

**MARK SCHEME for the May/June 2012 question paper**  
**for the guidance of teachers**

**0625 PHYSICS**

**0625/21**

Paper 21 (Core Theory), maximum raw mark 80

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 must be read in conjunction with the question papers and the report on the examination.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2012 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

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## NOTES ABOUT MARK SCHEME

- B marks** are independent marks, which do not depend on any other marks. For a B mark to be scored, the point to which it refers must actually be seen 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 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, e.g. if an equation carries a C mark and the candidate does not write down the actual equation but does correct working which shows he knew the equation, then the C mark is scored.
- 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.
- c.a.o.** means "correct answer only".
- e.c.f.** means "error carried forward". This indicates that if a candidate has made an earlier mistake and has carried his incorrect value forward to subsequent stages of working, he may be given marks indicated by e.c.f. provided his subsequent working is correct, bearing in mind his earlier mistake. This prevents a candidate being penalised more than once for a particular mistake, but **only** applies to marks annotated "e.c.f."
- e.e.o.o.** means "each error or omission".
- 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** 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.
- Spelling** Be generous about spelling and use of English. If an answer can be understood to mean what we want, give credit.
- Significant figures**  
Answers are acceptable to any number of significant figures > 2, except if specified otherwise, or if only 1 sig. fig. is appropriate.
- Units** Incorrect units are not penalised, except where specified. More commonly, marks are allocated for specific units.
- Fractions** These are only acceptable where specified.
- Extras** Ignore extras in answers if they are irrelevant; if they contradict an otherwise correct response or are forbidden by mark scheme, use right + wrong = 0
- Ignore** Indicates that something which is not correct is disregarded and does not cause a right plus wrong penalty.
- 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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- 1 (a) speed = distance ÷ time in any form OR (distance =) speed × time  
 $80 \times \frac{1}{2}$  OR  $80 \times 0.5$   
40 (km) C1  
C1  
A1
- (b) (i) First section of line:  
horizontal line starting at zero time, any speed M1  
at 80 km/hour A1  
from 0 to 0.5 hour, no further A1
- (ii) Second section of line:  
straight line sloping down B1  
line starting at end of previous section and ending at 1 hour  
(condone not straight) B1  
line ending at 30 km/hour B1
- Third section of line:  
vertical/near vertical line down to 0 at 1 hour B1  
ignore further sections of graph [Total: 10]
- 2 (a)  $84 - 53$   
 $31 \text{ (cm}^3\text{)}$  C1  
A1
- (b)  $238 - 205$   
 $33 \text{ (g)}$  C1  
A1
- (c) density = mass ÷ volume, however arranged B1  
 $33 \div 31$  e.c.f. (a) and (b) C1  
1.0645161 correct to any no of sf > 2 don't accept fractions A1  
g/cm<sup>3</sup> accept kg/m<sup>3</sup> if clear attempt to convert to kg and m<sup>3</sup> B1  
[Total: 8]
- 3 (a) 70 000 (N) arrow to right accept labelled "thrust" B1  
25 000 (N) arrow to left accept labelled "friction" B1
- (b) (i) to left OR backward OR opposing motion B1  
(ii) 45 000 (N) B1  
(iii) air friction/air resistance/drag NOT wind/wheels/weight  
NOT if any incorrect extra e.g. weight B1
- (c) (i) accelerates OR speed increases OR moves faster M1  
(ii) idea of unbalanced force e.g. forward force > backward force  
NOT just forward force is bigger A1  
[Total: 7]


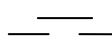

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4	(a)	they/molecules/particles/atoms moving/vibrating/have KE	C1	
		they/molecules/particles/atoms collide (condone with each other)	C1	
		they/molecules/particles/atoms collide <u>with walls</u>	A1	
		extra relevant information e.g. exert force, change of momentum, bounce back/off, lots over an area, random/Brownian motion	B1	
	(b) (i)	decreases	B1	
	(ii)	increases	B1	
			<b>[Total: 6]</b>	
5	(a)	changed/converted/transferred to other forms	B1	
	(b) (i)	24 (kJ)	B1	
		(ii)	idea of wasted/lost heat ignore sound	C1 A1
		(iii)	696 OR 720 – candidate's (i), correctly evaluated	B1
(iv)	idea of not very good no e.c.f. accept "there is a lot of energy lost", accept calculation ignore "not 100%"	B1		
			<b>[Total: 6]</b>	
6	(a)	EITHER		
		ray from tip of object through optical centre of lens straight on after lens	M1 A1	
	OR	ray from tip of object through $F_2$ and on to lens parallel to axis after lens	M1 A1	
		(b)	image drawn between candidate's intersection and the axis	B1
	(c)	same size inverted real } no e.c.f. use $\checkmark + \times = 0$ for size and orientation		B1
				B1
			B1	
(d)	smaller closer to lens/to the left	B1 B1		
	<b>[Total: 8]</b>			

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7	(a) infra-red	B1
	(b) infra-red	B1
	(c) X-rays	B1
	(d) microwaves	B1
		<b>[Total: 4]</b>
8	(a) (i) charge(s) OR electron(s) NOT ions	B1
	(ii) (an) ammeter	B1
	(iii) (a) voltmeter	B1
	(b) ( $R =$ ) $V/I$ in any form	C1
	9.6/0.8	C1
	12	A1
	$\Omega$ OR ohm(s) OR volt/amp OR volts per amp	B1
	(c) (i) increases	B1
	(ii) decreases OR e.c.f. from (i)	B1
		<b>[Total: 9]</b>
9	(a) coil clearly and unambiguously indicated	B1
	(b) increase strength/power of magnet ignore increase magnetism/ignore add core ignore magnets closer/bigger	} any 2
	increase current/voltage/energy from battery accept stronger/more powerful battery	
	increase number of turns (in coil) ignore bigger coil ignore rotations	
	(c) reverse current OR reverse magnet/field however expressed	B1
		<b>[Total: 4]</b>

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- 10 (a) any variation of  allow  and  B1
- (b) (i) plug switch M1
- (ii) exposed metal or equivalent OR not insulated OR (easy to get) shock A1
- (c) (i) pull-cord switch B1
- (ii) idea that water/moisture conducts ignore shock B1  
covering/plastic/nylon is an insulator OR no metal is exposed B1
- (d) 3 lamps connected in parallel with each other B1  
NOT if shorted out by switch or extra wire  
lamp combination (e.c.f.) in series with switch (e.c.f.) and supply  
accept any recognisable symbol, accept closed switch B1
- [Total: 8]**
- 11 (a) any downward deflection and no upward deflection B1  
curve, either all up or all down, from A to end of region between plates M1  
straight on from end of region between plates, towards BC A1
- (b) idea of deflection upwards/it goes upwards/it moves upwards no e.c.f. B1  
ignore opposite direction/opposite path
- [Total: 4]**
- 12 (a) thorium OR Th OR 232 OR 90 B1
- (b) technetium OR Tc OR 99(m) OR 43 B1
- (c) barium OR Ba OR 139 OR 56 } any 2 B1  
silver OR Ag OR 110 OR 47 }  
thorium OR Th OR 232 OR 90 } B1
- NOTE: technetium + anything scores 1 mark, "all of them" scores 1 mark
- (d) silver OR Ag OR 110 OR 47 B1
- (e) technetium OR Tc OR 99(m) OR 43 OR gamma B1  
NOT any extras
- [Total: 6]**