



Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE 2010

MARKING SCHEME

CHEMISTRY

ORDINARY LEVEL

Introduction

In considering the marking scheme the following should be noted.

1. In many cases only key phrases are given which contain the information and ideas that must appear in the candidate's answer in order to merit the assigned marks.
2. The descriptions, methods and definitions in the scheme are not exhaustive and alternative valid answers are acceptable.
3. The detail required in any answer is determined by the context and the manner in which the question is asked, and by the number of marks assigned to the answer in the examination paper, and in any instance, therefore, may vary from year to year.
4. The bold text indicates the essential points required in the candidate's answer. Words, expressions or statements separated by a solidus (/) are alternatives which are equally acceptable. A word or phrase in bold, given in brackets, is an acceptable alternative to the preceding word or phrase. Whilst only key words and phrases are indicated in the marking scheme they must be presented in answers in a correct context if full marks are to be awarded.
5. In general names and formulas of elements and compounds are equally acceptable except in cases where either the name or the formula is specifically asked for in the question. However, in some cases where the name is asked for, the formula may be accepted as an alternative.
6. There is a deduction of one mark for each arithmetical slip made by a candidate in a calculation.

Outline Marking Scheme

Eight questions to be answered in all. These *must* include at least two questions from Section A.

Section A

Question 1

(a), $(5 + 3)$; (b), $(3), (3)$; (c), $[6 + (3 \times 3)]$; (d), $(9 + 3)$; (e), (3×3)

Question 2

(a), $(5 + 3)$; (b), $(6 + 3)$; (c), $(3), (3)$; (d), $(9 + 3)$; (e), (6) ; (f), (9)

Question 3

(a), $[(3 \times 3) + (3 \times 3)]$; (b), $[(4 \times 6) + (2 \times 4)]$

Section B

Question 4

Eight highest scoring items to count.

One additional mark to be added to the first two items for which the highest marks are obtained.

(a), (6) ; (b), (2×3) ; (c), (2×3) ; (d), (6) ; (e), (6) ; (f), (6) ; (g), (6) ; (h), (2×3) ; (i), (6) ; (j), (2×3) ; (k), (2×3)

Question 5

(a), $(5), [6 + (2 \times 3)]$; (b), $(3), (3), (2 \times 3)$; (c), $(2 \times 3), (6)$; (d), $(2 \times 3), (3)$

Question 6

(a), $(5), (2 \times 3)$; (b), (2×3) ; (c), $[9 + (2 \times 3)]$; (d), $(9 + 6 + 3)$

Question 7

(a), $(5 + 3)$; (b), (2×3) ; (c), (3×3) ; (d), $(3), (6)$; (e), $[9 + (3 \times 3)]$

Question 8

(a), (5) ; (b), $(9 + 3)$; (c), (6) ; (d), $(2 \times 3), (6), (3), (3)$; (e), (2×6)

Question 9

(a), $(3 + 2), (2 \times 3), (6), (2 \times 6)$; (b), $[9 + 6 + (2 \times 3)]$

Question 10

(a); (i), $(4 + 3)$; (ii), (6) ; (iii), $(6), (6)$

(b); (i), $(4 + 3)$; (ii), (6) ; (iii), $[6 + (2 \times 3)]$

(c); (i), $(4 + 3)$; (ii), (6) ; (iii), $(9 + 3)$

Question 11

(a); (i), (4) ; (ii), $(6 + 3)$; $(6 + 3)$; (iv), (3)

(b); $[9 + 6 + 4 + (2 \times 3)]$

(c); **A**; (i), (6) ; (ii), (6) ; (iii), (6) ; (iv), $(4 + 3)$

B; (i), $(4 + 3)$; (ii), (3) ; (iii), (3) ; (iv), (3×3) ; (v), (3)

Question 1

- (a) Name: **Ethanol**
Formula: **C₂H₅OH / CH₃CH₂OH** (5 + 3)
- (b) Identify: **Aluminium oxide / Al₂O₃** (3)
Describe: **White** (3)
- (c) (i): **At end of test tube**
(ii): **At middle of test tube**
(iii): **Under the solid**
How: **Glass wool** [6 + (3 × 3)]
- (d) What action: **Remove the delivery tube from the water trough**
What happens: **Suck –back / test tube crack** (9 + 3)
- (e) What colour: **Purple (pink) //
to colourless** [Allow 3 for decolourises]
What info.: **Unsaturated** (3 × 3)

Question 2

(a) Name: **A: Wash bottle**
B: Volumetric flask (5 + 3)

