

香港考試及評核局
HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY
香港中學文憑考試
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION

練習卷
PRACTICE PAPER
組合科學 (化學)
COMBINED SCIENCE (CHEMISTRY)

評卷參考
MARKING SCHEME

(2012年2月22日修訂稿)
(updated as at 22 Feb 2012)

本評卷參考乃香港考試及評核局專為本科練習卷而編寫，供教師和學生參考之用。學生不應將評卷參考視為標準答案，硬背死記，活剝生吞。這種學習態度，既無助學生改善學習，學懂應對及解難，亦有違考試着重理解能力與運用技巧之旨。

This marking scheme has been prepared by the Hong Kong Examinations and Assessment Authority for teachers' and students' reference. This marking scheme should NOT be regarded as a set of model answers. Our examinations emphasise the testing of understanding, the practical application of knowledge and the use of processing skills. Hence the use of model answers, or anything else which encourages rote memorisation, will not help students to improve their learning nor develop their abilities in addressing and solving problems.



SECTION A

Question No.	Key	Question No.	Key
1.	B	13.	A
2.	D	14.	C
3.	A	15.	D
4.	D	16.	A
5.	C	17.	D
6.	B	18.	A
7.	B	19.	C
8.	C	20.	C
9.	B	21.	B
10.	B	22.	A
11.	B	23.	D
12.	A	24.	D

SECTION B**General Notes for Teachers on Marking**

1. The marking scheme has been updated, with revisions made after the scrutiny of actual samples of student performance in the practice papers. Teachers are strongly advised to conduct their own internal standardisation procedures before applying the marking schemes. After standardisation, teachers should adhere to the marking scheme to ensure a uniform standard of marking within the school.
2. The marking scheme may not exhaust all possible answers for each question. Teachers should exercise their professional discretion and judgment in accepting alternative answers that are not in the marking scheme but are correct and well reasoned.
3. The following symbols are used:

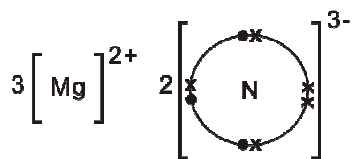
/	A single slash indicates an acceptable alternative within an answer.
*	Step-mark (for questions involving calculations)
‡	Correct spelling required

4. In questions asking for a specified number of reasons or examples etc. and a student gives more than the required number, the extra answers should not be marked. For instance, in a question asking students to provide two examples, and if a student gives three answers, only the first two should be marked.
5. For questions involving calculations, the number of significant figures in candidates' final answers should tally with that given in the question.
6. Chemical equations should be balanced except those in reaction schemes for organic synthesis. For energetics, the chemical equations given should include the correct state symbols of the chemical species involved.
7. In the question paper, questions which assess candidates' communication skills are marked with an asterisk (*). For these questions, the mark for effective communication (1 mark per question) will be awarded if candidates can produce paragraph-length answers which are easily understandable. No marks for effective communication will be awarded if the answers produced by candidates are written in note form, and/or contain a lot of irrelevant materials..

1. (a) (i) $\text{ZnO} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2\text{O}$ 1
or, $\text{ZnO} + 2\text{H}^+ \rightarrow \text{Zn}^{2+} + \text{H}_2\text{O}$ (1)
- (ii) Unreacted ZnO(s) can be seen. 1
- (iii) To ensure that the product is not contaminated with sulphuric acid. 1
or, The unreacted ZnO(s) can be removed by filtration, but it is difficult to remove the excess $\text{H}_2\text{SO}_4(\text{aq})$. (1)
-
- (b) Remove a drop of the solution with a glass rod, and see whether any solid forms when the drop cools. 1
(Accept other correct answers.) (1)
-
- (c) Washing with distilled water / cold water can remove the water-soluble impurities. 1
Using a small amount of water helps reduce loss of the salt. (1)
-
- (d) Any ONE of the following : 1
– drying the crystals between filter papers (1)
– putting the crystals in a desiccator. (1)
(DO NOT accept methods which involve strong heating.) (1)
-
- (e) Zn / $\text{Zn}(\text{OH})_2$ / ZnCO_3 1
(1)

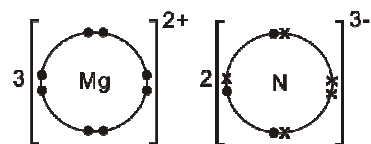
2. (a) Some components of wine (substances with a pleasant odour) can be oxidised by oxygen in air to give products that have a flat taste. 1
or, Ethanol in wine can be oxidised by oxygen in air to give ethanal / ethanoic acid. (1)
(1)
- (b) (i) The outermost shell of an argon atom is a stable octet structure. ∴ Ar does not readily form bonds with other atoms. 1
- (ii) Ar is denser than air. It displaces air from the bottle, and thus prevents the wine from contact with air. 1
- (iii) He is less dense than air. It will not displace air / it will easily diffuse from the bottle. 1
(3)
- (c) The substances with a pleasant odour are volatile organic compounds. Pumping air out from the bottle may also remove these substances. 1
(1)

3. (a) (i)

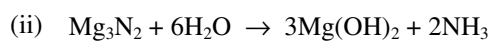


1

or,



(1)



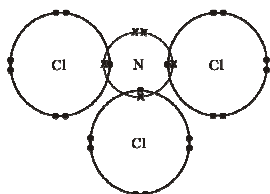
No. There is no change in oxidation number of any atom.

