(c) two correct refractions on Fig. 6.2 M1
no dispersion **and** ray ends close to P A1 [5]

7 **(a)** 12(.0) V B1

(b) top row: 4.6 **and** 0 B1
bottom row: square 1 = square 2 + square 3 **or** 9.2 B1
bottom row: 4.6 in squares 2 **and** 3 **cao** B1

(c) (*E*=) *QV* **or** *VIt* **or** 200 × 12 C1
2400 J **accept** 2370–2410 J e.c.f. A1 [6]

8 **(a)** fusion B1

(b) **(i)** mass decreases **or** product/nuclei/atoms less massive B1
mass becomes/converted to energy B1

(ii) $E = mc^2$ B1
$6.6 \times 10^{-29} \times (3.0 \times 10^8)^2$ C1
5.9×10^{-12} **or** 5.94×10^{-12} J A1 [6]

Section B

9	**(a)**	**(i)**	Any **three** lines: vibration of **cone/loudspeaker** vibration of **air/particles** (molecules) **particles/molecules** pass on vibrations/energy (to neighbours) compressions **and** rarefactions **or** longitudinal wave/movement of particle (max 3)	 B1 B1 B1 B1	
		(ii)	loud – large amplitude/max displacement low-pitched – frequency/no. of waves per sec low frequency, small frequency, etc. (long wavelength 1/2)	B1 M1 A1	
		(iii)	(t =) d/s **or** 0.57/330 0.0017 s	C1 A1	
		(iv)	speed of sound greater in water/liquid **or** v.v. less time taken in water/liquid **or** heard sooner/faster	B1 B1	[10]
	(b)	**(i)**	$v = f\lambda$ **or** 200 seen (λ =) v/f **or** 330/200 **or** 330/0.2 **or** 1650 (m) 1.6/1.65/1.7 m	C1 C1 A1	
		(ii)	attempt at compressions and rarefactions/longitudinal wave correct wavelength marked	M1 A1	[5]

[Total: 15]

10	**(a)**	**(i)**	at least 2 concentric, complete circles increasing gap at least 1 anticlockwise arrow **and** none incorrect	 B1	
		(ii)	stronger **or** more lines **or** lines closer together **or** extends further	B1	[4]
	(b)	**(i)**	(R =) V/I **or** 6.0/8.0 0.75 Ω	C1 A1	
		(ii)	(Q =) It **or** 8.0 × 120 **or** 8.0 × 2 960 C (16 C scores 1/2)	C1 A1	[4]
	(c)	**(i)**	L→R **or** N→S	B1	
		(ii)	force (on wire) **or** wire bends/moves into page/perpendicular to field/away (from us)/LH rule quoted	M1 A1	
		(iii)	force reverses **or** out of page **or** bends the other way e.c.f.	B1	[4]
		(iv)	accept first two marks on unlabelled diagram (wire becomes) coil / armature /solenoid force/movement opposite on sides of coil **or** moment current reverses during rotation/due to commutator or split ring	 B1 B1 B1	[3]

[Total: 15]

11 (a) (P =) VI **or** 6.0 × 1.6
9.6 W A

(b) (i) filament/J releases electrons
or thermionic emission B1
attracted by +ve terminal/metal plate/K B1
electrons move/accelerate B1

(ii) otherwise **electrons** hit (air) molecules/particles/lose energy
or electrons deflected/don't hit screen/cause ionisation of air B1

(iii) electrons/charges/beam/ray deflected (by magnetic field) B1
few(er) electrons reach plate/K/+ve terminal/pass round circuit B1

(iv) current = 0 **or** no reading B1
electrons repelled by **or** not attracted to K
or K does not emit electrons B1 [8]

(c) (i) (dot/speck of light) moves so fast (that the eye sees it as a single line) **or**
timebase pulls it horizontally **or** voltage is constant/zero B1

(ii) (line/trace) displaced vertically M1
at uniform rate/speed **or** slowly A1
moves 3.0 divisions/3cm B1

(iii) screen not high enough **or** trace moves beyond edge of screen
or line moves 6cm / more than 4cm (vertically) **or** line can only move 4cm **or**
screen is only 4cm from middle to top B1 [5]

[Total: 15]

B1 Independent mark
C1 Compensation mark; given also if the answer is correct
M1 Method mark:
if not given, subsequent A marks are not awarded
A1 Answer mark.