(b) Explain: (i): **One of known (exact) concentration**
(ii): **Substance from which a solution of exact concentration can be made //**
Substance which is stable, available pure and water soluble (6 + 3)

(c) What: **Contains no water** of crystallisation (3)
Give: **Stable / available pure / soluble in water** (3)

(d) Describe: **Rinsing the beaker (clock glass, glass rod) into the volumetric flask //**
Topping up the volumetric flask //
Washing down the sides of the titration flask [Any 2 (9 + 3)]

(e) Show: **$5.3 \div 106 = 0.05$** (6)
[Allow 3 marks for arriving at the M_r of 106]

(f) Calc.: **0.09 M** (9)

$\frac{27.5 \times M}{2} \quad (3) = \frac{25.0 \times 0.05}{1} \quad (3)$ $\text{Concentration} = \mathbf{0.09 M} \quad (3)$
--

Question 3

- (a) Give: Clean **probe** / soak **splints** overnight //
Dip probe (splint) in salt solution //
Insert probe (splint) in hottest part (top of blue cone) of **Bunsen flame** and
observe colour (3 × 3)
- Lithium: **Crimson / red**
Sodium: **Yellow / orange**
Potassium: **Lilac / purple** (3 × 3)
- (b) (i): ion: **Nitrate / NO₃⁻**
obs.: **Brown ring**
- (ii): ion: **Chloride / Cl⁻**
obs.: **White precipitate**
- (iii): ion: **Sulfate / SO₄²⁻**
obs.: **White precipitate** [(4 × 6) + (2 × 4)]

Question 4

Add one mark to the mark awarded to the first two items for which the highest mark is awarded.

- (a) Name: **Rutherford** [Accept Geiger or Marsden] (6)
- (b) State: **Arranged in terms of atomic weight // left gaps for undiscovered elements // reversed some pairs of elements // no noble gases** (2 × 3)
- (c) Define: **Sharing // of electron pair(s)** (2 × 3)
- (d) Give: **Separation of dyes // drug testing // identification of compounds // purification technique** (6)
- (e) What: **Tetrahedral** (6)
- (f) What: Formation of a **brick colour // red colour // precipitate** (6)
- (g) Dist.: **Temporary hardness is removed by boiling** (6)
- (h) Name: **Volume // temperature** (2 × 3)
- (i) Write:
$$\frac{[\text{CO}] \cdot [\text{H}_2]^3}{[\text{CH}_4] \cdot [\text{H}_2\text{O}]}$$
 (6)
[Allow 3 marks for top or bottom correct *or* 3 marks for inverted expression]
- (j) Name: **Thermometer**
What: **Polystyrene** (2 × 3)
- (k) List: **Infrastructure // available workforce // raw materials // access to market // taxation breaks** (2 × 3)
or
Explain: **Mixture of metals** [or metal with another element such as carbon]
Exa.: **Steel // bronze // brass // solder // pewter** (2 × 3)

Question 5

(a) Name: **Dalton** (5)

Explain: **Atoms of the same element can have different masses //**
e.g. carbon-12 & carbon-14 so Dalton was incorrect in his assertion //

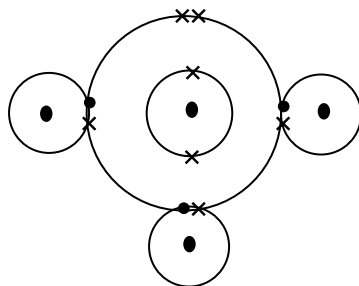
Term: **Isotopes** [6 + (2 × 3)]

(b) State: N: **3** (3)

H: **1** (3)

Explain: **Nitrogen requires 3 electrons to have the same electron configuration as neon //**
Hydrogen needs one electron to have the same electron configuration as helium
(2 × 3)

(c) Use:



(2 × 3)

[arrangement of electrons in nitrogen – 3 marks
combined with 3 hydrogen atoms – 3 marks]

What: **Pyramidal** (6)
[allow 3 marks for tetrahedral]

(d) Define: **Measure of the relative attraction an atom of an element //**
has for a shared pair of electrons in a covalent bond (2 × 3)

Use: **Polar covalent** (3)

Question 6

- (a) What: (i): **Contain carbon and hydrogen only** (5)
(ii): **Compounds with the same molecular formula //
but with different structural formulae** (2 × 3)
- (b) State: **Oil // coal // natural gas** (2 × 3)
- (c) Mention: **In coal mines // in dumps // in fuel tanks or tankers //
in sewage (effluent treatment) systems**
Why: **Methane is a greenhouse gas // causes global warming** [9 + (2 × 3)]
- (d) What: **Measure of the ability of a fuel to resist knocking**
What: **Reference hydrocarbon // assigned octane number of 100**
Draw: **CH₃C(CH₃)₂CH₂CH(CH₃)₂** (9 + 6 + 3)

