Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/31**

Paper 3 Core Theory **May/June 2016**

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.

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NOTES ABOUT MARK SCHEME SYMBOLS AND OTHER MATTERS

B marks	are independent marks, which do not depend on other marks. For a B mark to scored, the point to which it refers must be seen specifically in the candidate's answers.
M marks	are method marks upon which accuracy marks (A marks) depend. For an M mark to be scored, the point to which it refers **must** be seen in a candidate's answer. If a candidate fails to score a particular M mark, then none of the dependent marks can be scored.
C marks	are compensatory method marks which can be scored even if the points to which they refer are not written down by the candidate, **provided subsequent working gives evidence that they must have known it.** For example, if an equation carries a C mark and the candidate does not write down the actual equation but does correct substitution or working which shows that they knew the equation, then the C mark is scored. A C mark is not awarded if a candidate makes two points which contradict each other. Points which are wrong but irrelevant are ignored.
A marks	are accuracy or answer marks which either depend on an M mark, or which are one of the ways which allow a C mark to be scored.
Brackets ( )	around words or units in the mark scheme are intended to indicate wording used to clarify the mark scheme, but the marks do not depend on seeing the words or units in brackets e.g. 10 (J) means that the mark is scored for 10, regardless of the unit given.
c.a.o.	means "correct answer only"
Underlining	indicates that this must be seen in the answer offered, or something very similar.
OR / or	indicates alternative answers, any one of which is satisfactory for scoring the marks.
e.e.o.o.	means "each error or omission".
o.w.t.t.e.	means "or words to that effect".
Ignore	indicates that something which is not correct or irrelevant is to be disregarded and does not cause a right plus wrong penalty.
Spelling	Be generous about spelling and use of English. If an answer can be understood to mean what we want, give credit. However, beware of and do not allow ambiguities: e.g. spelling which suggests confusion between reflection / refraction / diffraction or thermistor / transistor / transformer.
Not / NOT	indicates that an incorrect answer is not to be disregarded, but cancels another otherwise correct alternative offered by the candidate i.e. right plus wrong penalty applies.

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e.c.f. means “error carried forward” . This is mainly applicable to numerical questions, but may occasionally be applied in non-numerical questions if specified in the mark scheme.

This indicates that if a candidate has made an earlier mistake and has carried an incorrect value forward to subsequent stages of working, marks indicated by e.c.f. may be awarded, provided the subsequent working is correct, bearing in mind the earlier mistake. This prevents a candidate from being penalised more than once for a particular mistake, but **only** applies to marks annotated “e.c.f”.

Significant figures On this paper, answers are generally acceptable to any number of significant figures $\geqslant 2$, except where the mark scheme specifies otherwise or gives an answer to only 1 significant figure.

Units On this paper, incorrect units are not penalised, except where specified. More commonly, marks are awarded for specific units.

Arithmetic errors Deduct only one mark if the **only** error in arriving at a final answer is clearly an arithmetic one. Regard a power-of-ten error as an arithmetic one.

Fractions Fractions are only acceptable where specified.

Crossed out work Work which has been crossed out **and not replaced but can easily be read**, should be marked as if it had not been crossed out.

Use of **NR** (# key on the keyboard) Use this if the answer space for a question is completely blank or contains no readable words, figures or symbols.

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Question	Answer	Marks
1(a)	cyclist accelerating **OR** moving faster **OR** cyclist has higher speed	**B1**
	both (cyclist and runner) accelerating	**B1**
	cyclists gradient steeper **OR** acceleration values calculated	**B1**
1(b)	Constant **OR** steady **OR** uniform (speed or motion)	**B1**
1(c)	indication of an area calculated	**C1**
	$6 \times 9 = 54$(m)	**C1**
	$\frac{1}{2} (6 \times 9) = 27$(m)	**C1**
	81(m)	**A1**
1(d)	horizontal line finishes at 10 seconds	**B1**
	straight line to time zero in two seconds	**B1**
		Total: 10

Question	Answer	Marks
2(a)	air resistance	**B1**
2(b)	W = m × g in any form	**B1**
	54(kg)	**B1**
2(c)	(540 – 100) = 440(N)	**B1**
	downwards	**B1**
		Total: 5

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Question	Answer	Marks
3(a)(i)	convection **OR** radiation	**B1**
3(a)(ii)	conduction	**B1**
3(b)	poor emitter **OR** poor radiator (of thermal energy)	**B1**
3(c)	(handles) become hot	**B1**
	use an insulator	**B1**
		Total: 5

