

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 exactly correct. Only one unit and only one fraction penalty per question.

Section A

- 1 (a) diagram of two forces **and** resultant B1
 $W / 6(\text{N})$ **and** $T / 8(\text{N})$ marked on perp. forces **or** scale given B1
 $10(.0 \pm 0.2) \text{ N}$ B1
 $35\text{--}39^\circ$ from $T/Y/\text{horizontal}$ or $51\text{--}55^\circ$ from $W/\text{vertical}$ **and** correct resultant B1
- (b) $10(.0) \text{ N}$ **or** e.c.f. B1 [5]
- 2 (a) $0.5(0) \text{ m}$ 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** $F \times d$ **or** 10×700 C1
 $(-)7000 \text{ J}$ A1
- (b) $Q/E/H = mc\Delta T$ **or** $(\Delta T =) 7000/(1) \times 4200$ C1
 1.7 **or** 1.67 **or** 5.5 C1
 8.9°C e.c.f. (a) A1 [5]
- 4 (a) (i) $(a = \Delta)v/t$ **or** $84/35$ C1
 2.4 m/s^2 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]

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

<i>liquid</i>	M1	<i>molecules</i>	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]

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Section B

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

[Total: 15]

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- 10 (a) (i) at least 2 concentric, complete circles B1
increasing gap B1
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 C1
0.75 Ω A1
- (ii) ($Q =$) It **or** 8.0×120 **or** 8.0×2 C1
960 C (16 C scores 1/2) A1 [4]
- (c) (i) $L \rightarrow R$ **or** $N \rightarrow S$ B1
- (ii) force (on wire) **or** wire bends/moves M1
into page/perpendicular to field/away (from us)/LH rule quoted 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 B1
force/movement opposite on sides of coil **or** moment B1
current reverses during rotation/due to commutator or split ring B1 [3]

[Total: 15]

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- 11 (a) ($P = VI$ or 6.0×1.6) C1
9.6 W A1 [2]
- (b) (i) filament/J releases electrons B1
or thermionic emission B1
attracted by +ve terminal/metal plate/K B1
electrons move/accelerate
- (ii) otherwise **electrons** hit (air) molecules/particles/lose energy B1
or **electrons** deflected/don't hit screen/cause ionisation of air
- (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 B1
timebase pulls it horizontally or voltage is constant/zero
- (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 B1 [5]
screen is only 4cm from middle to top

[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.