Coimisiún na Scrúduithe Stáit
State Examinations Commission

Scéimeanna Marcála   *Scrúduithe Ardteistiméireachta, 2003*

Fisic agus Ceimic   *Gnáthleibhéal*

Marking Scheme   *Leaving Certificate Examination, 2003*

Physics and Chemistry   *Ordinary Level*

Leaving Certificate Examination

2003

Physics & Chemistry
Ordinary Level

Marking Scheme

SECTION 1 – PHYSICS

Answer any three questions

1. Answer *eleven* of the following items (a),(b),(c) etc.

   (a) 2×3   (b) 2×3 (c) 2×3 (d) 6 (e) 2×3 (f) 2×3 (g) 2×3
   (h) 6 (i) 6   (j) 2×3 (k) 2×3   (l) 6   (m) 2×3 (n) 2×3
   (0) 2×3

2. (a) Define 4×3   Calculate 8×3
   (b) State 4×3   Calculate 6×3

3.   State 4×3   Describe 5×3   Give 6
       Complete 3×3   Give 6   Draw 4×3   Give 6

4. (a) What 2×3   Name 2×3   Describe 6×3
   (b) Explain 3×3   Give 2×3   What 2×6   Calculate 3×3

5.   State 3×3   What 2×3   Explain 2×3   Name 6
       Complete 7×3 Sketch 3×3   Name 2×3   Give 3

6.   *Answer any two of the following parts*. Each part carries 33 marks.

   (a)   What 4×3   Describe 7×3
   (b)   What 2×3   What 2×3   Describe 2×3   What 6
           Describe 3×3
   (c)   State 3×3   Name 5×3   What 3   Name 6
   (d)   What 6×3   How 3×3   Give 6

**NOTE: All questions carry the same number of marks.
However, one additional mark will be given to each of the first two
questions in each Section for which the highest marks are obtained
by the candidate**

Deduct 1 for incorrect /no units where indicated.

SECTION 11 – CHEMISTRY

Answer any three questions

7.   Answer *eleven* of the following items (a),(b),(c) etc.

(a) 2×3   (b) 6 (c) 2×3   (d) 6 (e) 2×3 (f) 2×3 (g) 2×3

(h) 2×3 (i) 2×3 (j) 6 (k) 6 (l)   2×3 (m) 2×3   (n) 6   (o) 6

8.   Explain 4×3   Complete 3×6 2×3   What 6
        Give 4×3   State 6   Use 2×3

9.   Define 4×3   Give 6   Explain 2×6

        Name 2×6   Give 2×6   Calculate 4×3

10.   (a) Define 4×3   Name 2×3   State 2×3 Name 2×3   Give 6

        (b) Define 2×3   Calculate 8×3

11.   What 3×3   Explain 4×3   Name 2×6   What 2×6

        Explain 2×3   Describe 3×3 Draw 2×3

12.   *Answer any two of the following parts*. Each part carries 33 marks.

        (a)   Name 2×6   What 2×3   Describe 3×3   Give 2×3

        (b)   Outline 4×3   Sketch 4×3   Use 9

        (c)   Give 9×3   What 2×3

**NOTE: All questions carry the same number of marks.
However, one additional mark will be given to each of the first two
questions in each Section for which the highest marks are obtained
by the candidate**

Deduct 1 for incorrect / no units where indicated.

SECTION I – PHYSICS

QUESTION 1

Answer any eleven parts

(a)   *(E$_k$)*   energy due to / example   …   3
                    motion   …   3

$$[\tfrac{1}{2}\,mv^2 \qquad … \qquad 2\times3\,]$$

(b) $E_p = mgh$ / $E_p = 40 \times 10 \times 20$ …   3
                               $= 8000$ …   3

(c) $F = ma$ / $F = 1000 \times 5$ …   3
                               $= 5000$ …   3

(d)   refraction   …   6
                [bending   …   3 only]

(e)   heating / photoelectric / blackened bulb   …   3
    longer / bigger / higher   …   3

(f)   *(Boyle's law)*
    pressure (*p*) / pV / p_1V_1 …   3
    inversely proportional to volume / $\propto 1/V$ / $= k$ / $= p_2V_2$ …   3

