

CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2012 series

5054 PHYSICS

5054/21

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, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

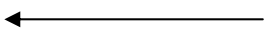
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Section A

- 1 (a) 950 N
upwards B1
B1
- (b) correct rectangle **and** diagonal **and** at least one velocity labelled
or correct triangle and at least one velocity labelled
(either way round) B1
from 7.8(0000) to 8.0(0000) m/s (inclusive) B1
scale stated B1 [5]
- 2 (a) (i) output/voltage/e.m.f. (directly) proportional to temperature (difference) B1
- (ii) $\frac{7.70 - 6.20}{800 - 750}$ **or** 1.5/50 **or** 0.03 **or** 0.6/1.5 **or** 20(°C) C1
770 °C A1
- (b) glass melts/liquid boils/no remote reading (e.g. head in furnace) B1 [4]
- 3 (a) (i) (WD =) mgh **or** $54 \times 10 \times 2.8$ C1
1500/1510/1512 J A1
- (ii) (P =) WD/t **or** E/t **or** 1500/3 **or** 1510/3 **or** 1512/3 C1
500/503/504 W A1
- (b) any **two** of:
also lifting board/rope
heat in motor/wires/cable
friction with something named e.g. axle/spindle/air B2
- (c) (i) power supply, motor and ammeter in series
(**ignore** series voltmeter and other components) B1
voltmeter to measure voltage across motor B1
- (ii) current (reading) $\times$ voltage (reading) **or** VI B1 [9]
- 4 (a) ($m =$) ρV **or** 740×30 **or** 22 000/22 200 C1
25 000/ 2.5×10^4 kg (allow 24 800 from 22 000) A1
- (b) ($a =$) F/m **or** 30 000/25 000 C1
(-) 1.2 m/s^2 A1 [4]

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- 5 (a) (i) clear attempt at measuring more than one wavelength e.g. 6.85/5
or 1.30 – 1.45 cm B1
10.7 – 11.3 cm B1
- (ii) $(v =)f\lambda$ or $3.6 \times (a)(i)$ C1
40(39.6) cm/s A1
- (b) (i) stays the same B1
- (ii) decreases B1 [6]
- 6 (a) any **three** of:
infra-red and microwaves reversed
visible light is omitted
ultrasound is not e.m./should not be included
ultraviolet is missing ('ultrasound instead of light' scores 2) B3
- (b) engineering use M1 detail/explanation A1
- detecting cracks in metal (more) X-rays pass through crack/poor weld
- or**
- checking welds image of crack on film/screen
- astronomy hot stars emit X-rays
- crystallography diffraction reveals pattern of atoms
- fluorescence substances re-emit different energies
- (airport/border) security contents of luggage/lorries revealed
- paintings investigated underpainting revealed
- (**not** medical use) [5]
- 7 (a) (at least) **two** parallel horizontal lines within the cylinder B1
(at least) **two** correctly shaped lines outside the cylinder B1
- (b) (i)  (right to left) **and** on diagram (somewhere) B1
- (ii) 1. path continuously curving in same direction M1
upwards (**ignore** lines outside the shaded area) A1
2. (changes to) downwards (curve) **not** reverses/opposite direction B1 [6]

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- 8 (a) (i) $(V =)IR$ or 0.025×600 C1
15 V A1
- (ii) $5(V)$ or $5/0.025$ or 800 or $800-600$ C1
200 Ω A1
- (b) (i) decreases B1
- (ii) ammeter: opposite to (i)
voltmeter: same as ammeter (both changes correct) B1 [6]
- [Total: 45]

Section B

- 9 (a) (i) $(\Delta P =) \rho gh$ or $1000 \times 10 \times 120$ C1
 $1.2 \times 10^6 \text{ Pa}$ A1
- (ii) $1.3 \times 10^6 \text{ Pa}$ B1 [3]
- (b) (i) $(F =)PA$ or $1.2 \times 10^6 \times 0.45$ or $1.3 \times 10^6 \times 0.45$ or $5.4 \times 10^5 \text{ (N)}$ C1
 $5.8/5.85/5.9 \times 10^5 \text{ N}$ A1
- (ii) any **two** of:
weight of hatch
pressure inside submarine
friction at seal/hinge/water resistance
lever effect B2 [4]
- (c) (i) sound or pressure wave B1
frequency > 20 kHz/**frequency** beyond human hearing/in audible B1
- (ii) (water) molecules/particles vibrate/oscillate B1
molecules collide with other molecules/neighbours B1
pass on vibration/energy (to neighbours)
or longitudinal (vibration/wave) or compressions and rarefactions B1
- (iii) 1. speed of sound/ultrasound (in water/sea water) B1
2. speed $\times t \div 2$ B1
- (iv) cleaning/quality control/detecting cracks/prenatal screening/
kidney stones/detecting shoals of fish/(used by dolphins/bats) B1 [8]
- [Total: 15]

Page 5	Mark Scheme	Syllabus	Paper
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- 10 (a) 16×7.5 or 120 or $96-17$ or 79
 $(Q =)mc\Delta T$ or $120 \times 2300 \times 79$
 $2.2(2.1804) \times 10^7 \text{ J}$ C1
C1 [3]
A1
- (b) (i) $2.2 \times 10^7/7$ or $2.2 \times 10^7/(7 \times 60)$ or $2.2 \times 10^7/(7 \times 3600)$ C1
 $3.1 \times 10^6 \text{ J/h}$ or $5.2 \times 10^4 \text{ J/min}$ or 870 J/s or W A1
- (ii) (heater/bricks) hot(ter) (**not** room cooler) B1
great(er) temperature difference (between heater and room) B1 [4]
- (c) air (next to heater) gets hot or conduction through metal/casing B1
expands or radiation or IR (radiation) B1
less dense B1
rises B1
circulation or convection current or arrows on Fig. 10.2 B1 [5]
- (d) double glazing/cavity walls/ceiling
tiles/carpet/curtains/loft insulation etc. or shiny foil B1
traps air radiation reflected M1
air is poor conductor/convection IR radiation/
prevented back into room A1 [3]
- [Total: 15]**
- 11 (a) (i) correct negative charges on tree. B1
- (ii) electrons/-ve charges attracted by cloud/+ve charges B1
electrons from ground or correct induction mentioned B1
- (iii) 1. $560/1.6 \times 10^{-19}$ C1
 3.5×10^{21} A1
2. $(I =)Q/t$ or $560/2 \times 10^{-4}$ C1
 $2.8 \times 10^6 \text{ A}$ A1 [7]
- (b) (i) at least 4 vertical lines between plates B1
equally spaced or curved at edges B1
arrows +ve to -ve/upwards B1
- (ii) oil droplet positively charged B1
attraction/force on (droplet) and in direction of field/upwards B1
force greater than weight (of droplet) or resultant force B1
- (iii) (droplet becomes) negative C1
(droplet) gains electrons A1 [8]
- [Total: 15]**