Chemistry Assessment

Task 2

Term 1 2009

Theory

Part A: Multiple Choice Questions

General Instructions

- **Reading time** – 5 minutes
- **Working time** – 50 minutes
- **Write using black or blue pen**

- **Board-approved calculators may be used**
- **Write your Student Number on page 6 and 7**
- **A data sheet and a periodic table are provided at the back of the paper.**

Total Marks – 43

Part A – 10 marks

- Attempt Questions 1-10 on pages 1-5
- Allow about 10 minutes for this part

Part B – 33 marks

- Attempt Questions 11-19 on pages 8-13
- Allow about 40 minutes for this

Part A: Multiple Choice: 10 marks
Attempt Questions 1-10
Allow about 10 minutes for this part

Use the multiple choice Answer Grid on page 7

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

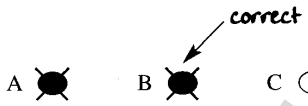
Sample: $2 + 4 =$ (A) 2 (B) 6 (C) 8 (D) 9

A ○ B ● C ○ D ○

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A ● B ⊗ C ○ D ○

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word **correct** and drawing an arrow as follows.



1. Which of the following reactions represents the Haber process?

(A) $O_2(g) + O(g) \rightleftharpoons O_3(g)$

(B) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

(C) $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$

(D) $CO_2(g) + H_2O(g) \rightleftharpoons H_2CO_3(g)$

2. Consider the following reaction at equilibrium.

$2NO_2(g) \rightleftharpoons N_2O_4(g) + \text{heat}$

What would be the effect of a decrease in pressure on this system?

(A) Heat will be absorbed.

(B) The equilibrium will not be disturbed.

(C) The concentration of N_2O_4 will increase.

(D) The rate of reverse reaction will decrease.

3. Which of the following represents a dilute solution of a strong acid?

(A) 0.1 M CH_3COOH

(B) 0.1 M H_2SO_4

(C) 2.0 M CH_3COOH

(D) 2.0 M H_2SO_4

4. Which of the following is a common industrial source of oxides of nitrogen in air?

(A) smelting metal ores

(B) lightning strikes in air

(C) volcanoes

(D) combustion of fuels in internal combustion engines

5. Identify the substance which is frequently used in foods as preservative.

(A) sulfuric acid

(B) hydrochloric acid

(C) acetic acid

(D) nitric acid

6. 16.0 g of a gas, *X*, occupies 6.20 L at 25^{o}C and 100 kPa. Identify gas *X*.

(A) N_2O_4

(B) NO_2

(C) CO_2

(D) SO_2

7. What is the common name of 2-hydroxypropane - 1,2,3 - tricarboxylic acid?

(A) citric acid

(B) acetic acid

(C) oxalic acid

(D) butanoic acid

8. Which of the following best describes the combustion of butane in limited oxygen?

(A) $C_4H_{10} + 13/2\ O_2 \rightarrow 4CO_2 + 5H_2O$

(B) $C_4H_{10} + 9/2\ O_2 \rightarrow C + 2CO + CO_2 + 5H_2O$

(C) $C_3H_8 + 5\ O_2 \rightarrow 3CO_2 + 4H_2O$

(D) $C_3H_8 + 7/2\ O_2 \rightarrow C + CO + CO_2 + 4H_2O$

9. The chemical equation describing the reaction between hydrofluoric acid and potassium hydroxide is shown.

$$HF\ (aq) + KOH\ (aq) \rightleftharpoons H_2O\ (l) + KF\ (aq)$$

Which option represents a conjugate acid/base pair for this reaction?

	Acid	*Conjugate base*
(A)	HF	F^-
(B)	KOH	K^+
(C)	H_2O	KOH
(D)	H^+	H_2O

10. Which chemical is the most appropriate to use when minimising damage due to acid or base spills in a chemical laboratory?

(A) sodium hydroxide

(B) sodium nitrate

(C) sodium hydrogen carbonate

(D) cloudy ammonia

▸ *Mark your answers on the Answer Grid on page 7.*

Student Number	
Marks	
Part A/10	
Part B/33	
Total/43	

Chemistry Assessment

Task 2
Term 1 2009

Theory

Part A: Multiple Choice Answer Grid
Part B: Free Response Questions and Answer Sheet

General Instructions

- **Reading time** – 5 minutes
- **Working time** – 50 minutes
- **Write using black or blue pen**
- **Write your Student Number at the top of this page and on page 7.**
- **Board-approved calculators may be used**

A data sheet and a periodic table are provided at the back of the paper.

Total Marks – 43

Part A – 10 marks

- Attempt Questions 1-10
- Allow about 10 minutes for this part

Part B – 33 marks

- Attempt Questions 11-19
- Allow about 40 minutes for this part

Student Number .....

Part A . Answer grid for multiple choice questions 1-10.