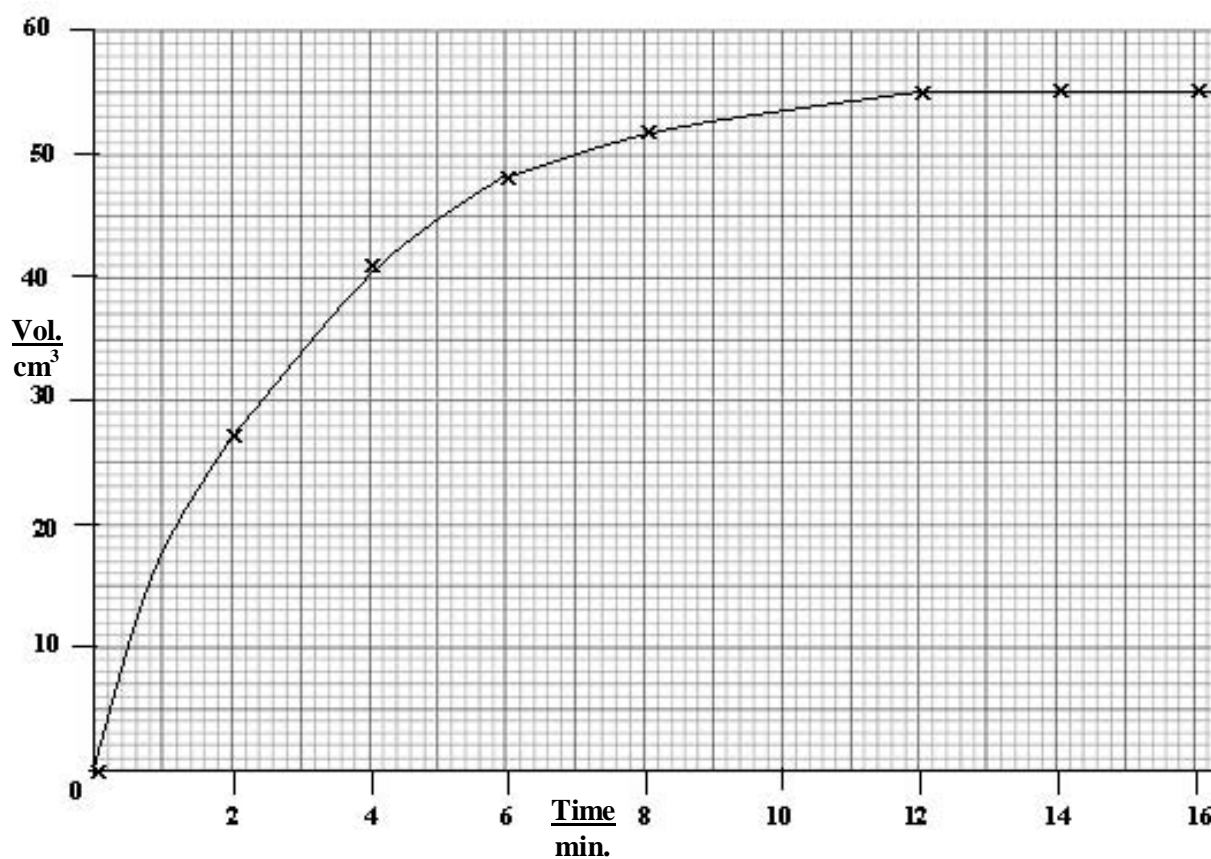
Question 7

- (a) Which: (i): **Ethanol / ethyl alcohol / $\text{CH}_3\text{CH}_2\text{OH}$**
(ii): **Ethanoic acid / acetic acid / CH_3COOH** (5 + 3)
- (b) Give: (i): **Ethyne**
(ii): **Ethanoic acid** (2 × 3)
- (c) Which (i): **Ethanol / ethyl alcohol / $\text{CH}_3\text{CH}_2\text{OH}$**
(ii): **Ethanoic acid / acetic acid / CH_3COOH**
(iii): **Ethene / ethylene / CH_2CH_2** (3 × 3)
- (d) Describe: **Sooty / luminous / yellow** (3)
Write: **$\text{C}_2\text{H}_2 + 2\frac{1}{2}\text{O}_2 \rightarrow 2\text{CO}_2 + \text{H}_2\text{O}$** (6)
[Formulae 3 marks + balancing 3 marks *or* 3 marks for LHS + 3 marks for RHS]
- (e) What: (i): **Addition / hydration**
Reag.: **Water / H_2O**

