Exam Paper Format

The latest HKCE Chemistry Examination, starting from 2005, consists of two papers.

	Paper 1	Paper 2
Types of questions	Conventional questions	Multiple-choice questions
Duration	1 hour 45 minutes	1 hour
Percentage share of the total subject marks	64%	36%
Details of the papers	Section A • 60% of paper mark • All questions are compulsory. • Consists of questions set on the Core part of the syllabus. Section B • 40% of paper mark • All questions are compulsory. • Consists of questions set on the whole syllabus.	Section A • 60% of paper mark • All questions are compulsory. • Consists of questions set on the Core part of the syllabus. Section B • 40% of paper mark • All questions are compulsory. • Consists of questions set on the whole syllabus.

Distribution of

Topic \ Year	1993	1994	1995	1996	1997	1998
Planet Earth	—	—	—	—	—	—
The Microscopic World	2b, 4a	1(a-b), 7b	1a, 4	7a	—	1a, 7a
Metals	1(ai, ii)	1(bi, c-d, eii), 6a	3(bi, ii, vi), 6(biii)	4, 6(aiii)	1a	8(bi-vi)
Acids and Alkalis	1b, 3b, 4b	1, 5a, 8a	5, 7a	1, 6b	3, 7a	3, 4, 6a, 8
Chemical Cells and Electrolysis	2a	7a	9a	6a, 9b	9b	6b, 9b
Products from Important Processes	5b	8b	8b	8(biii)	8a, 6b	9b, 8a
Fossil Fuels and Carbon Compounds	—	6a	8a, 7b	2, 3(a-b, d)	9a, 5	2(a-b), 9a
Plastics and Detergents	1e	3	9a, 6(aiv)	7b	1c, 7(bi-iii)	7b
Detection and Analysis	—	1(ei), 8b	8(bii)	6(ai), 8(biii)	7(aiii), 9(aii2)	—

Exam Questions

Topic \ Year	1999	2000	2001	2002	2003	2004	2005
Planet Earth	—	—	—	—	—	—	1(aii)
The Microscopic World	4	1, 2(a-b), 8c	8a	6b, 8b	1(a-b), 3(a, bii)	5, 6(bii), 9a	1(ai, b)
Metals	2c	3(a, b), 9(ai)	4, 5	—	2, 3(bi)	1, 8(a-b)	2, 8
Acids and Alkalis	7b	1, 4, 6a, 7a	2, 6a	6a, 7a, 9(a-b)	6a, 8b	2b, 7(a, ci)	3, 4, 10
Chemical Cells and Electrolysis	6a, 8a	6a	8(aiii), 9(a-b)	9c	7a, 9a	6(a, bi, iii)	7, 9
Products from Important Processes	9a	8(cii)	9(c-d)	9b	7(ci), 6(aiv)	9(av), 7(ci) 8(aii)	—
Fossil Fuels and Carbon Compounds	3, 6(bii-iii), 9b	8(a-b), 9b	3c, 7b	5, 6c, 8a	7b, 9c	3(a, b),4, 8c, 9b	5
Plastics and Detergents	1	6(cii), 7b	6(a, c), 7a	8c	5	6c, 7(b, cii)	6, 11
Detection and Analysis	4, 5, 6(aiii), 8(aiii)	—	9(aii)	—	2a, 7c	2(a-b)	12

Demonstration

Section A

1. Consider the following information about four substances, *A*, *B*, *C* and *D*:

Substance	Melting point	Boiling point	Solubility in water
A	800 ℃	1250 ℃	Soluble
B	950 ℃	1800 ℃	Insoluble
C	– 5 ℃	85 ℃	Soluble
D	–10 ℃	48 ℃	Insoluble

Table 1.8

(Note: *C* is completely miscible with *D*.)

Guidelines

This means *C* is completely soluble in *D*.

(a) Which of the above substance is likely to be in a liquid state?

(b) A solid sample *X* contains a mixture of *A* and *B*. Describe briefly how to use physical means to separate *A* from *B* in sample *X*. (Your answer should include an explanation.)

