

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 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^2 or cm of mercury or atmosphere(s) | B1 |
| | (b) correct points plotted at $(0.5V_0, 2P_0)$ and $(2V_0, 0.5P_0)$ 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) force (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

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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/s² 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 200×120 24 000 J | C1 A1 |
| 2 | $(E =) mcT$ or $100 \times 4.2 \times 20$ 8400 J | C1 A1 |
| 3 | $(E =) mL$ or 5×2250 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) | α has mass number 4 α has proton number 2 correct proton number for U ecf their value for α | 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 close to / fired at 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) and how this explains the nucleus is small | B1 B1 B1 |