



North Sydney Boys High School
Science Faculty
Year 12 Chemistry 2024
Assessment 1

Reading time – 5 minutes
Writing time – 55 minutes

General Instructions:

- Attempt all questions
- Write using black or blue pen
- Draw diagrams using pencil
- NESA approved calculators may be used
- Write your student number at the **top** of this page

Weighting - 25%

- **5% Knowledge & Understanding**
- **15% Working Scientifically skills**

Total Marks - 36

Total number of Questions: 9

Assessment has two parts:

Part A Knowledge and Understanding: 9 marks

Part B Working Scientifically: 27 marks

Section	Mark	Marks achieved
Part A: Knowledge & Understanding	9	
Part B: Working Scientifically skills	27	
Total	36	

This paper MUST NOT BE REMOVED from the examination room.

Part A: Knowledge and Understanding (9 marks)

Question 1 (2 marks)

Is Le Chatelier's principle valid for combustion reactions? Explain why?

Question 2 (2 marks)

Cycads were an important food source for the Aboriginal and Torres Strait Islander people. However, before it could be cooked to make bread it had to be processed due to the seeds containing cycasin, a deadly toxin. One of the most important steps in the processing of cycads was leaching.

Explain why leaching was an effective method for removing toxins from cycads.

Question 3 (2 marks)

The equilibrium constant for $3\text{H}_2(\text{g}) + \text{N}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$ is 6.8×10^5 .

Using the above reaction as an example, explain the difference between the reaction quotient (Q) and the equilibrium constant (K_{eq}). (2 marks)

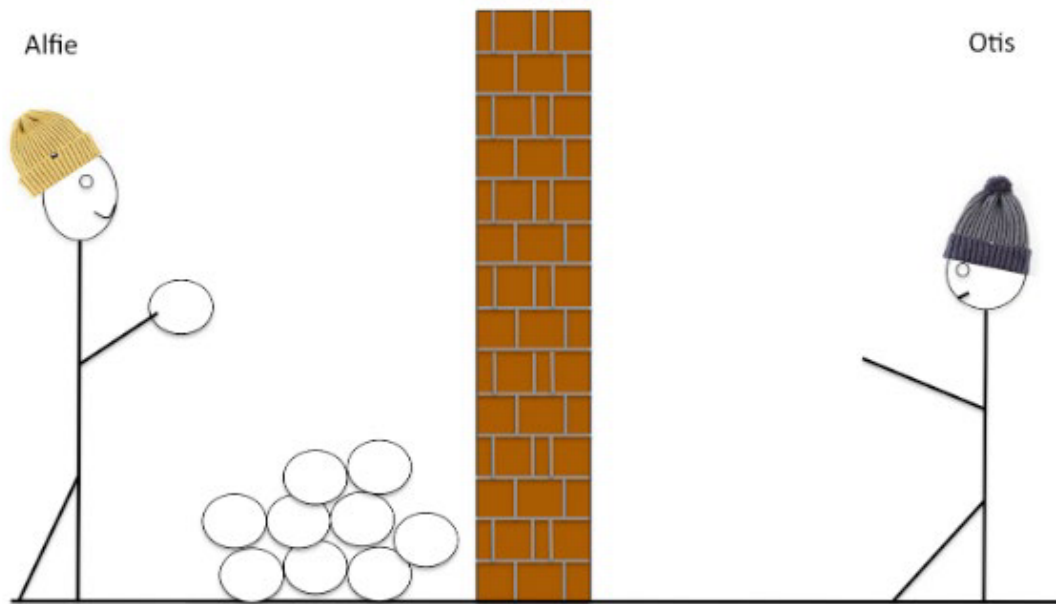
Question 4 (3 marks)

b) Account for why you cannot compare the K_{sp} values of silver cyanide (AgCN) and aluminium hydroxide ($\text{Al}(\text{OH})_3$) to deduce their relative solubilities. (2 marks)

Assessment continued next page

Part B: Working Scientifically (27 marks)

Question 5 (4 marks)



Assess Alfie's and Otis's modelling of dynamic equilibrium.

