

**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  $\geq 2$  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**  $10 \times 700$  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  
 $8.9$  °C e.c.f. (a) A1 [5]
- 4 (a) (i)  $(a = \Delta)v/t$  **or**  $84/35$  C1  
 $2.4$  m/s<sup>2</sup> 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>	<b>M1</b>	<i>molecules</i>	<b>A1</b>
dense(r)		close(r)/touching	
incompressible/volume fixed		close(r) <b>or</b> strong(er) forces	
fills bottom container		forces strong(er)	
expands less <b>when heated</b>		forces strong(er)	
more viscous/flows slower		forces strong(er)	
sound fast(er)		close(r) <b>or</b> strong(er) forces	
better <b>conductors</b> 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**  $200 \times 12$  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  
 $5.9 \times 10^{-12}$  **or**  $5.94 \times 10^{-12}$  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  $\Omega$   
 C1  
 A1
- (ii)  $(Q =) It$  **or** 8.0  $\times$  120 **or** 8.0  $\times$  2  
 960 C (16 C scores 1/2)  
 C1  
 A1 [4]
- (c) (i) L  $\rightarrow$  R **or** N  $\rightarrow$  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  $6.0 \times 1.6$   
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
- (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.