(c) A bottle contains *C* and *D* together. A student tries to separate *C* and *D*.
   (i) Suggest a method to separate *C* and *D*.
   (ii) Draw a labelled diagram for this separation.

Guidelines

No marks will be given if the diagram is not labelled.

(d) If a student carelessly put some *A* into pure water to form solution *Y*. Suggest a method to obtain pure water from solution *Y*.

(9 marks)

Suggested Answer

(a) *C* and *D* — 1

(b) *Addition of water* to dissolve solid *A* from the mixture to form solution. — 1
Filter the insoluble *B* from the solution. — 1
Evaporate the filtrate to form a saturated solution. — 1
Let the saturated solution cool to form crystal *A*. — 1

Guidelines

These processes are always used to separate or prepare salts.

2 The Microscopic World

Review

2.1 Atomic structure

Elements

- An element is a substance which cannot be broken down into two or more simpler substances by chemical methods.
- Elements can be classified mainly into metals and non-metals.

	Metals	Non-metals
Example	Elements of Group I to Group III, except beryllium, boron	Elements in Group IV to Group 0
Appearance	Shiny	Dull
Density	Usually high density	Usually low density
Melting and boiling points	High	Low
Electricity conductivity	Conductor of electricity	Non-conductor of electricity
Malleability and ductility	Malleable and ductile	Neither malleable nor ductile, but brittle

Table 2.1

Atoms

- Elements are different because their basic constituent particles, i.e. atoms are different.

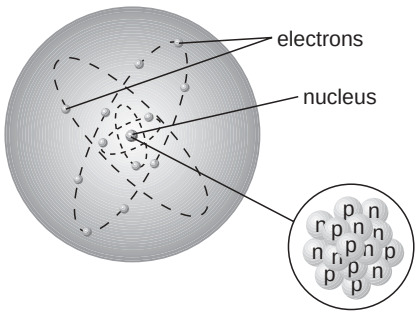


Figure 2.1

Practice

1. For each of the following experiments, state all the observable changes and write a chemical equation for the reaction involved.

   (a) Calcium granules are placed in a Bunsen flame. Hint 1

   (b) A mixture of zinc oxide and carbon powder is heated strongly in a combustion tube.

   (c) Magnesium ribbon is placed in dilute sulphuric acid in a test tube.

   (d) A copper rod is placed in a boiling tube which contains silver nitrate solution. Hint 2

   (e) Potassium metal is added to zinc chloride solution. Hint 3

   (15 marks)

2. The results of experiments with iron and four other metals, Fe, *X*, *Y* and *Z*, are shown in the table below:

Experiments	Fe	*X*	*Y*	*Z*
Adding the metal to iron(II) nitrate solution	No observable change	A colourless gas *P* is evolved.	Iron is deposited.	No observable change
Heating the metal oxide	No observable change	No observable change	During heating, the oxide becomes yellow from white powder	The black oxide powder becomes reddish-brown

Table 3.5

   (a) (i) Name the gas *P*.
   (ii) Write an equation for the reaction involved between metal *X* and iron(II) sulphate solution. Hint 4

   (b) (i) What is metal *Y*? Explain briefly. Hint 5
   (ii) Write an equation for the reaction involved between metal *Y* and iron(II) sulphate solution.

   (c) (i) Name the black powder. Hint 6
   (ii) Write an equation for heating the oxide of *Z*.

   (d) Based on the above information, arrange the four metals in ascending order of reactivity, and briefly explain your answer. Hint 7

   (11 marks)

CE
CHEM

Mid-term Test

CHEMISTRY PAPER 1

Question-Answer Book

$1\frac{3}{4}$ hours

This paper must be answered in English

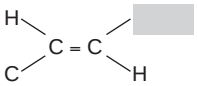
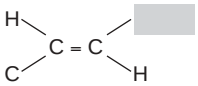
1. This paper consists of TWO sections, Section A and Section B. Section A carries 54 marks and Section B carries 36 marks.