(4 marks)

[illegible]

Assessment continued next page

Question 6 (5 marks)

- a) To improve the quality of X-ray photos in the diagnosis of intestinal disorders, the patient drinks an aqueous suspension of BaSO_4 . However, since Ba^{2+} is toxic, its concentration is lowered by the addition of dilute Na_2SO_4 solution. What is the solubility of BaSO_4 in 0.10 M Na_2SO_4 . Give your answer in g/100mL (3 marks)

- b) When performing the calculation in part a) an assumption can be made, explain when the assumption can and cannot be made. (2 marks)

Assessment continued next page

Question 7 (6 marks)

In an experiment to estimate the solubility product for silver chromate, varying volumes of solutions of silver nitrate ($5.0 \times 10^{-4} \text{ mol L}^{-1}$) and potassium chromate ($5.0 \times 10^{-4} \text{ mol L}^{-1}$) were mixed with water according to the following table, and it was noted whether a precipitate was formed.

Test	1	2	3	4	5
Volume of AgNO_3 solution added (mL)	5.0	10.0	15.0	20.0	25.0
Volume of K_2CrO_4 solution added (mL)	5.0	10.0	15.0	20.0	25.0
Volume water added (mL)	90.0	80.0	70.0	60.0	50.0
Precipitate formed	No	No	Yes	Yes	Yes

- a) Use the results above to calculate an approximate value for the solubility product for silver chromate. (4 marks)

Question 7 continued next page

- b) Why is the value obtained in part (a) only approximate? How would you obtain a more accurate value? (2 marks)

Question 8 (3 marks)

The diagrams represent equipment used in an investigation to determine the chloride ion concentration in a water sample.

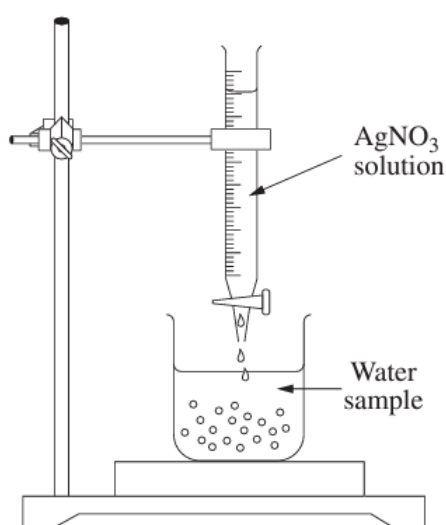


Figure 1

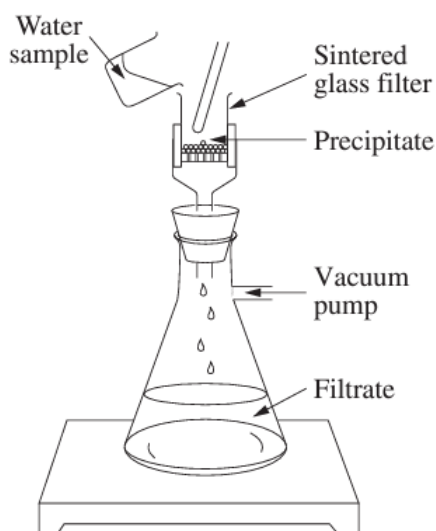
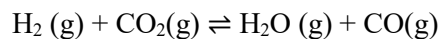


Figure 2

Describe how the chloride ion concentration in a water sample can be determined using the equipment in the diagrams. Include a relevant chemical equation and description of the calculation involved.

Question 9 (9 marks)

For the reversible reaction represented by the equation



The equilibrium constant, K_{eq} , is 0.60 at a temperature of 900 Kelvin.

