

MARK SCHEME for the October/November 2008 question paper

5054 PHYSICS

5054/02

Paper 2 (Theory), maximum raw mark 75

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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
 $10(.0 \pm 0.2)$ N B1
 $35\text{--}39^\circ$ from T/Y /horizontal or $51\text{--}55^\circ$ 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** $F \times d$ **or** 10×700 C1
 $(-)$ 7000 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 $^\circ\text{C}$ 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
increasing gap
at least 1 anticlockwise arrow **and** none incorrect
B1
B1
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]

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- 11 (a) $(P =) VI$ or 6.0×1.6
9.6 W C1
A1 [2]
- (b) (i) filament/J releases electrons B1
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 B1
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 B1
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 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 B1
screen is only 4cm from middle to top [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.