

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

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Section A

- 1 (a) (i) $(a =)\Delta v/t$ or 95/0.011
 $8.6(3636) \times 10^3 \text{ m/s}^2$ C1
 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)
 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
or pressure outside > pressure inside B1 [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) $WD = F \times x_{(||)}$ or force \times distance (parallel to/in direction of force) B1
- (ii) $8.8 \times 10^6 / 40$ or $a = (-)5.0 \text{ (m/s}^2)$ 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]

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5	(a) temperature at which a liquid becomes a gas		B1	
	(b) (i) molecules close together/touching or closer than in gas randomly arranged or irregular structure		B1 B1	
	(ii) to separate/increase the distance between molecules work done against (intermolecular) forces or supply p.e. or break bonds		B1 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) X at crossing point of rays		M2 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 basic idea	(e.g. prenatal scanning) (e.g. ultrasound reflects off foetus)	B1 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 1.5 mA		C1 A1	
	(ii) 9.0 V		B1	
	(b) (reading / it) increases resistance of LDR falls		B1 B1	
	(c) light meter / sensor or automatic light switch or something sensible		B1	[6]
				[45]

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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]

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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]