CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the March 2016 series

0625 PHYSICS

0625/32 Paper 3 (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 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.

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.

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 $\geqslant 2$. 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.

1 **(a)** 80 (cm^3) B1

(b) 176.0 (g) B1

(c) $D = M / V$ in words, numbers or symbols C1
176 ÷ 80 C1

2.2 (g / cm^3) A1

(d) (sand) will float C1

sand is less dense than gold A1

[Total: 7]

2 **(a)** **(i)** 400 (metres) B1

(ii) evidence of 6 minutes C1
speed = distance / time in any form (e.g. 400 ÷ 360 or **(a)(i)** / 6) C1

$6 \times 60 = 360$ s C1
1.1(1) (m / s) A1

(b) A B1

shortest time (to return) / steepest gradient B1

[Total: 7]

3 **(a)** middle box ticked – moment B1

(b) pivot / fulcrum B1

(c) any four from: B4
- (heavier) boy has greater force / weight / moment
- when (heavier) boy lifts feet initially tips clockwise
- as boy moves his (clockwise) moment (about P) becomes less
- as distance (of boy's weight) from the pivot decreases end B moves upward
- see-saw level o.w.t.t.e (when) turning forces balanced / moments equal
- then end A tips down as anticlockwise moment is greater

[Total: 6]

4 **(a)** volume of balloon increases (until 14:00) then decreases again B1

(b) any three from: B3
- temperature (in room / balloon) increases
- gas molecules move faster / have more energy **OR** collisions more energetic when heated
- more frequent / harder collisions
- collisions result in greater force on balloon (surface) / gas pressure increases

[Total: 4]

5 **(a)** correct order: E B A C D B3
1 mark for B immediately before A
1 mark for C immediately before D
3 marks for all correct i.e. B, A, C then D

(b) any three from: B3
- conserve non-renewable reserves
- less atmospheric pollution / acid rain
- reduces greenhouse gases / global warming
- (renewable) energy source will not run out
- reduces dependence on fossil fuels (from other countries)

[Total: 6]

6 **(a)** **(i)** (the) normal B1

(ii) *y* B1

(b) **(i)** (red), orange, yellow, green, blue, indigo, violet / purple B1

(ii) any three from: B3
(ON DIAGRAM) ray reflected
angle *i* = angle *r* (by eye)
explanation:
(incident angle) is greater than critical angle
(so there is) total internal reflection

[Total: 6]

7 **(a)** any two from: B2
- hot air expands / particles move (further) apart
- hot air less dense
- less dense air rises

(b) any four from: B4
- aluminium / foil (on bottom) is a good reflector
- infrared / radiation reflected back into room
- (trapped) air is a good insulator / poor conductor
- (insulation) reduces heat lost by conduction
- foam reduces convection currents / prevents air moving
- (air cannot move so) prevents heat loss by convection
- aluminium / foil (on top) is a poor emitter (so reduces radiation into space above ceiling)

[Total: 6]

8 **(a)** for full marks the method described must work
any four from: B4
- means of producing sharp sound
- use of suitable reflecting surface
- measure total distance travelled by sound
- measurement of time for sound to travel measured distance.
- use of speed = distance / time

(b) **(i)** circle around DE B1

(ii) circle around CF B1

(iii) higher amplitude drawn B1

same wavelength drawn (by eye) B1

[Total: 8]

9 **(a)** line from microwaves to satellite communications B1

line from infra-red waves to TV remote control B1

(b) any two from: B2
- X-rays may cause mutation of DNA / cells
- X-rays are ionising
- idea of unnecessary exposure
- (sales assistants) exposed to large dose of X-rays

[Total: 4]

10 **(a)** (bar) magnet is brought close to both ends (of one of unknown bars) B1
either
If both ends attract it is an iron bar B1
or
If one end repels it is a magnet

(b) iron bar moves toward coil B1

any two from:

- current in coil
- coil becomes an electromagnet B2
- soft iron attracted to coil
- iron bar becomes (an induced) magnet (with opposite pole nearest coil)

(c) at least one circle centred on wire (by eye) M1

two or more circles centred on wire (by eye) B1

arrow showing clockwise direction on at least one circle B1

[Total: 8]

11 (a) (i) ammeter correct symbol in series with lamp B1

voltmeter correct symbol in parallel with lamp B1

lamp correct symbol B1

(ii) $R = V/I$ in any form C1

$6 \div 1.2$ C1

5 (Ω) A1

(iii) (resistance) increases B1

(b) (i) 3 lamp symbols drawn B1

(lamps connected) in parallel with battery B1

(ii) any two from: B2

- lamps all have 6 V or full voltage (across them)
- if one (lamp) breaks, others continue to operate / little / no effect on others
- lamps can be switched on and off independently

[Total: 11]

12 (a) line from alpha to stopped by paper B1

line from beta to negative charge B1

line from gamma to e.m. radiation B1

(b) (i) 84 B1

(ii) 126 B1

(c) evidence of line from 8000 or idea of halving e.g. 8000 and 4000 C1

20 ± 1.0 (weeks) A1

[Total: 7]