



Cambridge International Examinations
Cambridge Ordinary Level

PHYSICS

5054/22

Paper 2 Theory

October/November 2016

MARK SCHEME

Maximum Mark: 75

Published

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Section A

- 1 (a) (i) $(v = u +)at$ or 3.4×5.0 C1
17 m/s A1
- (b) (i) 0 or zero or no resultant force B1
- (ii) straight line of positive gradient from (0, 0) B1
horizontal line at $v > 0$ and after initial acceleration B1
straight line from (0, 0) to (5.0, 17) and
straight line from (5.0, 17) to at least (15.0, 17) B1
- (iii) calculate the area under the graph or area of trapezium B1 [7]
- 2 (a) (i) (GPE =) mgh or $45 \times 10 \times 1.8$ B1
810 J B1
- (ii) kinetic either order } either order
thermal / internal / heat / sound } B1
B1
- (b) (i) upwards / centripetal / towards centre (of circle) B1
- (ii) it / weight less (than normal contact force) or upward force greater B1 [6]
- 3 (a) (i) 20 N B1
- (ii) 1. $(I =)Fd$ or 20×0.35 or 20×0.70 or 14 C1
7.0 N m A1
2. friction (at hinge / seal) or air resistance or to cause an initial acceleration B1
- (b) (for other directions) perpendicular distance is less B1 [5]
- 4 (a) temperature at which liquid / water turns to gas / vapour / steam B1
- (b) (i) $(T =)24$ (°C) or $100 - 24$ or 76 C1
 $(\Delta Q =)mc\Delta T$ or $1.5 \times 4200 \times 76$ C1
 4.8×10^5 J A1
- (ii) heat is lost (to the surroundings) or evaporation B1
at higher temperatures heat is lost at greater rate B1
- (c) (i) stays at 100 °C / constant B1
- (ii) molecules separate / are pulled apart / are far apart / break bonds /
overcome forces of attraction B1
work done separating the molecules or molecules gain PE B1 [9]

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- 5 (a) atoms / molecules / particles move / collide B1
atoms / molecules / particles collide with walls / piston B1
collisions cause forces B1
- (b) $(p_2 =)p_1 V_1 / V_2$ **or** $1.1 \times 10^5 \times 40 / 110$ C1
 4.0×10^4 Pa A1 [5]
- 6 (a) any **three** of:
filament is heated / hot **or** thermionic (emission) mentioned
electrons negative **or** electrons escape / are emitted
electrons attracted / accelerated by a positive charge / high potential / anode
opposite charges attract **or** positive (anode) attracts negative (electrons) B3
- (b) no collisions with air / particles **or** allows electrons to reach the screen B1
- (c) electron beam is a current **or** moving charges M1
deflected by a magnetic field **or** experience force in magnetic field A1 [6]
- 7 (a) 94 electrons **and** 94 protons B1
144 neutrons B1
(only) electrons in orbit / surrounding nucleus **or** (only) protons
and neutrons in nucleus B1
- (b) (i) (beta-particles) weak(er) B1
(beta-particles) strong(er) B1
- (ii) any **two** lines from
glasses / goggles **or** lead container / shield / clothing / gloves
tweezers / manipulator / carry in large cardboard box
minimise time of exposure / film badge B2 [7]
- [45]

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Section B

- 8 (a) (i) 0.83 – 0.86 N B1
- (ii) line curved B1
line (curved) upwards B1 [3]
- (b) (i) $(P =)h\rho g$ C1
 $0.035 \times 1000 \times 10$ or $3.5 \times 1000 \times 10$ or $35 \times 1000 \times 10$ C1
350 Pa A1
- (ii) $(F =)PA$ or 350×0.0016 or 350×16 or 5600 C1
0.56 N A1
- (iii) 1.4 N or (a)(i) + (b)(ii) calculated B1 [6]
- (c) (i) (atmospheric pressure) exerts a downward force / pressure B1
(on top of the block)
(cancels out the) extra upward force / pressure B1
- (ii) (vector) has direction (in addition to magnitude) B1 [3]
- (d) any **three** lines from
force due to water increases
force due to spring decreases
increased pressure (at base)
they add to give a constant value / weight of block or total force constant B3 [3]
- [15]**
- 9 (a) rate of flow of charge or charge flowing per unit time B1 [1]
- (b) (i) 7.5 V B1
- (ii) $(R =)V/I$ or 7.5 / 4.0 C1
1.9 Ω A1
- (iii) $(P =)VI$ or 6.5×4.0 C1
26 W A1
- (iv) resistance increases M1
(reading of ammeter) decreases A1 [7]
- (c) (i) at least two lines on left **and** two lines on right of core **and**
correct shape (by eye) B1
good shape (by eye) **and** into poles **and** no straight sections **and**
at least one line on each side B1
at least one arrow N to S (primarily upwards) **and** none wrong B1 [3]

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- (ii) 1 cylinder is magnetised (by induction) B1
top (of cylinder) is an S-pole B1
unlike poles attract **or** S-pole attracts N-pole B1
- 2 it does not (remain in contact) **and** iron is temporary / soft magnetic material / core (and cylinder) lose magnetisation B1 [4]

[15]

- 10 (a) (i) 3.0×10^8 m/s B1
- (ii) $(\lambda =)c / f$ **or** $3.0 \times 10^8 / 4.3 \times 10^{14}$ C1
 7.0×10^{-7} m A1 [3]

- (b) (i) decreases B1
- (ii) $\sin(i) = n \times \sin(r)$ **or** $1.5 \times \sin(30^\circ)$ **or** 0.75 C1
49° A1
- (iii) 41° B1 [4]

- (c) (i) dispersion at **both** surfaces **and** refractions in correct direction B1
violet / blue light below the red light shown B1
- (ii) spectrum **or** band of (continuous) colours **or** colours of rainbow B1
red, orange, yellow, green, blue, (indigo, violet) B1
- (iii) 1 X marked above red B1
2 it is / black surfaces are good absorbers (of IR radiation) B1 [6]

- (d) intruder / human IR beam broken IR reflected B1
being emits IR
- or**
- intruder warm **or** does not reach change detected B1 [2]
IR detected detector

[15]