

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

MARK SCHEME for the May/June 2008 question paper

0625 PHYSICS

0625/31

Paper 31 (Extended 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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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

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

CIE is publishing the mark schemes for the May/June 2008 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 SYMBOLS

- 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. NOTE: M marks in questions 4 and 11.
- 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.

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- 1 (a) (i) v/t or $(v-u)/t$ or $28.5/3$ or his correct ratio
 9.3 to 9.5 m/s^2 C1
A1
- (ii) area under graph or $0.5 \times 3 \times 28.5$ or $\frac{1}{2}b \times h$ C1
 42 to 44 m (allow reasonable e.c.f.) A1
- (iii) 15 m/s B1
- (b) (plastic ball larger so) upward force/air resistance/drag more (or vice versa for rubber ball)
IGNORE wind resistance B1
rubber ball, this force not big enough to balance weight/gravity (force) B1
plastic ball, upward force/air resistance big enough to balance/equal weight/gravity
(force) B1
- (c) mg or 0.05×10 or 50×10 accept 9.8 or 9.81 instead of 10 C1
 0.5 N or 0.49N or 0.4905N nothing else A1
- [10]**
- 2 (a) fusion (of nuclei) CARE: NOT fission or fision ACCEPT fussion B1
condone radiation as an extra
- (b) radiant/heat energy from Sun or radiation from Sun)
energy from Sun raises temperature of water/heats water/melts ice)
energy from Sun evaporates water) any 3 B1 $\times 3$
PE in cloud)
rain)
stored water has PE)
- (c) (i) $25/100$ for gas-fired or $30/90$ for hydroelectric
or energy out/energy in or power out/power in B1
- (ii) $30/90$ or $1/3$ or 33% is more than $25/100$ or $\frac{1}{4}$ or 25%
OR lower input into hydroelectric station, but more output than gas-fired station B1
IGNORE hydroelectric losses less than gas-fired losses
- [6]**

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3	(a) mgh or $90 \times 10 \times 14$ accept 9.8 or 9.81 instead of 10 12 600 J or 12348 J or 12360.6 J nothing else		C1 A1
	(b) PE lost = KE gained or $mgh = \frac{1}{2}mv^2$ ($v^2 =$) 280 e.c.f. or 274.4 or 274.68 16.7 m/s e.c.f. or 16.565 m/s or 16.573 m/s NOTE: 16.8 m/s gets A0		C1 C1 A1
	(c) energy lost or friction/air resistance/drag/wind resistance		B1
			[6]
4	(a) (pushing rubber cover) volume reduced (when volume reduce), pressure goes up		M1 A1
	(b) $1 \times (10^5) \times 60 = 1.5 \times (10^5) \times V$ 40 (cm ³) reduction in volume = 20 cm ³ or 1/3		C1 C1 A1
	(c) (ave) speed of mols/particles/atoms greater at high temp NOT energy/KE stronger/more collisions with walls OR greater pressure		B1 B1
			[7]
5	(a) SOLID higher temperature means higher energy/greater speed of mols/particles/atoms NOT more vibration NOT vibrate more		B1
	vibrations get bigger or movement greater/take up more space or separation larger		B1
	GAS (ave) speed/energy of mols/particles/atoms greater (ave) separation of mols/particles/atoms greater or mols/particles/atoms take up more space or increased pressure causes container to get bigger		B1 B1 B1
	(b) liquids: slightly more gases: much more		B1 B1
	(c) regular/uniform expansion or appropriate range (be generous if numbers quoted) or expands a lot/large expansivity or (relatively) non-toxic or low freezing point/melting point or measures low temperatures any 1 IGNORE reacts to small temp change IGNORE high boiling point		B1
			[7]

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- 6 (a) (for all rays, ignore any arrows, -1 for each incorrect extra ray)
- | | | | |
|--|---|-------|--------|
| correct ray through $F_1 \pm 1\text{mm}$ on axis |) | | |
| |) | | |
| correct ray through $F_2 \pm 1\text{mm}$ on axis |) | any 2 | B1, B1 |
| |) | | |
| ray through lens centre $\pm 1\text{mm}$ on axis |) | | |
| image drawn between his intersection and axis | | | B1 |
- (b) virtual upright/erect magnified/enlarged further (from lens) any 3 B1 × 3
[6]
- 7 (a) (condone discontinuities at boundaries)
- mirror:**
- | | | |
|---|--|----|
| equally spaced reflected waves, approx. same spacing as incident (by eye) | | B1 |
| IGNORE reflected waves to left of arrowhead | | |
| correct angle to surface, by eye | | B1 |
- block:**
- | | | |
|--|--|----|
| reduced wavelength in block | | B1 |
| ACCEPT refracted waves to left of arrowhead | | |
| at sensible angle of refraction | | B1 |
| CONDONE reflected waves shown as well as refracted | | |
- (b) (i) $3 \times 10^8 / \text{speed in glass} = 1.5$ C1
 $2 \times 10^8 \text{ m/s}$ A1
- (ii) $\sin 70^\circ / \sin r = 1.5$ C1
 38.7895° to 2 or more sig figs A1
[8]
- 8 (a) all 4 lights in parallel with supply and none in series B1
master switch in a place where it will work (cannot score if no supply or if short circuit) B1
one switch for 2 lights in living room AND one for bathroom
AND one for bedroom B1
- (b) (i) $W = V \times I$ or $100 = 200 \times I$ in any form C1
 0.5 A or 0.5 a A1
- (ii) $I \times t$ or 0.5×60 e.c.f. C1
 30 C or 30 c e.c.f. A1

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- (c) (i) 135 W B1
- (ii) any power \times any time (words or symbols or numbers) C1
 NOTE: 280 (W) is the total power of lamps in house, so counts as “power”
- 486 000 J or 486 kJ or 0.135 kWh accept lower case units A1
 NOTE: $45 \times 3600 = 162000$ J gets e.c.f. from (i)
- [10]**
- 9 (a) 3 complete circles about thick wire, roughly concentric on wire B1
 clockwise or anticlockwise arrows on any 2 correct circles, and no contradictions B1
- (b) (i) reduced B1
- (ii) same OR none B1
- (c) (i) thin wire is a current-carrying conductor in a magnetic field B1
 field produced by current in thick wire B1
 OR alternative approach:
 (both wires produce a magnetic field B1)
 (fields interact B1)
- (ii) inwards/towards thick wire/to right/towards T_1T_2 B1
- (iii) smaller force B1
- [8]**
- 10 (a) correct symbol, must show 3 connections, condone rounded “nose”, ignore width of the shape, allow OR gate followed by NOT gate, correctly drawn B1
- (b) if truth table is shown, mark the truth table and ignore the rest
 either input 1, output 0 **AND** both inputs 1, output 0 B1
 both inputs 0, output 1 accept high/low, on/off for both B1
- (c) (i) one input is high/1 AND output is low/0 B1
 IGNORE any reference to 2nd input
- (ii) 1. on B1
 2. off B1
- [6]**

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- 11 (a) number of protons 17 and 17 B1
 number of neutrons 18 and 20 B1
 number of electrons 17 and 17 B1
- (b) alpha, beta, gamma words or symbols, any order NOT gamma particles B1
- (c) (mark (i) and (ii) together)
- (i) any correct use M1
- (ii) simple correct explanation A1

[6]