**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**GCE Ordinary Level**

# MARK SCHEME for the October/November 2007 question paper

# 5054 PHYSICS

**5054/02** Paper 2 (Theory), maximum raw mark 75

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 October/November 2007 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

UNIVERSITY of CAMBRIDGE
International Examinations

1 unit penalty per question, no sig. fig penalty **throughout paper**.

Section A

**1** **(a)** parachute opens or speed drops from (50 to 5 m/s) **or** decelerates (**e.g.** uniformly) **and** lands/hits ground **or** speed becomes 0 or stops (**e.g.** decelerates) B1

**(b)** accelerates **or** speed increases (**not** increasing acceleration) B1
acceleration decreases (to 0) **or** speed becomes constant B1

**(c)** forces balance/cancel **or** no resultant **or** equal and opposite (**not just** forces equal) B1
weight/gravity **and** air resistance/drag mentioned (**not** upthrust/friction) B1

**(d)** (d =) st **or** s=d/t or any speed x any time **or** area under graph C1
150 m A1 [7]

**2** **(a)** **(i)** take reading of liquid before rock placed in **or** pour in a known/specified volume **or** fill eureka can to spout/overflowing B1
take reading with rock and subtract **or** add rock **and** measure overflow B1

**(ii)** will not fit in **or** volume too large B1

**(b)** (d =) m/v **or** 101/22 C1
4.59 g/cm$^3$ A1

**(c)** C B1
mass/volume **or** density different **or** mass not proportional to volume B1 [7]

**3** **(a)** **(i)** geothermal B1

**(ii)** will not run out **or** infinite **or** being replaced (**not** can be used again/recycled) B1

**(b)** **(i)** (E =) mcT **or** 1000 x 4200 x 80 **or** whole equation rearranged C1
3.36x 10$^8$ J A1

**(ii)** (E=) mL **or** 100 x 2.3 x 10$^6$ **or** whole equation rearranged C1
2.3x10$^8$ J A1 [6]

© UCLES 2007

| | | | | | |
|---|---|---|---|---|---|
| **4** | **(a)** | good absorber (**not** good absorber and emitter) | (**not** attracts) | B1 | |
| | | radiation **or** infra red | (**not** heat) | B1 | |
| | **(b)** | hot water rises | (**not** heat rises) | B1 | |
| | | by convection (currents) **or** density explanation | | B1 | |
| | **(c)** | **(i)** reduce/avoid/prevent loss of heat | | B1 | |
| | | **(ii)** cover/wrap in lagging/any sensible material (**not** wood/insulation, **acc.** plastic tank) | | B1 | [6] |
| **5** | **(a)** | **(i)** atoms vibrate/move back and forth/to and fro | (**accept** particles/molecules) | M1 | |
| | | atoms hit neighbours **or** pass on heat/energy to neighbour | (**not** vibrations) | A1 | |
| | | **(ii)** atoms take up more space/further apart/larger vibrations | (**not** atoms larger) | B1 | |
| | **(b)** | atoms move throughout (liquid) or not in fixed places or arrangement irregular **or** broken bonds (**e.g.** atoms move faster) | | B1 | |
| | | atoms move at random/further apart (**e.g.** fixed volume/variable container shape etc.) | | B1 | [5] |
| **6** | **(a)** | cone/molecules vibrate | | B1 | |
| | | molecules (vibrate) longitudinally/back and forward (in direction of sound) **or** compressions **and** rarefactions mentioned (**e.g.** longitudinal waves) | | B1 | |
| | **(b)** | **(i)** a number from 18,000 to 22,000 Hz | | B1 | |
| | | **(ii)** ($v = f\lambda$) algebraic **or** numerical using 20 Hz **or** candidate's **(i)** | | C1 | |
| | | 17 m | | A1 | [5] |

© UCLES 2007

**7** **(a)** **(i)** steel B1

**(ii)** rod inside (coil) with current on (at some stage) B1

**(b)** **(i)** (soft) iron accept Mumetal or any other soft magnetic material B1

**(ii)** **all** lines directly join from left to right **and** top line goes down **and** bottom line up M1
no lines inside box **and** no lines cross/touch A1 [5]

