CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge Ordinary Level

MARK SCHEME for the May/June 2015 series

5054 PHYSICS

5054/21   Paper 2 (Theory), maximum raw mark 75

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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge O Level – May/June 2015	5054	21

1 **(a)** **(i)** 60 m   B1

     (ii) 12 s   B1

    (b) **(i)** straight line from origin to 200 m at 40 s   B1
              any line straight or curved from (40,200) to (60,500)   B1

     (ii) $s = d/t$ or 500/60   C1
             8.3 m/s   A1

2 **(a)** **(i)** force moves through a distance (in same direction)   B1

     (ii) chemical (potential) energy   B1

    (b) **(i)** 480 Nm   B1

     (ii) attempt to apply moments with two forces and distances   C1
             400 N   A1

3 **(a)** Pa **or** N/m^2 **or** cm of mercury **or** atmosphere(s)   B1

    (b) correct points plotted at $(0.5V_0, 2P_0)$ and $(2V_0, 0.5P_0)$ B1
       curve through points of decreasing gradient   B1

    (c) molecules hit sides/piston   B1

       more molecules hit per second/hit more frequently   B1
       molecular impacts create large(r) **force** (upwards on piston)   B1

4 **(a)** oscillate/vibrate stated or described   B1
       transverse movement described   B1

    (b) 0.40 m   B1

    (c) **(i)** $v = f\lambda$ or $(f =)$ v/λ or 2/(b)   C1
          5.0 Hz   A1

     (ii) clear attempt to draw wave moved along 0.20 m to right   B1

5 **(a)** sin i/sin r or sin 50/sin 30   C1
       1.5(321)   A1

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(b) moving from more dense to less dense medium   B1
or moving to lower refractive index (air)
angle of incidence is greater than critical angle   B1

(c) less heat loss / more efficient   B1
less chance of hacking / more secure / less interference
less reduction in signal / less need for boosting / larger distances possible / thinner
or less bulky

6 **(a)** **(i)** ($I=$) V/R or 6/60   C1
0.1(0) A   A1

     (ii) ($I=$) P/V or 0.9/6   C1
or 0.15 (A) seen
0.25 A   A1

(b) **(i)** lamp correctly drawn in series with resistor but not the lamp   B1

     (ii) less voltage (across lamp) **because** some voltage across resistor / shares
voltage with resistor   B1
or less current **because** of effect of resistor

7 **(a)** field lines **of magnet** mentioned or magnetic flux mentioned   B1
field lines cut the coil or flux changes   B1

(b) reversed movement of magnet causes one of   B1
• reversal of (induced) emf
• reversal of (induced) current
• field lines cut / flux change in reverse direction
LED emits light when **current** passes in one direction   B1

(c) more current or more induced emf   B1
and flux lines cut faster or faster change in flux

8 **(a)** emission of electrons   B1
emission caused by heat / high temperature   B1

(b) anode positive   B1
anode attracts / accelerates electrons   B1
or electric field between filament and anode

(c) **two sets** of plates shown at 90º to each other with connection(s)   B1
labelled y plates **and** x plates / time base   B1

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Page 4	Mark Scheme	Syllabus	Paper
	Cambridge O Level – May/June 2015	5054	21

9 (a) (i) speed and mass   B2

(ii) 1 speed and direction   B1
or distance / time and direction
or displacement / time

2 direction changes   B1

(iii) force of gravity from / towards Earth   B1
force is centripetal   B1
or at right angles to motion / velocity

(b) (i) 450 000 N   B1

(ii) ($a =$) F/m or $50\,000/40\,000$ C1
$1.25\,\text{m}/\text{s}^2$ A1

(c) (i) same change in velocity / speed   M1
in same time period   A1

(ii) start at origin and straight line for first 4 minutes   B1
gradient increases at first after 4 and then decreases   B1
constant speed from 10 minutes until 12 minutes   B1

(iii) area **under** graph   B1

10 (a) (liquid) molecules not arranged (so) regularly   B1
(liquid) molecules not vibrating / moving in same direction   B1
or do not have same speed

(b) (i) molecules / liquid escape (from surface) / break bonds   B1

(ii) fast moving / more energetic molecules evaporate / escape   B1
leaving slow molecules **or** molecules with less **kinetic** energy (on average) B1

(c) (i) hot air rises   B1

(ii) (steam) condenses or changes to liquid (on thermometer)   B1
or heat (conducted) from hot to cold
gives out latent heat (to thermometer)   B1
or explanation involving bonds being made

    (iii) **1** $(E =)Pt$ **or** 200×120 C1
                  24 000 J   A1

          2 $(E =) mcT$ **or** $100 \times 4.2 \times 20$ C1
                  8400 J   A1

          3 $(E =) mL$ **or** 5×2250 C1
                  11 250 J   A1

          4   4350 J **or** $1 - (2+3)$ B1

11 (a) (i) 51   B1

    (ii) more protons than electrons   B1
            or different number of protons and electrons
            positive and negative do not cancel   B1

   (iii) 25 protons   B1
            a different number of neutrons   B1

  (b) (i) 147   B1

    (ii) α has mass number 4   B1
            α has proton number 2   B1
            correct proton number for U ecf their value for α B1

  (c) (i) alpha particles only travel a short distance in air   B1
            or alpha particles stopped / scattered / deflected by air
            or alpha particles ionise air

    (ii) particles come off in different directions   B1
            or not emitted in one line / as a ray
            or not all the particles pass through the slit

   (iii) B correct shape and deflected more than A   B1

   (iv) particles **close to / fired at** the nucleus are deflected (back) / repelled B1
            some particles pass (straight) through   B1
            a few particles come back / large deflection or most pass (straight) through
            (with little deviation)   B1
            and how this explains the nucleus is small