Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/43**

Paper 4 Extended Theory **May/June 2018**

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.

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

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1: Marks must be awarded in line with: • the specific content of the mark scheme or the generic level descriptors for the question • the specific skills defined in the mark scheme or in the generic level descriptors for the question • the standard of response required by a candidate as exemplified by the standardisation scripts.
GENERIC MARKING PRINCIPLE 2: Marks awarded are always **whole marks** (not half marks, or other fractions).
GENERIC MARKING PRINCIPLE 3: Marks must be awarded **positively**: • marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate • marks are awarded when candidates clearly demonstrate what they know and can do • marks are not deducted for errors • marks are not deducted for omissions • answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.
GENERIC MARKING PRINCIPLE 4: Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	tangent on graph **OR** gradient **OR** (a =) $\Delta v \div \Delta t$ or $(v - u) \div t$	**C1**
	accept gradient increases; **not** gradient decreases	**C1**
	values from tangent or line 13 to 14 m / s^2	**A1**
1(b)(i)	gradient changes **OR** graph is curved	**B1**
1(b)(ii)	mass of space rocket decreases **OR** gravitational field strength decreases	**B1**
1(c)	area under graph **OR** (distance =) average speed × time	**C1**
	4550 × 100 **OR** (4100 + 5000) ÷ 2 × 100	**C1**
	4.5/4.55/4.6 × 10^5 m	**A1**

Question	Answer	Marks
2(a)(i)	*(KE =)* $\frac{1}{2} \times m \times v^2$	**C1**
	½ × 0.020 × 350^2	**C1**
	1200 J	**A1**
2(a)(ii)	(Δh =) $KE \div mg$ **OR** 1200 ÷ (0.020 × 10) **OR** 1225 ÷ (0.020 × 10)	**C1**
	6000/6100 m	**A1**
2(b)(i)	(force of) air resistance acts downwards	**M1**
	adds to gravitational force/resultant force increases/deceleration increases/deceleration > g	**A1**
2(b)(ii)	(kinetic energy) to gravitational potential energy	**B1**
	(kinetic energy) to thermal/internal energy	**B1**

Question	Answer	Marks
3(a)(i)	$(p =)\ h \times \rho \times g$ or $5.0 \times 1000 \times 10$	C1
	50 000 (Pa)	C1
	(total pressure = 50 000 + 1.0×10^5 =) 1.5×10^5 Pa	A1
3(a)(ii)	1.5×10^5 Pa	B1
3(b)	(rises because) density of gas is less than density of **OR** resultant upward force on bubble	B1
	(as bubble rises) pressure (of gas in bubble) decreases	B1
	(volume of bubble increases because) $p \times V$ = constant **OR** $V \propto 1 \div p$	B1

Question	Answer	Marks
4(a)	more energetic molecules escape/evaporate	B1
	less energetic molecules remain	B1
	average <u>kinetic</u> energy of molecules decreases **OR** temperature depends on <u>kinetic</u> energy	B1
4(b)	convection	B1
	surface/colder water more dense **OR** contracts	B1
	(cold water) sinks **OR** warmer water rises	B1
4(c)(i)1	difference between the maximum temperature and minimum temperature it can measure	B1
4(c)(i)2	distance moved by the thread per °C **OR** per unit temperature change	B1
4(c)(ii)	(range) increases **and** less expansion/increase in volume (of mercury per unit temperature rise)	B1

Question	Answer	Marks
5(a)(i)	path shows three or more straight line sections	B1
	with sudden changes of direction **and** at least two different lengths	B1
5(a)(ii)	air molecules travelling in random (directions)	B1
	collide with the smoke particle	B1
5(b)	(average) speed of the molecules decreases	B1
	molecules collide less often (on the piston and the walls of the cylinder)	B1
	smaller momentum change molecules (on collision)	B1
	piston now has a greater force on its right-hand side **OR** pressure less than atmospheric	B1

Question	Answer	Marks
6(a)	attempt at compressions and rarefactions	B1
	at least one compression labelled **and** at least one rarefaction labelled	B1
	wavelength **and** labelled λ	B1
6(b)(i)	(it/frequency remains) constant	B1
6(b)(ii)	(it/wavelength) decreases	B1
6(c)	320 to 350 m / s	B1

Question	Answer	Marks
7(a)	one side of wave(front) slows down before the other side	**B1**
	wave(front) slews around **OR** bends at boundary	**B1**
	bends towards the normal **OR** bends towards the side that slows first	**B1**
7(b)	$(n =)\ c \div v$ **OR** $(3.0 \times 0^{8}) \div (1.9 \times 10^{8})$	**C1**
	1.6	**A1**

Question	Answer	Marks
8(a)(i)	straight line from tip of O to tip of I	**B1**
	dotted line/lens marked at 3.0 cm from O	**B1**
8(a)(ii)	Any **one** of: paraxial ray from tip of O refracting at lens to tip of I paraxial ray to I from lens **and** ray from O to meet it at lens	**B1**
8(a)(iii)	(focal length) in range 2.2 cm to 2.6 cm	**B1**
8(a)(iv)	real **and** light pass through it/projected on to screen/rays converge	**B1**
8(b)	(focused rays) set fire to curtain	**B1**

Question	Answer	Marks
9(a)	(*R* =) *V* ÷ *I* **OR** 12 ÷ 0.15	**C1**
	80 Ω	**A1**
9(b)(i)	increases	**B1**
9(b)(ii)	(voltmeter reading) decreases **OR** less p.d. across variable resistor	**B1**
	more p.d. across 20Ω/fixed resistor	**B1**
9(c)(i)	1.5 J of (electrical) energy supplied in driving charge around the circuit	**B1**
	energy per unit charge **OR** per coulomb	**B1**
9(c)(ii)	8	**B1**

Question	Answer	Marks
10(a)(i)	there is a reading **OR** shows *I*/*V*/p.d.	**M1**
	then returns to zero/centre	**A1**
10(a)(ii)	S/south-pole at the right-hand end which attracts the magnet	**B1**
	opposes the change (causing the deflection)	**B1**
10(b)(i)	(turns ratio or $N_P \div N_S$ =) $V_P \div V_S$ **OR** 240 ÷ 12	**C1**
	20 **OR** 20 ÷ 1 **OR** 20:1	**A1**
10(b)(ii)	**diode** underlined	**B1**

Question	Answer	Marks
11(a)(i)	β(-particles)	**B1**
11(a)(ii)	α(-particles)	**B1**
11(a)(iii)	γ(-rays)	**B1**
11(b)(i)	downward <u>curve</u>	**B1**
11(b)(ii)	3 (half-lives identified) **OR** 168 ÷ 56	**C1**
	1 ÷ 8 **OR** 9.0×10^5 (Rn) atoms remain	**C1**
	(7.2 × 06 – 9.0 × 105 =) 6.3×10^6 (α-particles emitted)	**A1**