

**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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- 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<sup>2</sup> **or** cm of mercury **or** atmosphere(s) B1
- (b) correct points plotted at (0.5V<sub>0</sub>, 2P<sub>0</sub>) and (2V<sub>0</sub>, 0.5P<sub>0</sub>) 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 ( $f =$ )  $v/\lambda$  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

| Page 3 | Mark Scheme                       | Syllabus | Paper |
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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  $90^\circ$  to each other with connection(s) B1  
 labelled y plates **and** x plates / time base B1

| Page 4 | Mark Scheme                       | Syllabus | Paper |
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- 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  
 $1.25 \text{ m/s}^2$  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

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|        |         |                                                                                                                                                                                                                                                                                            |                |
|--------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
|        | (iii) 1 | $(E = )Pt$ or $200 \times 120$<br>24 000 J                                                                                                                                                                                                                                                 | C1<br>A1       |
|        | 2       | $(E = ) mcT$ or $100 \times 4.2 \times 20$<br>8400 J                                                                                                                                                                                                                                       | C1<br>A1       |
|        | 3       | $(E = ) mL$ or $5 \times 2250$<br>11 250 J                                                                                                                                                                                                                                                 | C1<br>A1       |
|        | 4       | 4350 J or 1 – (2+3)                                                                                                                                                                                                                                                                        | B1             |
| 11 (a) | (i)     | 51                                                                                                                                                                                                                                                                                         | B1             |
|        | (ii)    | more protons than electrons<br>or different number of protons and electrons<br>positive and negative do not cancel                                                                                                                                                                         | B1<br>B1       |
|        | (iii)   | 25 protons<br>a different number of neutrons                                                                                                                                                                                                                                               | B1<br>B1       |
| (b)    | (i)     | 147                                                                                                                                                                                                                                                                                        | B1             |
|        | (ii)    | $\alpha$ has mass number 4<br>$\alpha$ has proton number 2<br>correct proton number for U ecf their value for $\alpha$                                                                                                                                                                     | B1<br>B1<br>B1 |
| (c)    | (i)     | alpha particles only travel a short distance in air<br>or alpha particles stopped / scattered / deflected by air<br>or alpha particles ionise air                                                                                                                                          | B1             |
|        | (ii)    | particles come off in different directions<br>or not emitted in one line / as a ray<br>or not all the particles pass through the slit                                                                                                                                                      | B1             |
|        | (iii)   | B correct shape and deflected more than A                                                                                                                                                                                                                                                  | B1             |
|        | (iv)    | particles <b>close to / fired at</b> the nucleus are deflected (back) / repelled<br>some particles pass (straight) through<br>a few particles come back / large deflection or most pass (straight) through<br>(with little deviation)<br><b>and</b> how this explains the nucleus is small | B1<br>B1<br>B1 |