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.

Cambridge is publishing the mark schemes for the October/November 2012 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

CAMBRIDGE
International Examinations

Section A

1	**(a)**	950 N	B1	
		upwards	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 × 10 × 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) × 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]

© Cambridge International Examinations 2012

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 × **(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		**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]

© Cambridge International Examinations 2012

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)**	(ΔP=) ρgh **or** 1000 × 10 × 120	C1	
			1.2×10^6 Pa	A1	
		(ii)	1.3×10^6 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** 5.4×10^5 (N)	C1	
			5.8/5.85/5.9 × 10^5 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/inaudible	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 × t ÷ 2	B1	
		(iv)	cleaning/quality control/detecting cracks/prenatal screening/ kidney stones/detecting shoals of fish/(used by dolphins/bats)	B1	[8]
				[Total: 15]	

© Cambridge International Examinations 2012

10 (a) 16 × 7.5 **or** 120 **or** 96–17 **or** 79 C1
(Q =)$mc\Delta T$ **or** 120 × 2300 × 79 C1
2.2(2.1804) × 10^7 J A1 [3]

(b) (i) 2.2 × 10^7/7 **or** 2.2 × 10^7/ (7 × 60) **or** 2.2 × 10^7/ (7 × 3600) C1
3.1 × 10^6 J / h or 5.2 × 10^4 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 × 10^{-19} C1
3.5 × 10^{21} A1

2. (I =)Q/t or 560/2 × 10^{-4} C1
2.8 × 10^6 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]

© Cambridge International Examinations 2012