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.

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 x 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]