



PHYSICS

0625/32

Paper 3 Core Theory

March 2017

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 will not enter into discussions about these mark schemes.

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NOTES ABOUT MARK SCHEME SYMBOLS AND OTHER MATTERS

M marks	are method marks upon which further 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.
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 answers.
A marks	In general, A marks are 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. However, correct numerical answers with no working shown gain all the marks available.
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 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.
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>	indicates that this <u>must</u> 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.

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.
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.
Units	Deduct one mark for each incorrect or missing unit from an answer that would otherwise gain all the marks available for that answer: maximum 1 per question . No deduction is incurred if the unit is missing from the final answer but is shown correctly in the working. Condone wrong use of upper and lower case symbols, e.g. pA for Pa. Use the annotation Xp to signify where a unit penalty has been applied.
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.
Transcription errors	Deduct only one mark if the only error in arriving at a final answer is because given or previously calculated data has clearly been misread but used correctly.
Fractions	Only accept these where specified in the mark scheme.
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.

Question	Answer	Marks
1(a)(i)	A OR E stated	B1
1(a)(ii)	C	B1
1(a)(iii)	area under graph	C1
	$0.5 \times 16 \times 8$	C1
	64 (m)	A1
1(b)	single straight line from origin drawn	B1
	diagonal line finishing at 10 m/s in 20 s	B1
1(c)	Steeper (gradient) owtte	B1
	Total:	8

Question	Answer	Marks
2(a)(i)	N, L	B1
2(a)(ii)	M, K	B1
2(b)	$D = M \div V$ in any recognised form	C1
	2.6	A1
	g/cm^3	B1
	Total:	5

Question	Answer	Marks
3(a)	point where all the weight seems to act owtte	B1
3(b)(i)	moments clockwise = moments anticlockwise	C1
	$2.5 \times 18 = 1.5 \times ?$ OR $45 \div 1.5$	C1
	30 (cm)	A1
3(b)(ii)	$w = m \times g$ in any recognised form	C1
	$2.5 \div 10$	C1
	0.25 (kg)	A1
	Total:	7

Question	Answer	Marks
4(a)	<u>fission</u>	B1
4(b)	plutonium OR uranium	B1
4(c)	L in first box	B1
	K and M in second and third boxes respectively	B1
	J in fourth box	B1
4(d)	dangerous to humans / ionising radiation	B1
	(concrete) prevents leaks / absorbs radioactivity	B1

Question	Answer	Marks
4(e)	no polluting gases/saves fossil fuels/does not need wind to operate owtte	B1
	waste products difficult to deal with/last long time	B1
4(f)	wind OR wave/tidal OR solar OR wood OR biofuel OR HEP OR geothermal OR hydroelectric	B1
	Total:	10

Question	Answer	Marks
5(a)	$P = F \div A$ in any recognised form	C1
	$6500 \div 100$	C1
	$65 \text{ (N/cm}^2\text{)}$	A1
5(b)	smaller area (at point)	B1
	greater pressure	B1
	Total:	5

Question	Answer	Marks
6(a)	evaporation / boiling solidification / freezing melting	B3
6(b)	faster movement / gain <u>kinetic</u> energy	B1
	larger separation of molecules owtte	B1
6(c)	all boxes ticked	B1
6(d)	bimetal strips	B1
	train rails buckling	B1
	Total:	8

Question	Answer	Marks
7(a)	energy	B1
	frequency	B1
	amplitude	B1
	wavelength	B1
7(b)	(transverse) vibrations perpendicular to travel/energy transfer	B1
	Total:	5

Question	Answer	Marks
8(a)	indication of speeds / velocity	B1
	light quickest	B1
8(b)(i)	echo / reflection (of sound)	B1
	from cliff	B1
8(b)(ii)	speed = distance \div time in any recognised form	C1
	1000 \div 330	C1
	3.03 (s)	A1
	5–7 seconds	B1
	Total:	8

Question	Answer	Marks
9	Any five, in any order, from	
	water heats up	B1
	molecules gain kinetic energy / move faster / move further apart	B1
	water expands OR water volume increases	B1
	density (of water) decreases	B1
	warm water rises OR cool water falls	B1
	convection (current)	B1
	Total:	5

Question	Answer	Marks
10(a)	70 (°)	B1
10(b)(i)	normal correctly positioned on B	B1
	reflected ray drawn correctly	B1
10(b)(ii)	<i>r</i> labelled correctly	B1
10(c)	$i = r$ /angle of incidence = angle of reflection	B1
	Total:	5

Question	Answer	Marks
11(a)	metal	B1
11(b)(i)	volt OR V OR mV	B1
11(b)(ii)	1 Nothing owtte	B1
	2 pointer deflects / moves	B1
	backwards and forwards owtte	B1
11(c)	1 strength of magnet	B1
	2 rate of (relative) movement	B1
	Total:	7

Question	Answer	Marks
12(a)	neutron	B1
	proton	B1
	electron	B1
12(b)	nucleus labelled	B1
	P + N in central position	B1
	3 protons and 4 neutrons clearly shown	B1
	3 electrons in outer shell(s)	B1
	Total:	7