(ii): **Oxidation**
Reag.: **Sodium dichromate / $\text{Na}_2\text{Cr}_2\text{O}_7$ / Na_2CrO_4**
Acidified // sulfuric acid / H_2SO_4 [9 + (3 × 3)]

Question 8

- (a) Define: **something which alters the rate of a chemical reaction** but remains unchanged itself at the end of the reaction. (5)
- (b) Give: (i): **Hydrogen peroxide // H_2O_2**
(ii): **Manganese dioxide // MnO_2** (9 + 3)
- (c) When: **No more gas being given off** (6)
- (d) Plot: **Axes** (2 × 3)
All points plotted correctly (6)
[Allow 3 marks for 6 correctly plotted points]
Curve drawn (3)



From: **34 ± 2** (3)

- (e) Explain: **Concentration of hydrogen peroxide decreases // rate decreases with concentration** (3)
- (f) Using: **Increase temperature // more finely divided catalyst** (6)

Question 9

(a) Define: $-\log_{10} // [H^+]$ (3 + 2)

Name: (i): **Sulfuric acid // acid**

(ii): **Lime // sodium hydroxide** (2 × 3)

What: **Corrosion of pipe work** (6)

Flocculation: **A flocculating agent is added (e.g. aluminium sulfate) //
Removes finely suspended / reference to formation
of clumps (flocs) or settling** (2 × 6)

or

Fluoridation: **A fluoridating agent is added (e.g. sodium fluoride or
antimony hexafluoride) //
Prevention of tooth decay** (2 × 6)

(b) Write: 1: **Solids**
2: **Biological oxidation**
3: **Nitrates and phosphates**
4: **Eutrophication** [9 + 6 + (2 × 3)]

Question 10

- (a) (i): Cu: **0.1**
Acid: **0.2** (4 + 3)
- (ii): Water: **3.6 g // 0.2 × 18** (6)
- (iii): Volume: **2.24 litres // 0.1 × 22.4** (6)
How: **6×10^{22} molecules // 0.1 × 6×10^{23}** (6)
- (b) (i): What: Chlorine present as **hypochlorite ion (OCl⁻) / hypochlorous acid (HOCl)**
Function: **Disinfect / kill bacteria (germs)** (4 + 3)
- (ii): Why: **To maintain appropriate levels / chlorine levels don't get too low (high)** (6)
- (iii): Outline: **Collect sample** under level of pool surface //
Add to cuvette (analyser bottle) //
Add reagent (DPD tablet) //
Place in comparator / Hach meter / data logger //
Compare colour to chart / take reading [6 + (2 × 3)]
- (c) (i): What **Clove oil**
Cloves (4 + 3)
- (ii) What: **Release excess pressure // safety** (6)
- (iii) Name: **Y: Water**
Name: **Z: Steam** (9 + 3)

Question 11

- (a) (i): What: **Contains a benzene ring in their molecules / contains $(4n + 2)\pi$ delocalised electrons** (4)
- (ii): Give: Name: **Toluene (methyl benzene)**
Structure: **$C_6H_5CH_3$** (6 + 3)
- (iii) Name: **Recrystallisation**
Is: **Solids** (6 + 3)
- (iv) What: **Carcinogen** (3)
- (b) Match: A: **Arrhenius base**
B: **Reducing agent**
C: **Empirical formula**
D: **Molecule**
E: **Alpha particles**
F: **Diffusion** [9 + 6 + 4 + (2 × 3)]
- (c) A
- (i) **Principal product as opposed to another product generated by or during the process** (6)
- (ii) **Costs over which you have no control** (6)
- (iii) **A process where the product is made in lots or batches as opposed to a continuous feed in of reactants and a continuous output of product** (6)
- (iv) **Produces necessary goods (medicines) // increases food output // lowers food costs // health and hygiene products** (4 + 3)
- B
- (i) **Small molecules // joined together to form a giant (large) molecule** (4 + 3)
- (ii) **Plastic bags / milk bottles** (3)
- (iii) **Addition** (3)
- (iv) **Sorting // shredding // washing // drying // melting // re-extruding (remoulding)** (3 × 3)
- (v) **Decreases litter / decreases waste / environmentally friendly / lower energy needs** (3)

