



Cambridge International Examinations
Cambridge Ordinary Level

PHYSICS

5054/22

Paper 2 Theory

May/June 2016

MARK SCHEME

Maximum Mark: 75

Published

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Page 2	Mark Scheme	Syllabus	Paper
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- 1 (a) mark at a time between 4.0 and 7.5 seconds B1
- (b) (a =) $(v - u)/t$ numerical or algebraic C1
or (a =) gradient of graph stated
 2.5 m/s^2 A1
- (c) forward force and backward force clear B1
equal forces (in horizontal direction) B1
or no resultant force
or forces cancel/balance/in equilibrium
- 2 (a) (PE =) mgh **or** Fd **or** 5×3.5 C1
 17.5 J **or** 17 J **or** 18 J A1
- (b) (i) (efficiency = useful) energy output/energy input B1
in any form but all three quantities must be mentioned
if efficiency is not the subject of the equation
- (ii) $17.5/0.65$ **or** $17.5/65$ C1
or $0.65/65 = (\text{a})/\text{energy input}$
 26.9 J **or** 27 J A1
- (c) due to friction (in bearings of motor) B1
or due to (electrical) resistance (in motor)
or air resistance acts
or thermal energy/heat produced/lost (in resistance of motor/due to friction)
- 3 (a) (i) C M1
- (ii) **data** quoted to prove stretches more at end A1
or extensions/changes in length increase/are not the same (at higher loads)
- (iii) 4.5 cm B1
- (b) (tie rock to spring A) B1
- find weight/force/newtons using length or extension **and** graph **or** match readings (in table)
 - find known weight/mass/force/N that gives same extension of spring
 - use of proportionality with length or extension
 - extension (in cm)/1.6
- (mass =) weight/g B1
or weight/gravitational field (strength)

Page 3	Mark Scheme	Syllabus	Paper
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- 4 (a) steam B1
 or (water) vapour
 or water in gaseous form
- (b) (E =) mL numerical or algebraic C1
 or 52 000–6000 or 46 000 (J) seen
- (52 000–6000)/20 or 46 000/20 C1
 2300 J/g or 2.3×10^6 J/kg A1
- (c) fast moving/energetic molecules escape/evaporate/break bonds/become gas B1
 leaving slow(er) molecules/less energetic molecules B1
 or reducing **average** (kinetic) energy (of molecules or liquid)
- 5 (a) (i) long-sight or far-sight or hypermetropia B1
- (ii) rays do not come together (on back of eye) B1
 or rays do not converge (on retina)
 or it/the image is not formed on retina/back of eye
 or it/the image is formed behind retina/back of eye
- (b) (i) lens between rays and eyeball **and** a converging lens shown B1
- (ii) converging or convex B1
- 6 (a) (i) red B1
- (ii) blue B1
- (b) ANY 2 from (the use must agree with the type) B4
- Microwaves B1
use – satellite television, telephone, mobile/cell phones; B1
 cooking, heating in a microwave oven, television
 remote, radar, communication
- X(-rays) B1
use – hospital use in medical imaging or security imaging, killing cancerous cells, B1
 and engineering applications such as detecting cracks in metal, crystallography
- gamma (rays) B1
use – medical treatment in killing cancerous cells, and engineering applications B1
 such as detecting cracks in metal, sterilisation, tracer applications, radiotherapy

Page 4	Mark Scheme	Syllabus	Paper
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- 7 (a) any insulator, e.g. perspex, plastic, nylon, rubber B1
- (b) top of P shows a net negative charge with some negative charges under rod B1
bottom of P has equal number of positive charges B1
- (c) (i) clear net negative charge on P B1
and (net) negative charges above or at middle line
- (ii) 1 negative (charges)/electrons flow to earth B1
or (P) becomes neutral
- 2 charges spread over P B1
- 8 (a) current/a.c (in primary coil) creates magnetic field B1
or current/a.c magnetises iron B1
changing magnetic field (in secondary)
- (b) it/secondary has less turns (than primary) B1
or primary has more turns (than secondary)
or (some) flux escapes
- (c) (steel is) a permanent magnet B1
or weaker fields produced
or (steel) difficult to magnetise/demagnetise
or (steel) is a hard magnetic material
- (d) passes current/charge in one direction B1
or has high resistance/is an insulator when current in one direction/reverse biased
- 9 (a) (amount of) energy/work (dissipated by source) M1
by unit charge (around a circuit) A1
- (b) (i) 1 they are the same B1
or $I_B = I_1 = I_2$
- 2 $E = V_1 + V_2$ B1
- (ii) (I=) V/R in any form algebraic or numerical C1
0.25 A A1
- (iii) 4.5 V B1
- (iv) (P=) VI **or** (P=) I^2R **or** (P=) V^2/R C1
in any form algebraic or numerical
1.1(25) W A1

Page 5	Mark Scheme	Syllabus	Paper
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- (c) current is (directly) proportional to voltage B1
or voltage/current is a constant
law holds for constant physical conditions/ B1
constant temperature/constant pressure/for metals
- (d) (i) (directly) proportional B1
or $(R) \propto 1$
- (ii) inversely proportional B1
or $(R) \propto 1/A$
- (e) 1st band orange B1
2nd and 3rd bands both black B1
- 10 (a) (i) B – anode B1
D – filament **or** heater B1
E and F–Y plates or X plates in either order B1
- (ii) 1 attract electrons **or** gives electrons speed/K.E. B1
- 2 heats up cathode B1
or gives electrons energy to escape (metal/cathode)
or causes/allows thermionic emission
- (iii) kinetic energy to light B1
or electrical energy to light
- (iv) voltage/charge is applied to the X-plates/vertical plates B1
or turn on time base
(steadily) increasing voltage/charge applied to plate(s) B1
or saw tooth voltage applied
or electrons attracted/repelled by plate(s) or by the electric field between them
- (b) (i) 1 1(.0)V B1
- 2 one wave 1.3–1.4 squares **or** 3 waves in 4 squares C1
2.6–2.8 ms A1
- 3 $(f =) 1/T$ numerical or algebraic C1
345–400 Hz A1
- (ii) smaller amplitude shown B1
larger period shown B1

Page 6	Mark Scheme	Syllabus	Paper
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- 11 (a) (nucleus/nuclide/atom) with same number of protons B1
- (b) (i) 2 B1
- (ii) neutron B1
- (iii) 2 B1
- (iv) 4 B1
- (c) nuclei repel B1
 or like/positive charges repel
 (needs) high kinetic energy/speed (to overcome repulsion) B1
- (d) ANY 3 lines from B3
 (dust/gas) collapses/comes together/clusters/condenses
 gravitational attraction or gravity mentioned B1
 temperature rises or KE (dust/gas) increases B1
 (nuclear) fusion occurs B1
 equilibrium established as radiation pressure/outward
 force balances inward force B1
- (e) (i) time for a quantity to halve C1
time for (radio)activity/count rate/number of atoms/number of nuclei to halve A1
- (ii) any relevant halving seen, e.g. 16 000/2 C1
 1000 A1