UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the May/June 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 May/June 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, expect 2 or more sig. figs and 1 where 2nd fig is zero.
Fractions are treated as not showing final answer but can score C marks. Accept a fraction in Question 5.

Section A

1 **(a)** accelerates or speed increases **from rest/for 2-4s/for 8-20m** B1
then a constant/uniform speed **or** velocity B1

(b) between 7 and 8 m B1

(c) distance 80 (+ 2) or s= d/t in any algebraic or numerical form C1
7.3 **or** 7.27 **or** 7.273 m/s A1 [5]

2 **(a)** **(i)** **molecules** move faster or more **kinetic energy** (when hotter) B1
(more) **molecules** have (enough) energy/speed **and** escape/leave surface/ break bonds/overcome forces of attraction B1

(ii) large(r) area or wind or drier/dry atmosphere/draught or lower **atmospheric** pressure B1

(b) 40 seen or (E=) mL algebraic or numerical C1
92000 J A1 [5]

3 **(a)** mention of lower and upper fixed points **or** 0(ºC) and 100(ºC) **or** ice point/steam point B1
(marks made on) thermometer with ice/**water** mixture
and (steam above) boiling water (at atmospheric pressure) B1
divided into 100 (equal) parts (**accept** 10 parts marked 10,20 etc.) B1

(b) **(i)** 120ºC **or** –10ºC to 110ºC B1

(ii) each degree/scale marking/10ºC/division is an equal distance/0.9–1.1mm/cm/expansion
or appropriate graph a straight line B1

(c) 10ºC and 20ºC marks clearly further up thermometer **and** roughly equal spacing B1 [6]

4 **(a)** reflections correct by eye B1

(b) **all** the ray **reflects** back (into the denser medium/glass)
or reflection **and** no refraction/escape into air B1

(c) more calls **or** greater bandwidth **or** more/faster data(/sec)/information **or** better quality **or** less power loss/energy loss/attenuation **or** greater distance (between repeaters) **or** harder to tap **or** less noise/interference B1

(d) $f = v/\lambda$ in any form numerical or algebraic C1
3.3×10^{14} Hz A1 [5]

5 **(a)** any ray from top of object correct through lens within 1mm of optical centre or F B1
other ray from same point correct through lens meeting 1st ray **and** none wrong B1

(b) **(i)** image size/object size (accept image distance/object distance **or** v/u) B1

(ii) 0.55–0.65 **ecf diagram in (a) sizes or distances** B1

(c) rays completed to retina but would meet behind retina B1 [5]

6 **(a)** at least 3 approx straight lines in middle of coil B1
one loop around top or bottom of coil B1
correct direction shown on at least one line or loop B1

(b) **(i)** 100 oscillations/cycles/waves/changes in direction (and back again) in 1 sec
or time for one oscillation etc. 0.01s B1

(ii) coil/cone moves left to right **or** back and forth **or** oscillates/vibrates **or** in and out B1
(current in) coil produces magnetic field/pole(s)
or Left Hand Rule/current in magnetic field (gives force) B1
fields/poles (of coil) oscillate/reverse B1
force (exerted by magnet) oscillates/alternates (**accept** attracts/repels) B1 ANY 2 B2 [7]

7 **(a)** **(i)** 6 Ω B1

(ii) $1/R = 1/R_1 + 1/R_2$ algebraic or numerical C1
2 Ω A1

(b) $I = V/R$ algebraic or numerical C1
6 A ecf (ii) A1

(c) (I =) 2 (A) **or** proportionality idea/potential divider idea seen C1
8 V A1 [7]

8 **(a)** different number of neutrons/ mass number B1

(b) **time** taken to halve M1
(number of) nuclei/atoms/activity/count (rate)
(**not** radioactivity/amount/mass/substance/clearly **one** nucleus/particles) A1

(c) **mark on graph** at 2000 or at two suitable points B1
12 s B1 [5]

Section B

9 (a) (i) *A* = *B* (assume opposite direction and co-linear) B1

(ii) B > A (assume opposite direction and co-linear) B1 [2]
maximum of 1 mark if directions wrong

(b) towards **centre** of circle/corner B1 [1]

(c) (i) 0 **and** 8–9 s B1

(ii) chemical (potential energy) (**accept** electrical if electrical car clear) B1
to kinetic energy **or** K.E. increases B1
thermal energy/heat/internal energy produced B1
Max 2/3 if clear error

(iii) acceleration = (*v*–*u*)/t **or** gradient C1
(7.8 to) 8/5 (**accept** any corresponding period e.g. 8s 12.6–12.8, 6s 9.4–9.6) C1
1.6 m/s^2 (**accept** 1.56–1.60) A1

(iv) area under graph **or** average speed 4 (m/s) **or** ½ 5 speed used in **(iii)** at 5 s C1
½ x (7.8 to) 8 x 5 C1
20 m (**accept** 19.5–20; **ecf speed used in (iii)** at 5 s) A1 [10]

(d) speed of car/friction with road (accept slippery road or ice or water or oil on road)/ friction in engine/tyre condition or area or pressure/air resistance/wind speed or direction/mass or inertia **of car or passengers**/slope of road B2 [2]

10 (a) resistance of cables B1
power/energy/heat loss **or** voltage drop **or** current low in cables/wires clear B1 [2]

(b) low(er) current in line **or** less voltage drop/power/heat/energy loss B1
A steps voltage up or increases voltage or reduces current B1
B steps voltage down or decreases voltage or increases current B1 [3]

(c) (i) two coils (no label needed) M1
coils labelled/described primary/input **and** secondary/output
or insulated **or** copper A1
coils on complete (soft) iron (core) B1
(accept from labelled diagram or description)

(ii) alternating/changing **current** input B1
(alternating) magnetic field (produced in core **or** coil) B1
induced e.m.f./voltage/current (in secondary coil) B1 [6]

(d) (i) I = P/V algebraic or numerical C1
3 A A1

(ii) E = VIt **or** Pt algebraic or numerical **or** 600 (s) used C1
414 000 (J) **or** 414kJ **or** 410 000 (J) A1 [4]

11 (a) –ve charge/electrons moves or rod gains electrons C1
–ve charge/electrons move from cloth to rod A1
positive electrons scores 0/2 in **(a)** and **(b)(i)** +ve moves max 1 mark

(b) (i) (electrons) move to right/to X/to opposite side (to rod) / B1
(electrons or –ve) repelled (by rod) or like charges repel B1

(ii) +ve on left and –ve on right, inside or outside sphere B1

(iii) +ve attracted to rod or unlike charges or +ve and –ve attract B1
repulsion of –ve on sphere (by rod) weaker (than attraction) B1 [7]

(c) (i) connection of sphere to earth/ground/0 V B1

(ii) move down to the ground/earth **or** electrons on right/at X removed B1
repelled (by –ve on rod) **or** move from –ve to 0 potential B1

(iii) only +ve on sphere at left or clearly more positive on left than on right B1 [4]

(d) Sensible example of a **use** of charging,
e.g. precipitator, photocopier, spray painting, gold leaf electroscope, plates in CRO M1
ink jet printer, Van de Graff generator, piezoelectric devices, capacitor, lightning conductor
simple diagram showing effect A1
a correctly charged object clear A1
description of the function that the charge performs A1 [4]