Question	Answer	Marks
4(a)	<u>hot rocks</u>	**B1**
4(b)	input: thermal	**B1**
	output: electrical	**B1**
4(c)	**any two from:** air pollution **OR** atmospheric pollution climate change **OR** global warming **OR** greenhouse gases use up diminishing resources **OR** non-renewable	**B2**
		Total: 5

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Question	Answer	Marks
5(a)	**any two from:** larger area (in contact with roof) weight **OR** force spread out lower pressure (on roof)	**B2**
5(b)	400 + 1600 seen **OR** 2000(N)	**B1**
	P = F / A stated	**C1**
	2000 / 0.8	**C1**
	2500	**A1**
	N / m^2 **OR** Pa	**B1**
		Total: 7

Question	Answer	Marks
6(a)(i)	three straight lines, joined end to end	**B1**
	at least two changes of direction	**B1**
6(a)(ii)	collisions **OR** bumps **OR** bounces off	**B1**
	(with moving) air molecules	**B1**
6(b)	more collisions **OR** changes of direction	**B1**
		Total: 5

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Question	Answer	Marks
7(a)	to the left **OR** anticlockwise	**B1**
7(b)	row 1 – increases	**B1**
	row 2 – stays the same	**B1**
	row 3 – decreases	**B1**
7(c)	electric cables lower to ground **OR** telephone lines in summer **OR** buckling tracks	**B1**
		Total: 5

Question	Answer	Marks
8(a)(i)	<u>normal</u>	**B1**
8(a)(ii)	20°	**B1**
8(b)	d	**B1**
	g	**B1**
	f	**B1**
	R **OR** S	**B1**
8(c)	any two rays correctly drawn from top of O: ray parallel to axis, through lens, and beyond F ray undeviated through centre of lens and beyond ray through F, through lens, then parallel to axis	**M2**
	inverted image correctly drawn and positioned at intersection of two rays	**A1**
		Total: 9

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Question	Answer	Marks
9(a)(i)	infra-red	**B1**
9(a)(ii)	frequency	**B1**
9(b)(i)	any two different applications from: • (medical) imaging **OR** detecting fractures in bone **OR** specific example e.g. CT scan / imaging teeth at dentist • detecting faults in metal • security imaging e.g. airport security checks of bags • cancer treatment	**B2**
9(b)(ii)	any two from: • behind a screen **OR** lead apron • large distance from X-ray beam • monitoring of **OR** restricting exposure • low dosage **OR** limit exposure time • monitor frequency of x-ray sessions • other people not allowed in room when X-ray being taken • avoid when pregnant	**B2**
9(b)(iii)	same speed	**B1**
		Total: 7

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Question	Answer	Marks
10(a)(i)	series	**B1**
10(a)(ii)	thermistor	**B1**
10(b)(i)	resistance decreases as temp increases	**B1**
	at decreasing rate **OR** not proportional **OR** not linear	**B1**
10(b)(ii)	resistance of Y = 80 Ω	**C1**
	$R_t = R_1 + R_2$ in any form	**C1**
	100(Ω)	**A1**
10(b)(iii)	$V = IR$ in any form	**C1**
	12 ÷ 100 **OR** 12 ÷ candidates **(b)(ii)**	**C1**
	0.12 (A) **OR** ECF from **(b)(ii)**	**A1**
		Total: 10

Question	Answer	Marks
11(a)	iron, steel	**B2**
11(b)	N and S correctly labelled on Fig. 11.1	**B1**
	N and S correctly labelled on Fig. 11.2	**B1**
11(c)(i)	repulsion	**B1**
11(c)(ii)	repulsion	**B1**
11(c)(iii)	No force	**B1**
		Total: 7

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Question	Answer	Marks
12(a)	idea of paper between source and detector **OR** measuring range (in air) **OR** pass through an electric or magnetic field	**B1**
	alpha stopped by paper **OR** larger range in air for beta **OR** identify deflection when in field	**B1**
12(b)	**any two from:** gamma travel at the speed of light gamma rays have no charge gamma rays have no mass gamma is a wave **OR** part of the electromagnetic spectrum gamma less ionising greater penetration not deflected by electric or magnetic fields	**B2**
12(c)	damages cells / tissues / DNA **OR** causes (cell) mutations **OR** radiation sickness	**B1**
		Total: 5

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