CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge Ordinary Level

MARK SCHEME for the October/November 2014 series

5054 PHYSICS

| 5054/22 | 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.

CAMBRIDGE
International Examinations

www.dynamicpapers.com

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2014	5054	22

Section A

1 **(a)** limit of proportionality (<u>not</u> breaking point)   B1

     (b) **(i)** 8.5 cm **cao**   B1

         (ii) 7.1 – 7.3 cm   B1

     (c) $4.0 \times (2.7/7.2)$ **or** $5.0 \times (2.7/9.0)$ **or** 1.5 (N) **or** read from graph **or** 11.2 (cm)   C1
          0.148 – 0.152 kg **or** 148 – 152 g   A1   **[5]**

2 **(a)** **(i)** Fd **or** 2.5×0.18 C1
            0.45 N m   A1

         (ii) force not applied at right angles to the tap   B1

     (b) long(er) distance needs small(er) force (for same moment) **or** inversely
         related/proportional   B1   **[4]**

3 **(a)** $V_1 = p_2V_2/p_1$ **or** $p \propto 1/V$ B1
        $1.0 \times 10^5 \times (1.8/2.0) \times 10^7$ C1
        $9.0 \times 10^{-3}\,\text{m}^3$ **or** $9000\,\text{cm}^3$ A1

     (b) **(i)** $(\rho =)\ m/V$ **or** $(0.30/9.0) \times 10^{-3}$ C1
          $33(.3333)\,\text{kg}/\text{m}^3$ **or** $0.033(3333)\,\text{g}/\text{cm}^3$ A1

         (ii) helium mass/weight small (fraction of total/mass of air included) **or** this
             includes the weight of the cylinder   B1   **[6]**

4 **(a)** **(i)** heat gained from burning fuel/combustion **or** friction between moving
            parts/with air/road **or** from (radiation of) Sun   B1

         (ii) heat lost to air/surroundings **or** by convection (currents) **or** exhaust/hot
             gases/fumes **or** from exhaust **or** heat emitted (by hot car) **or** by radiation   B1

     (b) at start chemical energy decreases **or** at start chemical energy to   B1
         gravitational/potential energy (of car) increases **or** at end of process   B1
         kinetic energy (of car **or** air) increases   B1   **[5]**

www.dynamicpapers.com

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2014	5054	22

5 **(a)** downward curve of correct curvature from marked 90 °C   B1
horizontal line at marked 58 °C   B1
downward (asymptotic) curve of correct curvature to marked 23 °C   B1

  (b) H marked halfway (by eye) along an intermediate horizontal line   B1

  (c) $(Q =) mL$ **or** 45×220 C1
9900 J   A1   **[6]**

6 **(a)** (the molecules) move faster **or** have more **kinetic** energy **or** accelerate
ignore vibrate faster   B1

  (b) **(i)** faster / energetic molecules escape   B1
average speed decreases **or** slower molecules remain   B1

        temperature depends on average KE **or** heat taken from runner   B1
OR
liquid becomes gas / vapour
latent heat needed or bonds broken
heat taken from runner

    (ii) water vapour blown away **or** surrounding air less humid   B1   **[5]**

7 **(a)** **(i)** lasts longer **or** one cell can be replaced without switching off the circuit **or**
less (internal) resistance **or** if one fails the others still work   B1

    (ii) 1.5 V   B1

  (b) **(i)** $(R =) V / I$ **or** $1.5 / 0.075$ C1
20 (Ω) **or** $1.5 / (0.075 - 6.0)$ C1
14 Ω A1

    (ii) decreases   B1
resistance of wire increases   B1   **[7]**

8 **(a)** one label correct <u>and</u> not contradicted   C1
C, 1S and 1B all correct and clear <u>and</u> none contradicted   A1

  (b) any **three** from:
magnetic field (between poles)
(coil / wire) cuts field / flux **or** field / flux cuts (coil / wire) **or** field / flux changes
(electromagnetic) induction
brushes rub against / in contact with rings   B3

