

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge Ordinary Level

MARK SCHEME for the October/November 2014 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 2014 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 2014	5054	21

Section A

- 1 (a) (i) $(a =) (v - u) / t$ **or** $\Delta v / t$ **or** $(55 - 40) / 2$ **or** equivalent values from graph
7.5 m/s² C1
A1
- (ii) $(F =) ma$ **or** 180×7.5 C1
1300 / 1350 / 1400 N A1
- (b) (i) (acceleration) decreases (to zero) B1
- (ii) air resistance / friction / drag mentioned B1
air resistance / friction / drag increases (with speed) **or** resultant force
decreases (with speed) B1
(finally) (air) resistance = driving force **or** resultant is zero B1 [8]
- 2 (a) (i) $F_1 \times d_1 = F_2 \times d_2$ **or** $(0.39 \times 0.40) / 0.30$ C1
0.52 N A1
- (ii) 0.052 kg **or** 52 g B1
- (b) $(\rho =) m / V$ **or** $52 / 60$ **or** $0.052 / 0.000\ 060$ **or** $0.052 / 60$ B1
 $870 / 867 / 866.7 \text{ kg/m}^3$ **or** 0.87 g/cm^3 **or** $8.7 \times 10^{-4} \text{ kg/cm}^3$ etc. B1 [5]
- 3 (a) (atoms / molecules / particles) move (about) / collide / hit B1
(atoms / molecules / particles) collide / hit the walls / surface (of the cylinder) M1
force on walls (causes pressure) A1
- (b) atoms / molecules / particles closer / more compact / more molecules per unit
volume / less space to move B1
more collisions with the wall / surface (of chamber) **not** if speed / KE changes B1 [5]
- 4 (a) any **two** from:
transmission of energy
without net movement of medium
through vibration of particles B2
- (b) (i) number of (complete) waves / cycles / oscillations per unit time / second B1
- (ii) distance between (neighbouring) waves C1
distance between (neighbouring) wavefronts / points of same phase **or** crest
to crest / trough to trough distance A1
- (c) three reflected wavefronts roughly correct direction M1
wavelengths equal to each other and incident wavelength by eye A1
reflected wavefronts joined to incident wavefronts B1 [8]

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2014	5054	21

- 5 (a) longitudinal / pressure / sound (wave) **or** compressions **and** rarefactions (frequency) greater than 15 – 25 kHz / above limits of audibility B1
B1
- (b) $(x =) vt / 2$ **or** $340 \times 0.030 / 2$ **or** 340×0.015 **or** 10.2 C1
5.1 m A1 [4]
- 6 (a) **electrons** repelled by cloud (leaving ground positive) **not** positive charge / protons move B1
like charges repel **or** electrons negative B1
- (b) (region) where (electric) charge experiences a force B1
- (c) $(I =) Q / t$ **or** $180 / 0.0015$ C1
 $1.2 \times 10^5 \text{ A}$ A1 [5]
- 7 (a) wire cuts field lines B1
current / e.m.f. / voltage **induced** B1
- (b) larger deflection **and** to the left / opposite direction B1
- (c) no deflection / current B1 [4]
- 8 (a) neutrons and protons together and alone in the middle B1
5 protons B1
7 neutrons (if protons and neutrons unlabelled 1/2) B1
5 electrons **and** electrons surrounding nucleus B1
- (b) (i) 6 B1
(ii) 12 B1 [6]

[Total: 45]

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2014	5054	21

Section B

- 9 (a) any **two** from:
biomass / wood; geothermal power; solar power; tidal power; wave power; wind power B2 [2]
- (b) (i) 1. $2.1(4) \times 10^{17} \text{ J}$ (**allow** $2.1(5) \times 10^{17} \text{ J}$ if candidate uses 365.24/5) B1
2. any **one** from: not enough water (to maintain maximum flow); rainfall varies (during the year); periods of low demand B1
- (ii) 1. (GPE =) mgh **or** $1.6 \times 10^{10} \times 10 \times 170$ C1
 $2.7(2) \times 10^{13} \text{ J}$ A1
2. $2.7(2) \times 10^{13} / 3600$ **or** $6.8 \times 10^9 \times 3600$ **or** $6.8 \times 10^9 / 7.5(55) \times 10^9$ **or** $2.4(48) \times 10^{13} / 2.7(2) \times 10^{13}$ C1
0.90 **or** 90% A1
3. any **two** from:
friction (of water) with pipe / turbine /; viscosity of water; friction at bearings; resistance / heat in the wires; KE of water leaving turbine B2 [8]
- (c) (i) less energy lost / wasted **or** more efficient B1
(for a given power) a high voltage results in a small(er) current B1
less heat generated in wires **or** I^2R **or** less resistive losses B1
(**not** if changed resistance mentioned)
- (ii) transformer B1
- (iii) transformers only work with an a.c. supply B1 [5]
- [Total: 15]
- 10 (a) (i) **heated / hot water** expands **or** density of **heated / hot water** decreases B1
(heated / hot water) rises B1
convection (current) / circulation set up **or** (heated / hot water) rises **and** cold water sinks B1
- (ii) convection transfers heat upwards **or** less dense / heated / hot water (already) at top B1 [4]
- (b) (i) (Q =) VIt **or** $230 \times 9.6 \times 3.5$ **or** $230 \times 9.6 \times 3.5 \times 60$ **or** 7728 C1
 $4.6(368) \times 10^5 \text{ J}$ A1
- (ii) ($\Delta T =$) Q/mc **or** $4.6(3680) \times 10^5 / 1.6 \times 4200$ C1
69 (°C) C1
91 °C A1
- (iii) evaporation **or** thermal energy / heat in **plastic casing / element / surroundings** (i.e. air or environment) B1 [6]

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2014	5054	21

- (c) (i) poor conductor (heat or electricity) **or** less heat lost/cooler to touch **or** less risk of shock B1
- (ii) poor emitter **and** less heat lost/of radiation/IR (**not** poor absorber) B1 [2]
- (d) (i) **temperature** where liquid and vapour/gas coexist **or** where liquid (**not** substance) boils (at atmospheric pressure)(**allow** becomes vapour/gas) B1
- (ii) (work done) against/overcoming forces between molecules **or** molecules gain P.E. (**ignore** K.E. increases) B1
changes to P.E./molecules separate B1 [3]

[Total: 15]

- 11 (a) (i) energy to drive charge around a circuit **or** terminal p.d. on open circuit B1
energy to drive **unit** charge around a circuit **or** energy/charge B1
- (ii) lasts longer **or** lower internal resistance **or** can replace a cell without switching off **or** continues to work if one cell is flat **ignore** more current (**not** greater e.m.f./voltage) B1 [3]
- (b) (i) 4.0Ω B1
- (ii) $(1/R_{\text{tot}} =)1/R_1 + 1/R_2$ **or** $1/3 + 1/X$ **or** product/sum **or** $(3 \times X)/(3 + X)$ **or**
 $\frac{1}{X} = \frac{1}{2} - \frac{1}{3}$ C1
 6.0Ω A1 [3]
- (c) (i) $(I =) V/R$ **or** $2.0/4.0$ C1
 0.50 A A1
- (ii) (from) 0 **and** (to) 0.50 to 5.0 A B1 [3]
- (d) $I_2 = I_3 + I_X$ B1 [1]
- (e) (i) 1.0 V B1
- (ii) 1.0 V B1 [2]
- (f) (i) temperature decreases B1
resistance decreases B1
- (ii) greater than 0.75 A (e.c.f. resistance increases in (f)(i)) B1 [3]

[Total: 15]