1

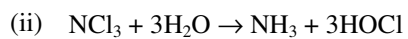
1

(3)

(b) (i)



1



Yes. The oxidation number of N decreases / the oxidation number of Cl increases.

1

1

(3)

4. (a) Dissolve 1.14 g of $M_2CO_3(s)$ in some distilled water / deionised water in a beaker. Transfer the solution to a 100.0 cm^3 volumetric flask. 1
Wash the beaker with distilled water / deionised water and transfer the washings into the volumetric flask. 1
 Add distilled water / deionised water up to the graduation mark of the volumetric flask. 1
 Shake the volumetric flask to ensure its content is well mixed. _____
 (3)
- (b) yellow to orange $\frac{1}{(1)}$
- (c) No. of moles of $H^+(aq)$ used 1
 $= 0.085 \times 25.30 \times 10^{-3}$
 $= 2.15 \times 10^{-3}$
- $M_2CO_3 + 2H^+ \rightarrow 2M^+ + CO_2 + H_2O$
- No. of moles of M_2CO_3 in 100 cm^3 of the solution 1*
 $= 2.15 \times 10^{-3} \times \frac{100}{10} \times \frac{1}{2}$
- Formula mass of $M_2CO_3 = \frac{1.14 \times 2}{0.0215}$
 $= 106$ 1
- Let x be the relative atomic mass of M
 $2x + 12 + 16 \times 3 = 106$
 $x = 23$
 M is likely to be Na. $\frac{1}{(4)}$

* step mark

5. (a)		C	H	
	% by mass	81.8	18.2	
	Atom ratio	$\frac{81.8}{12}$	$:\frac{18.2}{1}$	} 1*
		= 6.82	: 18.2	
		= 3	: 8	

Alkane has the general formula C_nH_{2n+2}

\therefore X is propane / C_3H_8 .

1
1

(3)

(b) Fractional distillation of the petroleum gaseous fraction.
or, Cracking of naphtha / heavy oil (or any appropriate petroleum fraction) followed by fractional distillation of the products.

1
(1)

(1)

(c) (i) X: C_3H_8 easily undergoes complete combustion to give CO_2 and H_2O . The products pose little harm to the environment.

1

(ii) Kerosene: kerosene undergoes incomplete combustion to give a luminous flame. The flame can be more easily seen.

1

(Accept other reasonable answers.)

(2)

* step mark

6. (a) †propan-2-ol / 2-propanol 1

(1)
- (b) All three compounds have a hydroxyl group / are monohydric alcohols. The boiling point of these compounds depends on the strength of van der Waals forces between molecules. 1
The strength of van der Waals forces in alcohols increases with the carbon chain length / molecular size. Boiling point increases in the order: **A < B < C** 1

(2)
- (c) For isomeric compounds with the same functional group, the strength of intermolecular force is affected by the shape of the molecules. 1
The structure of $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ allows the molecules to have a greater area of contact than those of $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$. $\therefore \text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ has a greater density. 1

(2)
- (d) The rate at which the steel ball drops depends on the viscosity of the liquid / the resistance (frictional force) experienced by the ball. This is related to the intermolecular attraction of the liquids. 1
The b.p. of the three compounds is in the order: **D < E < F**, i.e. strength of intermolecular attraction is in the same order. \therefore The ball will drop most slowly in **F**, and fastest in **D**. 1
- (For (c) and (d), also accept answers based on hydrogen bond formation.)
- Effective communication (Award 1 mark if candidates can express their ideas clearly.) 1

(3)

† correct spelling

8. (a) anode : $\text{CH}_3\text{OH}(\text{aq}) + \text{H}_2\text{O}(\ell) \rightarrow \text{CO}_2(\text{g}) + 6\text{H}^+(\text{aq}) + 6\text{e}^-$ 1
 cathode : $\text{O}_2(\text{g}) + 4\text{H}^+(\text{aq}) + 4\text{e}^- \rightarrow 2\text{H}_2\text{O}(\ell)$ 1
 (2)
- (b) (i) Methanol does not conduct electricity. It is not suitable to be used as the reaction medium for the electrochemical reaction. 1
 or, H_2O is involved in the half-equations. (1)
 or, Acid is involved in the electrochemical reaction. (1)
- (ii) Toxic and flammable 1
 (2)
- (c) Accept both 'Yes' and 'No' answers. Marks will be awarded only to the explanation. 2
 For 'No' answers,
 – Electrical sockets can be found in most places. DMFC laptop computers will only be used in places where electric sockets are not available. (1)
 – The cost for the manufacture of methanol is higher than that for the generation of electricity in most places. (1)
- For 'Yes' answers,
 – The use of DMFC laptop computers will become prevalent when stringent environmental laws are enforced as the disposal of DMFCs causes less harm to the environment than other rechargeable cells / methanol is a greener fuel than hydrocarbons. (1)
 – DMFC laptop computers will be commonly used in field work where electric sockets are not available. (1)
- (Accept other reasonable answers.) _____
 (2)