

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge Ordinary Level

MARK SCHEME for the October/November 2015 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 2015 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

® IGCSE is the registered trademark of Cambridge International Examinations.

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	5054	21

Section A

- 1 (a) (i) $(a =)\Delta v/t$ **or** $95/0.011$ C1
 $8.6(3636) \times 10^3 \text{ m/s}^2$ A1
- (ii) $(F =)ma$ **or** $0.018 \times 8.63 \times 10^3$ C1
 $150 / 155(.4545) / 160 \text{ N}$ A1
- (b) line from (0, 0) to (0.011, 95) with decreasing gradient B1
(becomes) horizontal at (0.011, 95) B1 [6]
- 2 (a) poor absorber / good reflector of (infra-red) radiation B1
(not with poor emitter) B1
less thermal energy absorbed B1
- (b) (i) (pressure / it) decreases B1
molecules slow down B1
less frequent / less violent (molecular) collisions **with wall** B1
- (ii) (pressure difference causes) a downward force on lid B1
or pressure outside > pressure inside [6]
- 3 (a) (k.e. =) $\frac{1}{2}mv^2$ C1
 $\frac{1}{2} \times 4.4 \times 10^4 \times 20^2$ C1
 $8.8 \times 10^6 \text{ J}$ A1
- (b) (i) $WD = F \times x_{(\parallel)}$ **or** force $\times$ distance (parallel to / in direction of force) B1
- (ii) $8.8 \times 10^6 / 40$ **or** $a = (-)5.0 \text{ (m/s}^2\text{)}$ **or** $t = 4.0 \text{ (s)}$ seen C1
 $2.2 \times 10^5 \text{ N}$ A1 [6]
- 4 (a) (point) C immediately above tip of pivot (and in middle(vertically) of screwdriver
($\pm 1 \text{ mm}$)) B1
- (b) (i) 0.64 N B1
- (ii) arrow W vertically downwards through candidate's C or pivot B1
- (c) no resultant force **or** upward force = downward force **or** force left = force right B1
no resultant moment (of force) **or** clockwise moment = anticlockwise moment B1 [5]

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	5054	21

- 5 (a) **temperature** at which a liquid becomes a gas B1
- (b) (i) molecules close together/touching **or** closer than in gas B1
 randomly arranged **or** irregular structure B1
 (ii) to separate/increase the distance between molecules B1
 work done against (intermolecular) forces **or** supply p.e. **or** break bonds B1 [5]
- 6 (a) **distance** from (optical) centre to focal point (principal focus) B1
- (b) (i) **both** Fs correctly positioned at ± 1 mm B1
- (ii) **two** of: paraxial ray to lens through focal point to image
 ray through optical centre
 ray through focal point and then paraxial to image (**ign.** arrows) M2
 X at crossing point of rays A1
- (iii) 3.4–3.8 cm B1 [6]
- 7 (a) at compression: molecules closer together **or** pressure higher **or** vice versa for rarefaction B1
- (b) (i) $v = f\lambda$ **or** in words B1
- (ii) larger **and** because the frequency is lower B1
- (c) states one use (e.g. prenatal scanning) B1
 basic idea (e.g. ultrasound reflects off foetus) B1 [5]
- 8 (a) (i) $(I =)V/R$ **or** $12/(6000 + 2000)$ **or** $12/8000$ **or** $12/2000$ **or** $12/6000$
or in (ii) $(V =)IR$ **or** 0.0015×6000 C1
 1.5 mA A1
- (ii) 9.0 V B1
- (b) (reading / it) increases B1
 resistance of LDR falls B1
- (c) light meter/sensor **or** automatic light switch **or** something sensible B1 [6]
- [45]

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	5054	21

Section B

- 9 (a) (i) (vector) has direction **or** scalar does not have direction **or**
(vectors) may cancel **or** scalars cannot cancel B1
- (ii) one vector quantity e.g.: displacement; velocity, acceleration B1
one scalar quantity e.g.: distance, length, speed, time, current, resistance B1 [3]
- (b) downward weight arrow of length 3.9–4.1 cm B1
correct triangle/parallelogram drawn **and** correct diagonal clear B1
270–285 kN B1
horizontal ($\pm 3^\circ$) B1
- (c) (i) from chemical/fuel energy B1
to kinetic (and thermal energy) (**not** with any intermediate) B1
- (ii) **air** resistance/friction/drag B1
air resistance/friction/drag increases **or** resultant force decreases B1
or acceleration decreases B1
resultant force is zero **or** (air) resistance/friction equals thrust B1
direction of motion is changing B1
velocity is vector **or** has a direction B1
(acceleration depends on) changing velocity **or**
resultant force towards centre (of circle) **or** **centripetal** force B1 [12]
- [15]
- 10 (a) (i) at least two straight parallel lines inside the coil B1
at least two (complete) lines one above the coil and one below the coil B1
third line in middle **and** evenly spaced **and** two closed loops B1
(any crossings max. 2/3)
- (ii) current (in X) increases B1
magnetic field becomes stronger/changes B1
current/e.m.f./voltage **induced** in Y/electromagnetic induction B1
opposite deflection B1
larger deflection B1
magnetic field decreasing **or** quicker (rate of) change B1 [9]
- (b) (i) to increase the strength of the magnetic field B1
to direct/concentrate the magnetic field (into the secondary coil) B1
- (ii) ($P = VI$) **or** $33\,000 \times 85$ C1
 $2.8 \times 10^6 \text{ W}$ **or** 2800 kW **or** 2.8 MW A1
- (iii) ($E = VIt$) **or** $33\,000 \times 85 \times 3600$ **or** $2.8 \times 10^6 \times 3600$ C1
 $1.0/1.01/1.008 \times 10^{10} \text{ J}$ A1 [6]
- [15]

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	5054	21

11 (a) (i)	(atoms) 3 and 4	B1	
(ii)	(atoms) 3 and 5	B1	
(iii)	(atoms) 3 and 4	B1	[3]
(b) (i)	17	B1	
(ii)	35	B1	[2]
(c) (i)	two separate sources: rocks (e.g. radon), outer space (e.g. cosmic rays), man-made sources (e.g. nuclear waste/fallout)	B2	
(ii)	22 counts/minute	B1	
(iii)	27 counts/minute	B1	
(iv)	use of 27/2 or 27/4 or 27/8 from 85 to 90 days (inclusive)	B1 B1	[6]
(d) (i)	(background count-rate is) reduced not to zero or not stopped or (some) gamma-rays in background count	B1 B1	
(ii)	not sensible all the beta-radiation would be absorbed or no beta-radiation reaches the detector	M1 A1	[4]
			[15]