2. Answer ALL questions in each section.

3. A Periodic Table is printed on page 1 of this Question-Answer Book. Atomic numbers and relative atomic masses of elements can be obtained from the Periodic Table.

Question Commands

The following table lists the question command(s) which showing the requirements of answering questions:

Question commands	Examples
What / Which ... (Simple answer is usually required.)	What gas evolves? Correct answer: Sulphur dioxide / SO_2 What is the direction of electron flow in the external circuit? Correct answer: From left to right Which of the following compounds can be used to make an addition polymer?    Correct answer: 
Suggest a formula ...	The oxide of aluminium is insoluble in water, suggest the formula for this oxide. Correct answer: Al_2O_3 Incorrect answer: Aluminium oxide
Name ... (Formula / Structure is NOT accepted.)	Name an element which is a metalloid. Correct answer: Boron Incorrect answer: B
Write the chemical equation ... (Although either chemical / ionic equation is accepted. The best answer should be a chemical equation.)	Write a chemical equation for the reaction when adding dilute hydrochloric acid to zinc granules. Correct answer: $Zn + 2HCl \rightarrow ZnCl_2 + H_2$ (chemical equation) Poor answer: $Zn + 2H^+ \rightarrow Zn^{2+} + H_2$ (ionic equation)
Write the chemical equation ...	Write a chemical equation for the reaction between sodium and water. State symbols should be given. Correct answer: $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$ (Score 2 marks) Poor answer: $2Na + 2H_2O \rightarrow 2NaOH + H_2$ (Score 1 mark only) (Remarks: 1 mark for equation and 1 mark for state symbols)
Write an ionic equation ...	Write an ionic equation for the reaction when adding hydrochloric acid to sodium carbonate. Correct answer: $2H^+ + CO_3^{2-} \rightarrow H_2O + CO_2$ Incorrect answer: $2HCl + Na_2CO_3 \rightarrow H_2O + CO_2 + 2NaCl$

Solution Guide

1 Planet Earth

Section A

1. (a) 1st process: Addition of water — 1
Function: To dissolve the salt — 1
2nd process: Stirring — 1
Function: To speed up the rate of dissolving — 1
3rd process: Filtration — 1
Function: To remove the insoluble salt / substance — 1
4th process: Evaporation — 1
Function: To remove water so as to form a saturated solution — 1
5th process: Crystallization — 1
Function: To form crystals of pure sodium chloride — 1

Reminder

The steps for the preparation of crystal from solution should involve:
- filtration
- evaporation ; and
- crystallization.

(b) Filtration

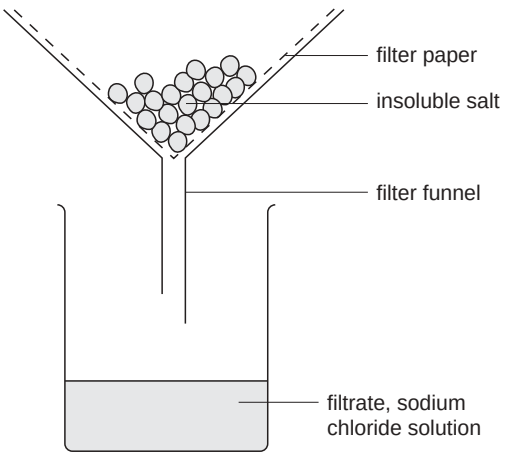


Figure 1.1

2

Reminder

The filter paper has to be shown in the diagram, otherwise, no marks will be awarded.

1M: Diagram
1M: Labels

Evaporation

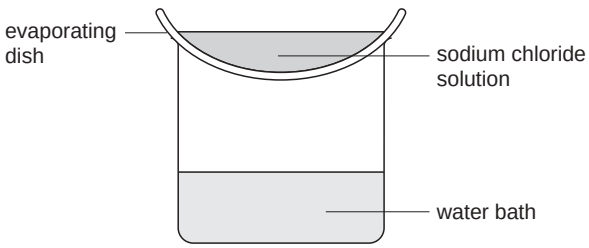


Figure 1.2

2

1M: Diagram
1M: Labels