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.

Cambridge is publishing the mark schemes for the May/June 2015 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.
NOTES ABOUT MARK SCHEME SYMBOLS & OTHER MATTERS

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. For example, 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.

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.

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".

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.

AND indicates that both answers are required to score the mark.

Spelling Be generous with spelling and use of English. However, do not allow ambiguities e.g. spelling which suggests confusion between reflection/refraction/diffraction or thermistor/transistor/transformer.

Sig. figs. On this paper, answers are generally acceptable to any number of significant figures \(\geq 2\), except where the mark scheme specifies otherwise or gives an answer to only 1 significant figure.

Units On this paper, incorrect units are not penalised, except where specified. More commonly, marks are awarded for specific units.

Fractions Fractions are only acceptable where specified.
Extras  If a candidate gives more answers than required, irrelevant extras are ignored; for extras which contradict an otherwise correct response, or are forbidden by the mark scheme, use right plus wrong = 0.

Ignore  indicates that something which is not correct is disregarded and does not cause a right plus wrong penalty.

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) 0.38 and 0.66 seen
OR correct vertical lines/marks on axes ± ½ square C1

0.28 (s) A1

(b) speed is changing/increasing OR it is accelerating B1
OR accelerating at first (when curved line) then steady speed (when line is straight)
(because) graph is a curve OR gradient is changing B1
OR different distances travelled in equal time intervals
OR accept ‘due to force of gravity’

[Total: 4]

2 (a) Any three from: max. B3
• string with mass on pin in front of card
• hang card on pin from a hole
• make sure card can swing freely
• (place plumb line on pin) and mark line/position on card
• repeat using at least one more hole
• where lines cross is centre of mass

(b) card will balance at that point B1
OR repeat using third hole
accept place pivot beneath centre of mass

[Total: 4]

3 (a) (i) 160 (g) B1

(ii) (density =) mass ÷ volume, in any form C1

candidate’s (a)(i) ÷ 200 C1

0.8 (g/cm³) A1

(b) (i) conduction B1

(ii) warm(ed) liquid expands B1
NOT particles expand

density of warm(ed) liquid decreases B1
NOT particles become less dense

less dense liquid/warm liquid rises B1
NOT heat rises
(c) (i) evaporation OR boiling  

(ii) any one from:  
• liquid molecules gain energy/move faster  
• (the) most energetic molecules ignore vibrates faster  

molecules escape (from the liquid/into the air)  

[Total: 11]

4 (a) weight OR gravitational attraction  

(b) two forces are equal (in size) OR X and Y are equal (in size) acting in opposite directions accept forces are balanced OR no resultant force for BOTH marks  

(c) arrow pointing to the right on Fig. 4.1 or Fig. 4.2  

(d) moves downwards/falls AND explanation e.g.  
Y>X OR upwards force has decreased  

[Total: 5]

5 (a) (i) upwards  

(ii) shape  

(b) (i) height of bounce decreases  

(ii) heats/is transferred into the surroundings  
OR (transferred) into thermal energy/heat/internal energy of surroundings  

[Total: 4]

6 (a) B, D, C, A  
all correct for 3 marks; 2 or 3 correct for 2 marks; 1 correct for 1 mark  

(b) energy source that will not run out  
OR source is not finite/is unlimited/is constantly replenished/can be replaced  

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(c) (i) any two from:
- short start-up time
- lower running costs OR lower cost per unit OR no fuel costs
- can be controlled to meet peaks in demand OR predictable (supply)
- does not produce polluting gases ACCEPT is less polluting
- can be used as an energy store
- provides a recreational facility/ tourism

IGNORE vague answers such as ‘environmentally friendly’

(ii) any one from:
- loss of habitat/environmental problems
- limited (suitable) sites (available)
- ACCEPT costly to build

[Total: 7]

7 (a) tractor tracks have larger area (in contact with ground)
OR reverse argument for car

pressure (on ground) mentioned
OR weight spread out (over larger area) NOT pressure is spread out

correct argument linking pressure and area

(b) (i) any value or range of values >0 and < 24

(ii) any two from:
- (molecules) are slower/have less KE
- fewer impacts OR impact with less force
- (so) less force per unit area

[Total: 6]

8 (a) ray goes straight through 1st surface without changing direction
ray reflecting and NOT refracting at either inclined surface
ray reflected through 90° at either surface OR i = r marked
emerging ray parallel to incident ray

(b) (i) X-rays

IGNORE answers in boxes

(ii) any two from:
- sensor detects warm things/heat/changes in temperature
- person is warmer/at different temperature (than surroundings)
- person emits (more) IR (than surroundings)
(iii) any two from

- same speed (in vacuum, accept air)
- can travel in a vacuum
- transverse waves

**IGNORE** electromagnetic

**NOT** 2 obviously contradictory responses, e.g. transverse AND longitudinal scores 0

[Total: 9]

9  (a) N and S labelled correctly, N on left, S on right  B1

(b) Repels (a known) magnet/ attracts unmagnetised iron/steel  B1

(c) steel

alternative materials such as Magnadur and Alnico accepted  B1

(d) (Place inside) coil OR hammer it OR heat it  B1

- coil connected to a.c. (supply) OR hammer for long time
- OR heat to high temperature then cool  B1

(e) (i) electromagnet  B1

(ii) (magnetic field/magnetism) can be controlled /can be switched off  B1

(iii) suitable use e.g. crane for moving vehicles in scrap yards / relay / electric bells etc.  B1

[Total: 8]

10 (a) (i) copper  B1

(ii) \( \frac{V_p}{V_s} = \frac{N_p}{N_s} \) in any form OR voltage ratio calculated  C1

- correct substitution e.g. 240/ 6 = 6000/ \( N_s \)  C1

- 150  A1

(b) damp  B1

[Total: 5]

11 (a) ionising radiation OR radioactive emissions OR radioactivity  B1

from surroundings OR that is always present  B1
(b) GM tube OR Geiger counter accept radiation/film badge B1

(c) 86 B1

133 B1

86 B1

(d) (i) $\alpha$ B1

(ii) nucleus B1

(iii) electron: 0/zero/blank space neutron: 2 proton: 2 B1 B1

note: no mark for electron, but max. 1 mark for question if electron has any non-zero number

[Total: 10]

12 (a) thermistor correctly identified (by letter T) B1

(b) (i) ammeter NOT ampmeter B1

(ii) voltmeter B1

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

$3.2\div0.005$ C1

$640 \, (\Omega)$ A1

(c) (ii) increases B1

[Total: 7]