  (c) (half) distance across screen **or** count divisions of / measure wavelength **or** the
wavelength corresponds to one rotation   B1
half distance multiplied by time base setting   B1   **[7]**

Section B

9 (a) changing speed / velocity   C1

change in speed / velocity / time constant **or** (v–u)/t constant **or** constant/equal
rate of change of speed / velocity   A1   **[2]**

(b) (a vector quantity has) direction   B1   **[1]**

(c) (i)   **1.** X between $t \geq 0$ and $t < 10\,s$ B1
       2. Y between $t > 20\,s$ and $t < 30\,s$ B1
       3. Z between $t > 10\,s$ and $t < 20\,s$ **or** between $t > 30\,s$ and $t < 40\,s$ B1

     (ii)   **1. two** speed values from graph between 15 and 35 s (±1 mm)   C1
          two corresponding time values from graph between 15 and 35 s
          (±1 mm) **or** (a =)$\Delta v / t$ C1
          500 m/s^2 A1
          2. (F =) ma **or** 8.4×500 C1
          4200 N   A1

     (iii)   **1.** arrow labelled F perpendicular to surface of Earth   B1
          arrow labelled R opposite to direction of travel (by eye) from rock   B1
          2. speed changes **or** density/pressure of air changes **or** cross-sectional
          area (of rock) changes   B1

     (iv) it hits the ground/surface of the earth **or** stops **or** speed is zero   B1   **[12]**

[Total: 15]

10 (a) 3.0×10^8 m/s   B1   **[1]**

(b) (i)   **1.** decreases **cao**   B1
       2. no change **cao**   B1
       3. decreases **cao**   B1

     (ii)   **1.** i correctly marked (to normal)   B1
         2. r correctly marked (to normal)   B1   **[5]**

(c) (i) $\sin i / \sin r = n$ **or** $\sin i / \sin r = 1.5$ C1
       $\sin 89 / \sin r = 1.5$ **or** $\sin 89 / 1.5$ **or** 0.67(0.666565)   C1
       42° **or** 41.8025°   A1

     (ii)

i equal to/close to 90° **and** r less than 45°	$\sin i / \sin 45 = 1.5$	$\sin^{-1}(1/n) / \sin^{-1}(1/1.5)$ **and** 41.8°	B1
	or	**or**	
i never bigger than 89°/90°	$\sin i > 1$	r not be more than c	B1 **[5]**

www.dynamicpapers.com

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2014	5054	22

(d) (i) (sin) i = 0 **or** ray enters directly / wavefront / light hits surface
along normal / perpendicular **or** all together B1
(sin) r = 0 **or** no refraction all slows down together B1

(ii) correct reflection at bottom surface (by eye) M1
second correct reflection at top <u>and</u> no refraction at either point A1 **[4]**

[Total: 15]

11 (a) same element **or** same number of protons / atomic number B1
different / particular number of neutrons **or** nucleons B1 **[2]**

(b) (i) 38 **cao** B1

(ii) 52 **cao** B1 **[2]**

(c) $^{90}_{39}$(Y) **or** ^{90}(Y) <u>and</u> ^{0}(β) B1
$^{0}_{-1}$(β) $_{39}$(Y) <u>and</u> $_{-1}$(β) B1 **[2]**

(d) (i) 87 / 29 **or** 3 (half-lives) **or** 6.0×10^{8} / 8 C1
7.5×10^{7} A1

(ii) any detector B1
corresponding detection method B1

detector	film	(solid-state) detector	GM-tube	ionisation chamber	scintillation counter	cloud chamber
detection	fogged	count / reading	count / reading	count / reading	count / reading	track seen

no reduction with **or** (use of) electric/magnetic field **or** describe M1
paper pattern of
track

complete reduction **or** correct deflection of track in **or** no other A1
with aluminium/lead electric/magnetic field track

(iii) **1.** unpredictable **or** not be known in advance **or** no set time between emissions
or fluctuates **or** not fixed **or** counts obtained varies B1
2. any **two** from:
direction / in space
time
which nucleus decays B2 **[9]**

[Total: 15]

© Cambridge International Examinations 2014