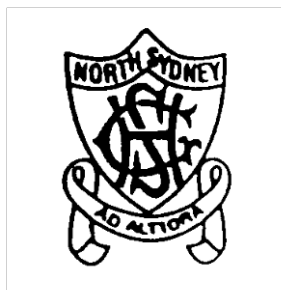


Student Number: _____

NORTH SYDNEY GIRLS HIGH SCHOOL



2020-21

HSC

Assessment Task 1

Chemistry

General Instructions

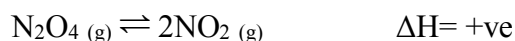
- Reading Time – 5 minutes
- Working Time – 50 min
- Write using a black pen
- Draw diagrams using pencil
- NESA calculators may be used
- Show all relevant working in questions involving calculations.
- **Write your student number at the top of this booklet**
- **Write your answers in the space provided.**

Total Marks – 30

Weighting – 20 %

Question 1 (5 Marks)

Consider the following reaction in a closed container.



- a) Identify TWO measures that could be taken that would cause the forward reaction to be favoured. 2

.....

- b) A student added a catalyst to the reaction vessel. Explain the effect of adding a catalyst to an equilibrium system. 2

.....

.....

.....

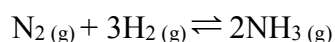
.....

- c) Describe the result of injecting 2.00 moles of argon gas into the reaction vessel. 1

.....

Question 2 (5 Marks)

Ammonia may be produced from its elements according to the equation:



- a) Write an expression for the equilibrium constant (K_{eq}) for this reaction. 2

.....

.....

- b) If the equilibrium constant for the forward reaction is 1.3×10^{-7} at 450°C , calculate the equilibrium constant for the reverse reaction at the same temperature. 1

.....

.....

- c) The equilibrium constant for the forward reaction at 350°C is 1.9×10^{-7} . Is the forward reaction endothermic or exothermic? Justify your response. 2

.....

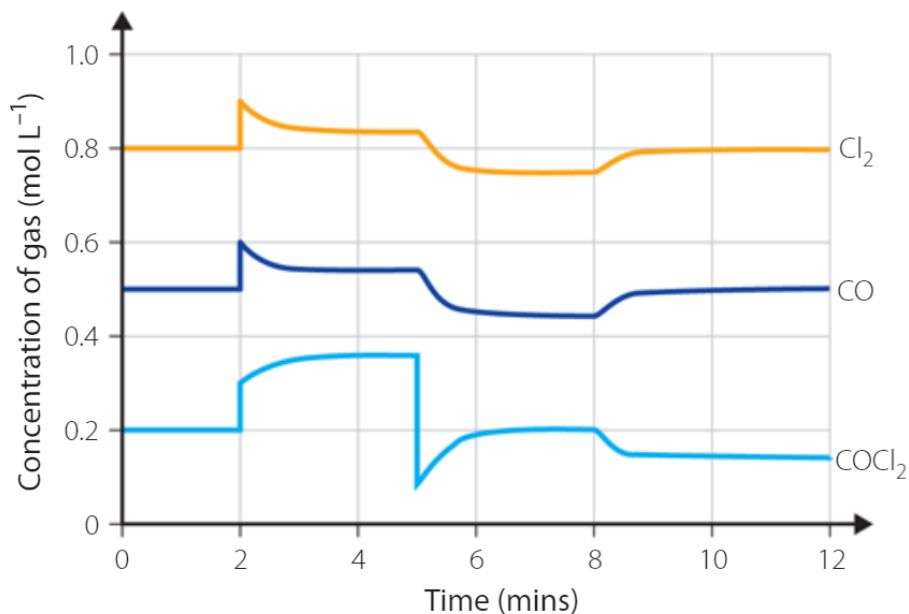
.....

.....

.....

Question 3 (6 Marks)

The graph below shows a closed system consisting of a mixture of the gases CO, Cl₂ and COCl₂ which was monitored over time. CO and Cl₂ react to form COCl₂ in an exothermic reaction.



a) Explain, using your understanding of collision theory, how the change at $t = 2$ minutes causes the reaction to favour the formation of COCl₂.

4

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

b) Explain what happened between 5 and 7 minutes.

2

.....

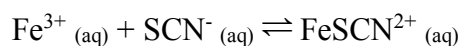
.....

.....

.....

Question 4 (5 marks)

Iron (III) ions react with colourless thiocyanate ions to form the red FeSCN^{2+} complex in equilibrium. 50.00 mL of $0.0020 \text{ mol L}^{-1}$ iron (III) nitrate solution and 50.00 mL of $0.0020 \text{ mol L}^{-1}$ potassium thiocyanate solution were combined in a reaction vessel and allowed to come to equilibrium. The concentration of FeSCN^{2+} ions was then measured over three trials. The equation for the reaction and the measured concentrations are given below.



	Trial 1	Trial 2	Trial 3
FeSCN^{2+} equilibrium concentration ($\times 10^{-5} \text{ mol L}^{-1}$)	8.714	8.715	8.716

a) Calculate the initial concentration of Fe^{3+} ions in the reaction vessel.

1

.....
.....

b) Calculate the equilibrium constant for the reaction.

4

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

QUESTION 5 BEGINS ON THE NEXT PAGE

Question 5 (4 marks)

Solid lead (II) chloride is dissolved in deionized water. Describe the process of dissolution and identify the energy changes that occur during this process. Include a balanced equation for the equilibrium that is established.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

QUESTION 6 BEGINS ON THE NEXT PAGE

Question 6 (5 Marks)

When potassium phosphate solution is mixed with magnesium nitrate solution at 25 °C, a precipitate is formed.

- a) Identify the precipitate.

1

b) If 31.0 mg of the same precipitate is added to 500 mL of deionized water, show whether the substance will dissolve or if the precipitate will remain.

4

END OF PAPER

BLANK PAGE