(g)   *(ideal gas)*
    obeys Boyle's law (gas laws) / satisfies K.T. assumptions   …   3
    always / exactly / at all temperatures and pressures   …   3

(h) distance / area / permittivity (dielectric, medium)/ voltage (V)

                                                    any one   …   6

           [charge (Q)   …   3 only]

(i) less heat (energy / power) loss (wasted) /
more economical (efficient)   …   6

(j) $P = VI$ / $60 = I \times 240$ …   3
          $I = 0.25$ …   3

       [240÷60 / 4   …   3 only]

(k) $R = R_1 + R_2$ / $R = 3 + 5$ …   3
                  $= 8$ …   3
      [$1/R = 1/R_1 + 1/R_2$ …   3 only]

(l) galvanometer / ammeter / voltmeter / ohmmeter /
loud-speaker / d.c. motor etc.

                                                      any one   …   6

(m) electrons / particles / rays   …   3
          radiation / light   …   3

(n) (i) alpha   …   3
    (ii) gamma   …   3
        [reverse order …   3 only]

(o) *(nuclear fission)*
nuclei / atoms / elements   …   3
split up   …   3
       [example   …   3 only]

Question 2

(a) Define (4×3)

(velocity)   (i)   rate of change / change of displacement / speed / $\underline{s}$ …   3
             of displacement / w.r.t. time / in given direction / t …   3

          [units …   3 only]

(acceleration)(ii)   rate of change / change in velocity / $\underline{v-u}$ …   3
             of velocity (speed) / w.r.t. time / t …   3

          [F = ma /units   …   3 only]

Calculate (8×3)

        (i) $v = u + at$ …   3
                 $= 0 + 4(1.5)$ …   3
                 $= 6 \text{ m s}^{-1}$ …   3

                 incorrect / no units (−1)

    (ii) $s = ut + ½ at^2$ 3
                $= 0 + ½ (1.5) (4)^2$ … 2×3
                $= 12 \text{ m}$ …   3

                 incorrect / no units (−1)

    (iii) $30 = 0 + ½ (1.5) t^2$ / 6.3 s   …   3

                 incorrect / no units (−1)

(b) State (4×3) *(P.C.M.)*

          when bodies collide   / no external forces / closed system   …   3
          momentum before / $m_1u_1 + m_2u_2$ …   3
          equals / =   …   3
          momentum after / $m_1v_1 + m_2v_2$ …   3

          [$mu = mv$ …   6 only / mu …   3 only]

Calculate (6×3)

        $m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2 \ / \ m_1v_1 + m_2v_2 = 0$ … 2×3

                [mu …   3 only]
      $(80)(2.5) + (160) v_2 = 0$ …   3×3

              $v_2 = 1.25 \text{ m s}^{-1}$ …   3
              incorrect / no units (−1)

Question 3

State (4×3)

I	incident ray (angle), normal, reflected ray (angle)	…	3
	on the same plane	…	3

II	angle of incidence	…	3
	= angle of reflection	…	3
	[refraction … 0]		

Describe (5×3)

Apparatus	concave mirror	…	3
	object	…	3
	screen / locating pin	…	3

Method	correct arrangement shown (stated)		
	focus (clear) image		
	move screen / pin		
	correct measurements		
	correct formula **any two**	…	2×3

[approximate method - mark according to the scheme]

Give (6)	narrow beam of light / repeat for other values of u /		
	repeat and take an average / $u > f$ / approx. value for f /		
	no parallax (stated or implied) / steady apparatus		
	any one	…	6
	[repeat … 3 only]		

Complete (3×3)

	one ray correct to mirror	…	3
	correct reflection	…	3
	2nd ray correct	…	3
	[convex mirror … 2×3]		

Give (6)	shaving (make-up) mirrors / searchlights / floodlights /		
	torch / headlights / dentist / microscope etc. **any one**	…	6

Draw (4×3)

	lens	…	3
	object	…	3
	1st correct ray	…	3
	2nd correct ray	…	3

Give (6)	spectacles (glasses) / microscope / telescope /		
	binoculars / camera / magnifying glass etc.		
	any one	…	6

QUESTION 4

(a) What (2×3)

(*temperature*)   is a measure (degree) 3

                 of hotness (coldness) 3

Name (2×3)   Celsius / Kelvin / Fahrenheit   **any two**   ... 2×3

Describe (6×3)

