

**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
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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 any line straight or curved from (40,200) to (60,500)	B1 B1
	(ii) $s = d/t$ or 500/60 8.3 m/s	C1 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 400 N	C1 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> ) curve through points of decreasing gradient	B1 B1
	(c) molecules hit sides/piston	B1
	more molecules hit per second/hit more frequently	B1
	molecular impacts create large(r) <b>force</b> (upwards on piston)	B1
4	(a) oscillate/vibrate stated or described transverse movement described	B1 B1
	(b) 0.40 m	B1
	(c) (i) $v = f\lambda$ or $(f =) v/\lambda$ or 2/(b) 5.0 Hz	C1 A1
	(ii) clear attempt to draw wave moved along 0.20 m to right	B1
5	(a) $\sin i/\sin r$ or $\sin 50/\sin 30$ 1.5(321)	C1 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 90° 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 m/s<sup>2</sup> 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

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