UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

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.

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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.

1 **(a)** speed = distance ÷ time in any form OR (distance =) speed × time — C1
80 × ½ OR 80 × 0.5 — C1
40 (km) — 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 — C1
31 (cm^3) — A1

(b) 238 – 205 — C1
33 (g) — A1

(c) density = mass ÷ volume, however arranged — B1
33 ÷ 31 e.c.f. **(a)** and **(b)** — C1
1.0645161 correct to any no of sf › 2 don't accept fractions — A1
g/cm^3 accept kg/m^3 if clear attempt to convert to kg and m^3 — 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]

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

[Total: 6]

5 **(a)** changed/converted/transferred to other forms B1

(b) **(i)** 24 (kJ) B1

(ii) idea of wasted/lost C1
heat ignore sound 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

[Total: 6]

6 **(a)** EITHER
ray from tip of object through optical centre of lens M1
straight on after lens A1
OR
ray from tip of object through F_2 and on to lens M1
parallel to axis after lens A1

(b) image drawn between candidate's intersection and the axis B1

(c) same size B1
inverted B1
real B1
} no e.c.f. use ✓ + × = 0 for size and orientation

(d) smaller B1
closer to lens/to the left B1

[Total: 8]

7 **(a)** infra-red B1

(b) infra-red B1

(c) X-rays B1

(d) microwaves B1

[Total: 4]

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
Ω OR ohm(s) OR volt/amp OR volts per amp B1

(c) **(i)** increases B1

(ii) decreases OR e.c.f. from **(i)** B1

[Total: 9]

9 **(a)** coil clearly and unambiguously indicated B1

(b) increase strength/power of magnet
ignore increase magnetism/ignore add core
ignore magnets closer/bigger

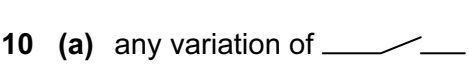
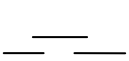
increase current/voltage/energy from battery
accept stronger/more powerful battery

increase number of turns (in coil)
ignore bigger coil ignore rotations

} any 2 B1 + B1

(c) reverse current OR reverse magnet/field however expressed B1

[Total: 4]

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
NOT if shorted out by switch or extra wire B1
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.
ignore opposite direction/opposite path B1
[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 } any 2
thorium OR Th OR 232 OR 90 } any 2 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
NOT any extras B1
[Total: 6]