Apparatus   mercury thermometer / beaker / heat source / ice / steam (boiling water)   **any three**   ... 3×3

Method   mark in ice (freezing point) 3

            mark in steam (b.p.) 3

            measure distance between the two points / divide up equally/ draw a graph 3

(b) Explain (3×3)

(*therm. property*)   changes .... 2×3

                 with temperature (heat) 3

Give (2×3)   length / mercury / alcohol / emf / voltage / colour / volume / pressure / gas   **any two**   ... 2×3

What (2×6)

    (i)   freezing point (0°C) 6

    (ii)   steam point (100^{0}C) 6

    [resistance   ...   6 only]

Calculate (3×3)   66 – 60 3

                    68 – 60 3

               75 ^{0}C 3

incorrect / no units (−1)

QUESTION 5

State (3×3)	force / *F*	…	3
	$\propto$ *(=)* the product of the charges / $Q_1 Q_2$	…	3
	inversely proportional to distance squared / $\propto 1 / d^2$ …		3
What (2×3)	leaves / charges	…	3
	collapse / converge / flow	…	3
Explain (2×3)	metal / electrons / charges	…	3
	conductor / flow / attract	…	3
Name (6)	amps (A)	…	6
	[coulombs … 3 only]		

(7×3)
Complete

X = ammeter / galvanometer

current / amps

Y = voltmeter

voltage

Name	Z = rheostat / resistor		
What	vary voltage (current)		

	1st correct	…	2×3
	next 5 correct	…	5×3

[metre for X and Y …   3 max]

Sketch (3×3)	two axes	…	3
	label one axis	…	3
	line through the origin	…	3
Name (2×3)	any two correct examples	…	2×3
Give (3)	chemical / magnetic	…	3

QUESTION 6

Answer any two parts

(a) What (4×3) G = Gravitation / gravity
                                             constant
   M = mass of the earth (planet)
   r = radius (distance)

1st correct	…	**2×3**
remainder	…	**2×3**

Describe (7×3)

Apparatus   pendulum, string, ruler, timer   …   4×3
(electromagnet, ball, ruler, timer)

Method   measure the length (height)
time for one oscillation (several oscillations / ball to fall)
one precaution
state correct formula   **any three**   …   3

(b) What (2×3)   (i)   wavelength / distance between two crests   …   3

   (ii)   amplitude / height of crest (wave)   …   3

What (2×3)   waves (cycles)   …   3
per second   …   3
      [$c = f \times \lambda$ / $f = 1/T$ ...   2×3]

Describe (2×3)
(show / state)
         wave spreads out   …   3
         into region beyond the slit   …   3
               [no diagram … deduct   3]

What (6)   diffraction / interference   …   6
      [reflection / refraction   …   0]

Describe (3×3)
         list the apparatus used   …   3
         outline the method used   …   3
         describe the result   …   3

         [explain interference   …   2×3]

(c) State (3×3)

emf (current)	…	3
induced	…	3
∝ rate of change of magnetic flux (field) /		
opposes the change	…	3

[correct formula   …   2×3]
[factors that effect *I or V*   /
suitable diagram (magnet, coil, galvo)   …   2×3 max]

Name (5×3)

A = magnet
B = coil / rotor
C = rings   **1st two correct**   …   4×3
                           3rd correct   …   3

      [B = conductor / wire   ...   3]

What (3)

connects coil to the brush / allows current to flow /
collects current/ rings move with coil etc.   …   3

Name (6)   transformer / induction coil etc.   …   6
                  [electromagnet / electric motor   …   3 only]

(d) What (6×3)

(i) *radioactivity*   decay /disintegration / unstable   …   3
                     of nuclei (atoms)   …   3
                     with the emission of radiation
                     (energy, particles, alpha, beta, gamma)   …   3

(ii)   *half-life*   time for half / time for   …   3
                     nuclei (atoms) / activity (mass)   …   3
                     to decay / to half   …   3

How (3×3)   ½ / ½ / ½   …   3×3

Give (6)   don't handle directly / store in a safe place /
wear protective clothing / reduce duration of exposure /
do not drink (eat) near source etc.
                                     any one   …   6

