Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/32**

Paper 3 Core 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.

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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.

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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.

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NOTES ABOUT MARK SCHEME SYMBOLS & OTHER MATTERS

B marks are independent marks, which do not depend on other marks. For a B mark to be scored, the point to which it refers must be seen specifically in the candidate's answer.

M marks are method marks upon which accuracy marks (A marks) later 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 A marks can be scored.

C marks are compensatory marks in general applicable to numerical questions. These can be scored even if the point 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 he 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 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. A marks are commonly awarded for final answers to numerical questions. If a final numerical answer, eligible for A marks, is correct, with the correct unit and an acceptable number of significant figures, all the marks for that question are normally awarded. It is very occasionally possible to arrive at a correct answer by an entirely wrong approach. In these rare circumstances, do not award the A marks, but award C marks on their merits. An A mark following an M mark is a dependent mark.

Brackets ( ) 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.

<u>Underlining</u> Underlining indicates that this <u>must</u> be seen in the answer offered, or something very similar.

OR / or This indicates alternative answers, any one of which is satisfactory for scoring the marks.

e.e.o.o. This means "each error or omission".

o.w.t.t.e. This means "or words to that effect".

Ignore This indicates that something which is not correct or irrelevant is to be disregarded and does not cause a right plus wrong penalty.

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Spelling	Be generous about spelling and use of English. If an answer can be understood to mean what we want, give credit. However, do not allow ambiguities, e.g. spelling which suggests confusion between reflection / refraction / diffraction or thermistor / transistor / transformer.
Not/NOT	This 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.
ecf	meaning "error carried forward" is mainly applicable to numerical questions, but may in particular circumstances be applied in non-numerical questions. 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 ecf 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 ecf.
Significant Figures	Answers are normally acceptable to any number of significant figures ≥ 2. Any exceptions to this general rule will be specified in the mark scheme. A second (or further) sig. fig. error in a single question is not penalised; annotate with SF SF. It is normally acceptable to quote just 1 s.f. for answers, which are exact to 1 s.f
Arithmetic errors	If the **only** error in arriving at a final answer is clearly an arithmetic one, then the mark awarded will be one mark lower than the maximum mark. Regard a power-of-ten error as an arithmetic error unless otherwise specified in the mark scheme. Annotate with POT. However if the power-of-ten error is due to the wrong omission or inclusion of g (= 10 N / kg) this rule does not apply. The use of a wrong SI prefix in the final answer is counted as a power-of-ten error rather than a unit error.
Transcription errors	If the only error in arriving at a final answer is because previously calculated data has clearly been misread, but used correctly, then for that part question the mark will be one less than the maximum mark
Fractions	Allow these only where specified in the mark scheme; they are a form of sig. fig. error; annotate with SF. Consequently, when a sig. fig. error and a fraction is used in the same question, the second answer may still be awarded full marks.
Crossed out	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. Look to see if it has been replaced on a blank page or another part of the same page.
Use of **NR**	(# or / 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)(i)	13.2(0) (s)	**B1**
1(a)(ii)	13.2 ÷ 30	**C1**
	0.44 (s)	**A1**
1(a)(iii)	reduces the effects of (timing / reaction time) errors owtte	**B1**
1(b)	Drops are accelerating **OR** moving with increasing speed	**B1**
1(c)	distance = area under graph OR ½ × b × h	**C1**
	0.5 × 1.5 × 15	**C1**
	11.25 (m)	**A1**

Question	Answer	Marks
2(a)	Any **four** from: pour some water into measuring cylinder record volume / reading of water (in measuring cylinder) place metal in water (in cylinder and completely submerge) record volume of water and metal (in cylinder) subtract starting volume from final volume (to give volume of metal)	**B4**
2(b)(i)	balance	**B1**
2(b)(ii)	density = mass ÷ volume	**C1**
	146 ÷ 20	**C1**
	7.3	**A1**
	g/cm^3	**B1**

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Question	Answer	Marks
3(a)(i)	10 (N) AND forwards/to the right	**B1**
3(a)(ii)	friction (between swimmer and water)	**B1**
3(a)(iii)	(now) moving at steady/constant speed	**B1**
	forces (now)balanced / in equilibrium **OR** forward force = backward force OR no resultant force	**B1**
3(b)	moment = force × (perp.) distance (from pivot)	**C1**
	700 × 3.5	**C1**
	2450 (N m)	**A1**

Question	Answer	Marks
4(a)	below	**B1**
4(b)	B A D C	**B3**

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Question	Answer	Marks
5(a)	gas AND oil both circled	**B1**
5(b)	water is heated / **changed to steam** as it passes through (fractures in) rocks	**B1**
	steam turns a turbine	**B1**
	the turbine drives a generator	**B1**
	generator produces electricity	**B1**

Question	Answer	Marks
6(a)(i)	mercury or alcohol	**B1**
6(a)(ii)	0 (°C) **AND** 100 (°C)	**B1**
6(b)(i)	conduction	**B1**
6(b)(ii)	Any **three** from: (heat causes) water molecules (to) move further apart OR (hot) water expands / volume increases (hot water) is less dense NOT molecules less dense/expand (so hot / less dense) water rises (and is replaced by cooler / more dense water) convection / current (in water)	**B3**

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Question	Answer	Marks
7(a)	no fixed position	**B1**
	(average) distance between molecules is greater than that of solids and liquids	**B1**
	molecules move in any direction owtte at high speeds	**B1**
7(b)(i)	change of direction	**B1**
	minimum of two straight lines drawn	**B1**
7(b)(ii)	Brownian (movement)	**B1**

Question	Answer	Marks
8(a)	top box ticked C to F_1	**B1**
8(b)	Diagonal ray through F1 to lens then parallel to optical axis to I.	**B1**
	ray parallel to principal axis to lens then refracted through F_2 to I	**B1**
	both rays meet at arrowhead of image	**B1**
8(c)	(image) closer (to lens / F_2) owtte (image) smaller	**B1** **B1**

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Question	Answer	Marks
9(a)(i)	light travels faster than sound **OR** flash / light seen before bang heard	**B1**
9(a)(ii)	speed = distance ÷ time in any form	**C1**
	500 ÷ 1.6	**C1**
	312.5 (m / s)	**A1**
9(a)(iii)	it is windy owtte **OR** reaction times to start / stop watch	**B1**
9(b)	echo	**B1**
	(sound) reflected from cliffs	**B1**

Question	Answer	Marks
10(a)(i)	cell symbol correctly drawn	**B1**
10(a)(ii)	series	**B1**
10(a)(iii)	electrons	**B1**
10(b)(i)	any **two** from: (both) lamps have correct / full potential difference if one lamp fails the other lamp still lights lamps can be switched (on/off)independently	**B2**
10(b)(ii)	V = IR or (I =) V ÷ R	**C1**
	3 ÷ 12	**C1**
	0.25 (A)	**A1**

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Question	Answer	Marks
11(a)	3rd box ticked steel	**B1**
11(b)	place ends/poles together	**B1**
	repulsion (takes place)	**B1**
11(c)(i)	coil of wire	**B1**
	iron rod inside	**B1**
	coil connected to an (electrical) power supply OR current in coil	**B1**
11(c)(ii)	number of turns (in coil)	**B1**
	current (in coil)	**B1**

Question	Answer	Marks
12(a)(i)	nucleon number OR mass number	**B1**
12(a)(ii)	proton number OR atomic number	**B1**
12(b)(i)	selected count rate halved	**B1**
	two pairs of co-ordinates clearly indicated	**B1**
	(half-life =) 4 (minutes)	**B1**
12(b)(ii)	shallower curve drawn	**B1**

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