**8** **EITHER**
any regular wave drawn (at least **one** complete wave) B1
amplitude 2 squares B1
time for 1 wave 0.04 (s) or f=1/T seen C1
2 complete waves drawn in 8 squares A1
**OR**
**(a)** water conducts/completes (LH) circuit B1
(small) current into (base of) transistor **or** $V_{BE}$ > 0.6 V B1
switches transistor on **or** (large) current from collector to emitter **or** in lamp B1
(lamp switches on alone 0)

**(b)** any sensible suggestion, e.g., warning of rain (**not** water level for the blind,
**not** automatic pump/windscreen wipers etc.) B1 [4]

Section B

**9** **(a)** **(i)** (acc =) (v-u)/t C1
14/3 C1
4.7 m/s$^2$ (penalise halving to 2.35 m/s$^2$, accept 2 or more sig figs **not** fractions) A1

**(ii)** F = ma or 5 x **(i)** C1
23 N (penalise **second** halving to 5.75 N, ecf **(i)** acc. 2 or more sig figs **not** fractions) A1

**(iii)** longer time of impact/slows down ball gradually/stops the ball more slowly B1
less acceleration B1 [7]

**(b)** **(i)** force / area **or** F/A (acc. force on unit area **not** force on an area; N/m$^2$) B1

**(ii)** larger area B1
smaller force B1 [3]

**(c)** **(i)** $P_1V_1 = P_2V_2$ **or** PV = constant C1
1.4 x 10$^7$ x 600 = P x 30000 **or** 1.4 x 10$^7$ x 600/30000 C1
280 000 Pa A1

**(ii)** molecules hit sides (of cylinder) (**not** each other) B1
molecules leave cylinder **or** fewer in cylinder **or** enter air bag B1 [5]

© UCLES 2007

**10 (a)** electrical circuit containing cell/source, ammeter/lamp/bell and component under test
**or** charged gold-leaf electroscope and component **or** other sensible apparatus M1
**one** correct observation A1
named conductor (any metal/carbon/graphite **accept** water) B1
named insulator (e.g. plastic **accept** paper **and** wood) B1 [4]

**(b) (i)** voltage/current **or** V/I **not** volts/amps B1

**(ii)** resistance increases at higher p.d. (**not** resistance increases) B1

**(iii)** (filament) lamp/bulb or **PTC** thermisitor (**not** metal conductor) B1

**(iv)** temperature changes C1
higher current/voltage produces higher temperatures A1 [5]

**(c) (i)** 1.0A **both** for $A_1$ and $A_4$ B1

**(ii)** (V=) IR in any form or 20 x 0.4 C1
8(.0) V A1

**(iii)** 8 V or same as **(ii)** B1

**(iv)** **(ii)** / 0.6 C1
13 Ω (accept 2 or more sig figs **or** recurring decimal **not** fractions ) A1 [6]

**11 (a) (i)** (as it enters) bends towards normal B1
(as it leaves) bends away from the normal B1

**(ii)** speed **and** wavelength change C1
speed **and** wavelength decrease A1
frequency unaltered B1

**(iii)** sin(i)/sin(r) C1
sin 40°/sin 25° C1
1.5(2) (penalise °, accept 2 or more sig figs; **1.5 alone** with no working B1) A1 [8]

**(b) Mark (i) and (ii) separately unless specifically referred to (i) in (ii)**

**(i)** **Words:** distance between (principal) focus/focal point (**not** F) and lens M1
centre of lens A1
**Diagram:** F/(principal) focus/focal point marked **and** lens marked/curved faces/triangles
**and** correct arrow of some sort M1
f/FL/fl/focal length marked **and** arrow from centre of lens to F A1

**(ii)** diagram showing object, lens and **one** correct ray M1
**second** correct ray M1
correct image shown (½ < h < 1) A1

**(iii)** smaller / de-magnified / e.c.f **(ii)** B1
upside down B1

© UCLES 2007