SECTION II - CHEMISTRY

QUESTION 7

Answer any eleven parts

(a) *(I.E.)*

    energy to remove   …   3

     electron   …   3

(b)   *p* orbital   …   6

                [*s / d*   …   3]

(c) *(exothermic reaction)*

    heat / energy   …   3

    given out   …   3

(d)   unequal sharing of electrons / large EN difference /

           molecule has a dipole moment etc.   **any one**   …   6

           [electron /

           correct e.g. showing unequal sharing of electrons   …   3 only]

(e) *(Hess's law)*

    heat change   …   3

    independent of the path   …   3

(f) $ZnCl_2 + H_2$ complete   …   3

                    $Zn + 2HCl$ balance   …   3

           [two different products shown / one correct product   …   3 only]

(g) M_r of C_2H_6 = 30   …   3

                    %C = 80 / (24 ÷ 30)   …   3

(h)   change (alter)
              the speed (rate)
              does not take part in the reaction   **any two**   …   2×3
                    [example   …   3]

(i) $pH = -log [H^+]$ / $pH = -log [0.02]$ …   3
                                        $pH = 1.7$ …   3
              [$log [H^+]$ / $log [OH^-]$ …   3]

(j)   vinegar / used on food / solvent / rayon / cellulose acetate etc.
                                        any one   …   6

(k)   variable valency / coloured compounds / catalysts
                                      any one   …   6
              [incomplete inner shell / $4s^2$ …   6]
              [magnetic / stable / metals   …   3 only]

(l)   32 g (1 mole) $O_2 \rightarrow 6 \times 10^{23}$ molecules / 0.0125 moles / 1÷80   …   3
     7.5×10^{21} …   3

(m) H_2 …   3
       O_2 …   3

(n)   acetone (propanone) / $(CH_3)_2CO$ …   6
     [functional group / name ending in –one   …   3 only]

(o)   benzene (C_6H_6) / phenyl (C_6H_5)   …   6

             [aromatic / hydrocarbon   …   3 only]

QUESTION 8

Explain (4×3)
(i) *(A_r)*   mass of an atom   …   3
              compared with ($\frac{1}{12}$ th)of the mass of C (12) atom   …   3

(ii) *(valency)*   no. of electrons / no. of bonds / combining power / charge …   3
                   lost or gained   / formed   / of an atom / on an ion   …   3

Complete (3×6, 2×3)

	Atomic No.	No. of neutrons	Mass No.
Chlorine			37
Potassium	19	20	
^{12}C		6	12
^{14}C	6	8	14

1ˢᵗ three correct   …   3×6
next two   …   3
remainder   …   3

What (6)   isotopes / definition implied   …   6
                [carbon   …   3 only]

Give (4×3)
   (i) *(Cl)* $1s^2$ / $2s^2$ $2p^6$ / $3s^2$ $3p^5$

   (ii)*(K)* $1s^2$ $2s^2$ / $2p^6$ $3s^2$ / $3p^6$ $4s^1$

                                                 1ˢᵗ correct   …   3×3
                                                 2ⁿᵈ correct   …   3

              [2 parts correct   …   3;
                   remainder   …   3 to a max of 3×3]

State (6)   ionic / implied from the formula   …   6

Use (2×3)   K one electron, Cl seven electrons   …   3
                 show the transfer of electrons   …   3

                 [K⁺ Cl⁻   …   3]

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QUESTION 9

Define (4×3)

| (i) *(acid)* | proton / H$^+$ | … | 3 |
| | donor | … | 3 |

| (ii) *(base)* | proton / H$^+$ | … | 3 |
| | acceptor | … | 3 |

[reverse order … 3×3]

Give (6)   burette   …   6

Explain (2×6)
rinse with water /
rinse with acid /
steamer/
place funnel in burette /
fill above the mark /
open tap / allow liquid to run through
bring meniscus to mark   **any two**   …   2×6

Name (2×6)
pipette / flask / funnel / beaker / pipette filler /
stand / white tile (paper)   **any two**   …   2×6

Give (2×6)
white tile /
add acid slowly (dropwise) /
swirl flask /
wash down the sides of the flask /
read bottom of the meniscus /
rough titre /
two or more accurate titres /
indicator / example   **any two**   …   2×6

