Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/31**

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 AND 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.
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.
Underlining	Underlining indicates that this must 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.
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.

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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	Answers are normally acceptable to any number of significant figures $\geqslant 2$. Any exceptions to this general rule will be specified in the mark scheme.

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Question	Answer	Marks
1(a)	density = mass ÷ volume in any form OR (mass =) density × volume	**C1**
	mass = 1000 × 0.05	**C1**
	50 (kg)	**A1**
1(b)	Floats OR does not sink	**M0**
	density of full barrel OR its density OR density of plastic OR density of barrel OR density of (pure) water is less than sea water	**C1**
	density of plastic OR barrel AND (pure) water is less than sea water	**A1**

Question	Answer	Marks
2(a)	(student) S	**B1**
2(b)	83.37 (s) seen	**C1**
	83.37 ÷ 50	**C1**
	1.67 (s) cao	**A1**
2(c)	165 (mm)	**B1**

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Question	Answer	Marks
3(a)	measure without any load / weights AND measure with load / weights	**B1**
	measure length OR ruler stated or seen	**B1**
	(extension =) difference in two values	**B1**
3(b)(i)	30 (cm)	**B1**
3(b)(ii)	2.5 (N)	**B1**
3(c)	W = m × g OR W = m × 10 OR (m =) W ÷ g in any form	**C1**
	6.0 ÷ 10	**C1**
	0.6(0) (kg)	**A1**

Question	Answer	Marks
4(a)(i)	stop the tractor tipping up/keep tractor level owtte	**B1**
4(a)(ii)	moment = force × (perp.) distance from pivot in any form	**C1**
	6000 × 2.1	**C1**
	12 600	**A1**
	Nm	**B1**
4(b)	Any **three** from: (wide tyres have) greater area (in contact with ground) pressure = force ÷ area in any form the bigger the area the smaller the pressure so tractor less likely to sink/become stuck (in soft ground)	**B3**

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Question	Answer	Marks
5	Box 1 ✓	**B3**
	Box 2 ✓	
	Box 3	
	Box 4	
	Box 5 ✓	

Question	Answer	Marks
6(a)(i)	straight line to mirror **AND** normal correctly positioned	**B1**
6(a)(ii)	two correct reflections drawn	**B1**
6(a)(iii)	angle of incidence = angle of reflection	**B1**
6(b)	refracted away from normal	**B1**
	refracted along straight edge	**B1**
	totally internally reflected	**B1**

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Question	Answer	Marks
7(a)(i)	ray from X through centre of lens	**B1**
7(a)(ii)	image drawn from axis to point where rays cross and labelled I	**B1**
7(a)(iii)	point labelled F where ray crosses principal axis	**B1**
7(a)(iv)	2.7 (cm) $\pm$ 0.2 cm	**B1**
7(b)	diminished 2nd box ticked	**B1**
	inverted 4th box ticked	**B1**

Question	Answer	Marks
8(a)(i)	(it is) vibrating	**B1**
8(a)(ii)	longitudinal	**B1**
8(a)(iii)	<u>frequency</u> (of sound) OR 25 kHz	**B1**
	is above (upper limit of) human hearing range OR is an ultrasound	**B1**
8(b)(i)	horizontal line with arrows at either end	**B1**
8(b)(ii)	(14.4 ÷ 4 =) 3.6 (cm)	**B1**
8(c)	Any **four** from: use of shallow water use of flat lamina or shape below surface / different depths (of water) used waves hit {shallower water / shape} at an angle (other than 90°) waves change direction (due to) change in speed	**B4**

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Question	Answer	Marks
9(a)	correct field pattern for bar magnet	**B1**
	no lines crossing and good detail of curvature	**B1**
	correct direction of arrow, i.e. out from N pole	**B1**
9(b)	electrons	**M1**
	move from the rod/to the cloth	**A1**
9(c)	1. force of repulsion circled	**B1**
	2. no force circled	**B1**

Question	Answer	Marks
10(a)(i)	correct symbol for ammeter	**B1**
	correct symbol for voltmeter	**B1**
	ammeter in series and voltmeter in parallel with lamp	**B1**
10(a)(ii)	(R =) V ÷ I OR $V = I \times R$ in any form	**C1**
	(R =) 4.5 ÷ 0.25	**C1**
	18 (Ω)	**A1**
10(b)(i)	variable resistor	**B1**
10(b)(ii)	(sliding contact moved to) change resistance (in circuit)	**B1**
	(and so) change current (in lamp) or p.d. (across lamp)	**B1**

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Question	Answer	Marks
11(a)	relative movement (between conductor and magnetic field) And any **two** from: connect conductor/coil to (sensitive) meter use of magnet/magnetic field	**B1**
	deflection on meter (indicates emf) OR voltage generated OR current in conductor	**B2**
11(b)(i)	(soft-) iron	**B1**
11(b)(ii)	more turns on output coil (than input coil) ora	**B1**
11(b)(iii)	Vs / Vp = Ns / Np in any form	**C1**
	Vs / 12 = 300 / 20 OR Vs = (300 / 20) × 12 OR Vs = 15 × 12 OR 12 / 20 = ? / 300	**C1**
	180 (V)	**A1**

Question	Answer	Marks
12(a)	2.5 (minutes)	**B1**
12(b)	any answer above 1246 (counts/s), e.g. 1247	**B1**
12(c)	1. helium nucleus OR 2 protons **AND** 2 neutrons	**B1**
	2. strongly (ionising)	**B1**
	3. weakly (penetrating)	**B1**

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