- a) 2.0 mole of hydrogen gas and 2.0 mole of carbon dioxide gas are mixed in a closed 1.0 litre container, and the reaction allowed to come to equilibrium. Calculate the number of moles of carbon dioxide gas in the container at equilibrium at 900.0 Kelvin. (3 marks)

- b) If the experiment in (a) had been carried out in a 2.0 litre container, explain the effect this would have on the number of moles of carbon monoxide gas at equilibrium at 900 Kelvin (2 marks)

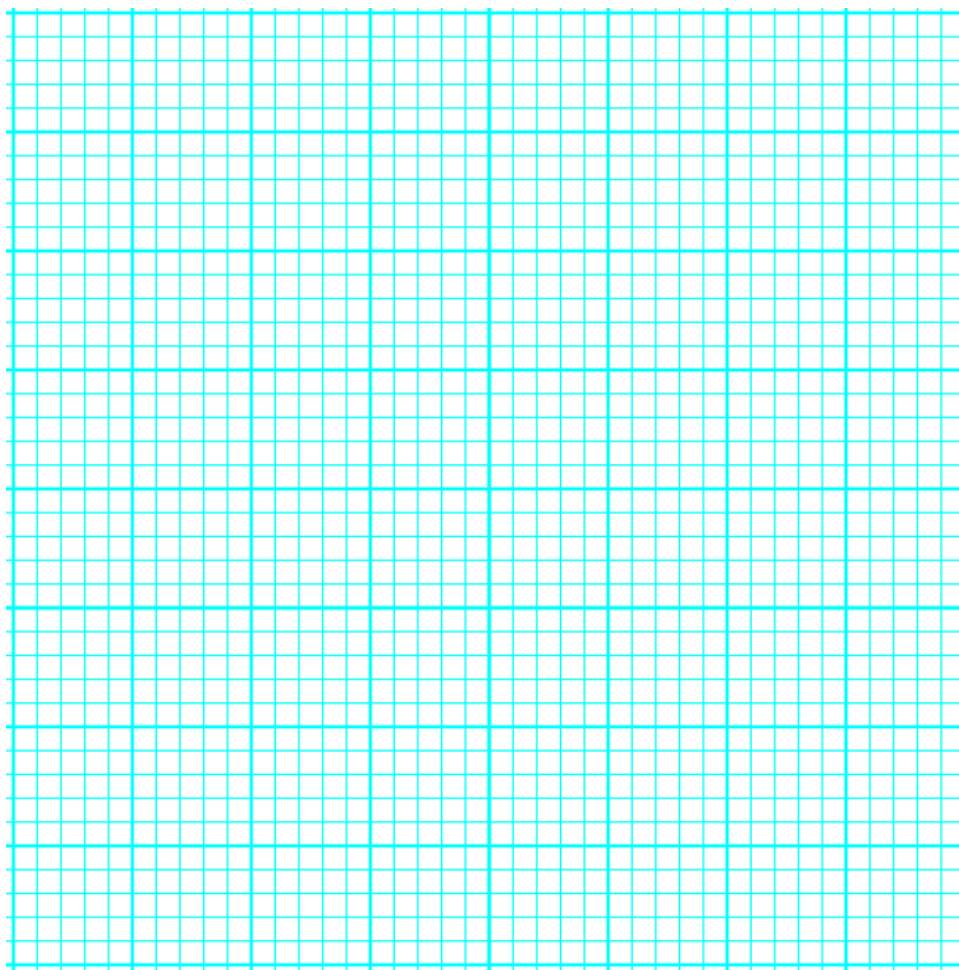
Question 8 continued on the next page

c) The following table shows the values of K_{eq} for the above reversible reaction at various temperatures.

Graph the data and include a curve of best fit.

Determine if the forward reaction is exothermic or endothermic? Justify your answer. (4 marks)

K_{eq}	Temperature (kelvins)
0.1	700
0.55	900
0.95	1000
1.5	1100
2.2	1200
3	1300



End of Assessment task