



Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS**0625/41**

Paper 4 Extended Theory

October/November 2019

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **11** printed pages.

Question	Answer	Marks
1(a)(i)	$a = \Delta v / \Delta t$ or $a = (v - u) / t$ in any form words, symbols or numbers or $(a =) \Delta v / \Delta t$ or $(a =) (v - u) / t$ or 15 (– 0) / 5.0 or $(a =)$ gradient 3.0 m / s ²	C1 A1
1(a)(ii)	$(F =) ma$ in any form words, symbols or numbers or $(F =) ma$ or 2300 × 3.0 6900 N	C1 A1
1(b)	accelerating or speed / velocity increasing at a decreasing rate or acceleration decreasing gradient (of graph is positive and) decreasing	B1 B1 B1
1(c)	air resistance or friction mentioned or resistive force air resistance or friction or resistive force increases (with speed)	B1 B1

Question	Answer	Marks
2(a)	any two from: shape size / volume / length / density / any linear dimension direction (of motion) / speed / velocity / momentum / kinetic energy / acceleration	B2
2(b)(i)	extension and tension / force / load mentioned extension is directly proportional to tension / force / load	C1 A1
2(b)(ii)1.	260 N	B1
2(b)(ii)2.	$k = F/x$ in any form words, symbols or numbers or ($k =$) F/x or 260 / (0.94 – 0.63) or 260 / 0.31 840 N/m	C1 A1
2(b)(iii)	from chemical (potential energy) to elastic (potential) / strain (at end)	B1 B1

Question	Answer	Marks
3(a)	force $\times$ time (for which it acts)	B1
3(b)(i)	$v = I/m$ or 0.019/0.00011 in any form words, symbols or numbers or ($v =$) I/m 170 m/s	C1 A1
3(b)(ii)	$KE = \frac{1}{2}mv^2$ in any form words, symbols or numbers or ($KE =$) $\frac{1}{2}mv^2$ $0.50 \times 0.00011 \times 170^2$ 1.6 J or 1.7 J	C1 C1 A1
3(c)	accept reverse comments if clearly about how the molecular structure of a solid differs from that of a liquid (molecules/they) have an irregular arrangement / not ordered / random arrangement (molecules/they) are (slightly) further apart (on average) (molecules/they are) not fixed in place	B1 B1 B1

Question	Answer	Marks
4(a)	it/cone vibrates any two from: alternating current (a.c.) (in coil/wire) or alternating magnetic field (neighbouring) air vibrates or vibrations passed on (producing) compressions and rarefactions / vibrations parallel to energy transfer vibrating at 15 000 Hz	B1 B2
4(b)	$\lambda = v/f$ in any form words, symbols or numbers or ($\lambda =$) v/f or 330 / 15000 0.022 m	C1 A1
4(c)	at least two vertical wavefronts either to left of barrier or in gap at least one wavefront showing some diffraction approximately constant wavelength throughout and ~50% of gap width	B1 B1 B1

Question	Answer	Marks
5(a)	four or more radial arrows / lines outside surface at least one arrow pointing towards (centre of) sphere and none wrong	B1 B1
5(b)(i)	positive charges on left and negative charges on right of S equal numbers	M1 A1
5(b)(ii)	it moves towards / attracted towards the negatively charged sphere / to the left	B1
5(b)(iii)	electrons / negative charges move (along the wire) towards Earth / towards ground / down the wire S becomes positively charged	B1 B1
5(c)	electrons mentioned free (to move) / delocalised / mobile in metals / S or fixed in position in plastic / stand	M1 A1

Question	Answer	Marks
6(a)(i)	$I = P/V$ or in any form words, symbols or numbers or ($I =$) P/V or 9000/230 39 A	C1 A1
6(a)(ii)	40 A or any greater integer value (in A) up to and including 60 A	B1
6(b)	$E = Pt$ or in any form words, symbols or numbers or ($E =$) Pt or 9000 $\times$ 1.0 or <u>9000 J</u> seen 35 – 16 or 19 ($^{\circ}\text{C}$) seen $m = E/(c\Delta T)$ or in any form words, symbols or numbers or ($m =$) $E/(c\Delta T)$ or 9000/(4200 $\times$ 19) 0.11 kg	C1 C1 C1 A1
6(c)(i)	two different metal wires <u>joined</u> at one end and voltmeter between free ends	B1 B1
6(c)(ii)	any one from: quick response / makes measurements fast measures rapidly varying temperatures electrical output small heat capacity robust / rugged	B1

Question	Answer	Marks
7(a)	7 / 7.6 / 8 / 10 marked towards top of y-axis and 1(.0) towards right of x-axis a straight line of positive gradient from 0, 0 to point 1.0, 7.6	B1 B1
7(b)(i)	energy (transferred) per unit charge energy (transferred) from chemical or energy (transferred) to electrical or energy (transferred) around / in a (complete) circuit	B1 B1
7(b)(ii)	1. $I = V/R$ or in any form words, symbols or numbers or ($I =$) V/R or 12 / 7.6 1.6 A	C1 A1
	2. 4.2 V or 4.3 V	B1
	3. $Q = It$ or in any form words, symbols or numbers or ($Q =$) It or $1.6 \times 5.5 \times 60$ or 1.6×5.5 or 8.8 (C) 520 C or 530 C	C1 A1

Question	Answer	Marks
8(a)(i)	$n = \sin(i) / \sin(r)$ in any form words, symbols or numbers or ($n =$) $\sin(i) / \sin(r)$ or $\sin(53^\circ) / \sin(30^\circ)$ 1.6	C1 A1
8(a)(ii)	path emerging into air along correct path (by eye) and labelled R	B1
8(a)(iii)	ratio / division of two identical quantities / speeds / sine functions / (pure) numbers	B1
8(b)(i)	path labelled V with two correct refractions and below path of red light in glass	B1
8(b)(ii)	larger frequency results in smaller speed (in glass) or r.a. (reverse argument) or inversely related / proportional. any two from: more refraction / closer to normal / larger refractive index for larger frequency or r.a. violet light has larger frequency or o.r.a. violet light has a smaller speed (in glass) or o.r.a. violet light has larger refractive index or o.r.a.	B1 B2

Question	Answer	Marks
9(a)(i)	${}^8_3\text{Li}$	B1
9(a)(ii)	4 × 4 × electron	B1 B1 B1
9(b)(i)	radioactive emission / (background) radiation / decay is random	B1
9(b)(ii)	any one of: rocks, buildings, soil, Earth, space, cosmic rays, Sun, radon, nuclear waste, weapons testing	B1
9(b)(iii)	440 – 24 or 416 or 52 or 55 or 79 or 3 (half-lives) or 45 / 15 or 1 / 2 ³ or 1 / 8 1/2 ³ or 1/8 or 52 or 55 or 79 76 (counts)	C1 C1 A1