Calculate (4×3)

$$\frac{M_1 V_1}{n_1} \quad = \quad \frac{M_2 V_2}{n_2} \qquad \dots \qquad 2\times 3$$

$$\frac{0.1 \times 28.5}{1} \quad = \quad \frac{M_2 \times 25}{1} \qquad \dots \qquad 3$$

$$M_2 \quad = \quad 0.114 \; / 2.85 \div 25 \qquad \dots \qquad 3$$

[reverse 25÷28.5   slip (-1)]

QUESTION 10

(a) Define (4×3)
   (i) *(oxidation)*   loss   …   3
                                  of electrons   …   3

   (ii) *(reduction)*   gain   …   3
                                  of electrons   …   3

                           [reverse order … 9]

  Name (2×3)   X = anode   …   3
                         Y = cathode   …   3
                           [reverse order … 3]

  State (2×3)   (i) anode / X   …   3
                           (ii) cathode / Y   …   3
                           [reverse order … 3]

  Name (2×3)   X = oxygen   …   3
                         Y = hydrogen   …   3
                           [reverse order … 3]

  Give (6)   electroplating / extraction of metals etc.
                                          any one   …   6

(b) Define (2×3)
   (heat of comb.)   heat change / one mole   …   3
                             burned   …   3

  Calculate (8×3)
     (i)   one mole releases 1300 kJ
             2600

     (ii)   one mole releases 2 moles CO_2
             4 moles CO_2

     (iii) M_r of C_2H_2 = 26
                    6.5 g = 6.5/26 = 0.25 moles
                                         325 kJ
                                         1st correct   …   4×3
                                         2nd correct   …   2×3
                                         3rd correct   …   2×3

QUESTION 11

What (3×3)
(hydrocarbons)

compound / only		…	3
carbon		…	3
hydrogen		…	3
[chemical formula	…	3×3]	
[named example	…	6]	

Explain (4×3)
(i) *(h. series)*

successive members differ by CH_2 /
same general formula /
gradual change in physical properties

any one … 2×3

[example / same functional group … 3]

(ii) *(f. group)*

atoms	…	3
which determine the chemical properties	…	3

Name (2×6)

(i)	alkanes (paraffins)	…	6
(ii)	alkenes (olefins)	…	6

[reverse order … 9; alkynes … 3]

What (2×6)

(i)   - OH / hydroxyl   …   6

[alcohol   …   3]

(ii)   - CHO   …   6

[aldehyde   …   3]

[reverse order …   9]

Explain (2×3)
(unsaturated)

double (triple)	…	3
bonds	…	3

[not all valencies satisfied   …   3]

Describe (3×3)

decolourises	…	2×3
bromine (potassium permanganate)	…	3

Draw (2×3)

functional group correct	…	3
remainder correct	…	3

QUESTION 12

Answer any two parts

(a) Name (2×6)   A = acid   …   6

                                 B = carbonate /marble / acid   …   6

                                      [reverse order   …   9]

What (2×3)   denser / heavier   …   3

                                   than air   …   3

Describe (3×3)   limewater

                                 turns milky   **1st correct**   …   2×3

                                                        2nd correct …   3

                                 [quenches a lighted splint   …   2×3 only]

Give (2×3)   acidic / does not support combustion etc

                                                    any one   …   3

                                 fire extinguishers / special effects /

                                 fizzy drinks / refrigerant etc.   **any one**   …   3

(b) Outline (4×3)   electron   …   3

                                   pairs   …   3

                                   repel   …   3

                                   as far apart as possible   …   3

                                 [lp:lp > lp:bp > bp:bp …   4×3]

Sketch (4×3)   any two correct (2D) shapes   **any two**   …   2×3

                                 position of atoms correct   **any two**   …   2×3

Use(9)   lone pairs (show / state)   …   9

                             [bond pairs   … 6; bond angle / repulsion   …   3]

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(c) Give (9×3)

name	formula
carbon monoxide	CO
carbon dioxide	CO_2
sodium oxide	Na_2O
aluminium oxide	Al_2O_3
sulphur dioxide	SO_2
sulphur trioxide	SO_3

any three correct names ... 3×3
any three correct formula ... 3×3
three correct matches ... 3×3

[explain acid, basic, neutral ... 3×3]

What (2×3)   an acid   ... 3
                       or a base   ... 3
                 [example   ...   3]