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.

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 <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.

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) <u>First section of line</u>:
       horizontal line starting at zero time, any speed   M1
       at 80 km/hour   A1
       from 0 to 0.5 hour, no further   A1

     (ii) <u>Second section of line</u>:
       <u>straight</u> 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

       <u>Third section of line</u>:
       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   no e.c.f.   use ✓ + ✗ = 0 for size and orientation   B1
real   B1

(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 ⎫ any 2   B1 + B1
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
[Total: 4]

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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
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 ⎫   B1
silver OR Ag OR 110 OR 47   ⎬ any 2
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
NOT any extras   B1
[Total: 6]