1.	A O	B O	C O	D O
2.	A O	B O	C O	D O
3.	A O	B O	C O	D O
4.	A O	B O	C O	D O
5.	A O	B O	C O	D O
6.	A O	B O	C O	D O
7.	A O	B O	C O	D O
8.	A O	B O	C O	D O
9.	A O	B O	C O	D O
10	A O	B O	C O	D O

Total .....

Part B Free Response Questions

Attempt Questions 11 – 19
Allow about 40 minutes for this part

▸ ***Show all relevant working in questions involving calculations.***

Question 11 (6 marks)

State and explain the choice of temperature and pressure conditions, and catalyst used to optimize the yield in the Haber process.

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Question 12 (6 marks)

Consider the following information concerning acids.

0.01 mol L^{-1} solution	***pH***
Acetic acid	3.3
Hydrochloric acid	2.0

(a) Explain the difference in pH between the two acids. Use equations to demonstrate your answer. (4 marks)

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(b) 0.01 mol L^{-1} HCl has a pH of 2.0. What volume of water must be added to 50.0 mL of this solution to obtain a final pH of 3.0? (2 marks)

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Question 13 (3 marks)

Sulfur dioxide is a gas that can contribute to acid rain.

(a) Give an equation to show the formation of acid rain from sulfur dioxide. (1 mark)

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(b) Describe two effects of acid rain. (2 marks)

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Question 14 (2 marks)

Outline two advancements of the Arrhenius theory of acids and bases over the Davy theory of acids and bases.

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Question 15 (5 marks)

Standard solutions are used in volumetric analysis.

(a) Identify the accurate glassware in which a standard solution is prepared. (1 mark)

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(b) 250 mL of a 0.2 $molL^{-1}$ solution of sodium carbonate was prepared.
Calculate the mass of sodium carbonate required to prepare the solution (2 marks).

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(c) 25.00 mL of this sodium carbonate solution reacted with 24.35 mL of hydrochloric acid.
Calculate the concentration of the acid. (2 marks)

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Question 16 (2 marks)

Identify a buffer in a natural system and describe its effects.

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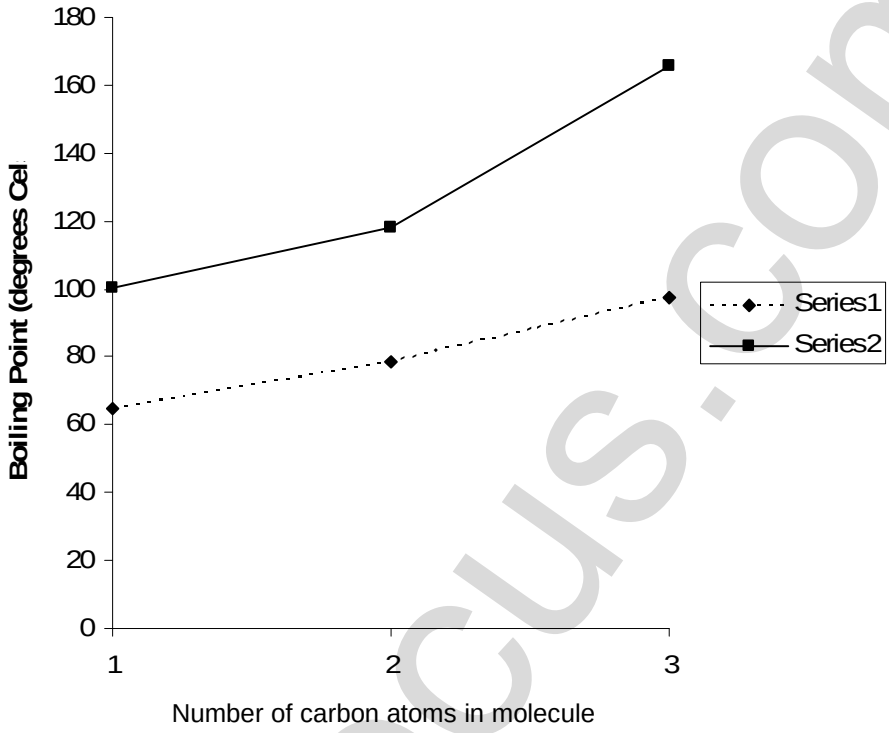
Question 17 (4 marks)

The boiling points of three alkanoic acids and their equivalent alkanols are presented in the graph. However, the two groups of chemicals have not been identified.

Boiling point (^{o}C)



(a) Which group of chemicals is represented by Series 1? Give reasons for your choice. (2 marks)

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(b) Describe the structural difference between molecules of 1-propanol and propanoic acid. (2 marks)

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Question 18 (2 marks)

Using balanced equations, explain the amphiprotic nature of $H_2PO_4^-$ in aqueous solutions.

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Question 19 (3 marks)

The odour of the ester that has the following chemical formula is pineapple:

$$CH_3CH_2CH_2COOCH_2CH_3$$

(a) State the name of the ester using IUPAC nomenclature. (1 mark)

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(b) Write a balanced formulae equation for the reaction that results in the formation of the ester. (2 marks)

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End of Theory Test