**EXTENDED RESPONSE #1 – INDUSTRIAL APPLICATIONS OF RATES AND EQUILIBRIUM**

**Syllabus requirements:**

*reagents and reaction conditions are chosen to optimise yield and rate for chemical synthesis processes, including in the production of ammonia (Haber process) and sulfuric acid (Contact process)*

The conditions used in industrial processes depend on a range of factors. Producers aim to minimise costs and maximise profits. Conditions must therefore need to take into consideration reaction rates, yield of product and economic costs.

If you are provided information about a process, such as the temperature and pressure conditions used, you should be able to justify the use of those conditions. For example, see 2010 WACE Exam Q42 *(page 48 of your past exam questions booklet)*. It describes the conditions used in the production of nitric acid. From the information provided, and your knowledge of collision theory and reaction rates, it is possible for you to explain how temperature, pressure and catalysts affect rate and yield for these reactions, and therefore justify the choice of conditions used.

Note that the syllabus also makes specific reference to the production of **ammonia (Haber process)** and the production of **sulfuric acid (Contact process)**. The fact that these two processes are named **specifically** indicates that the examiners will expect you to know **specific** information about these processes, including:

* The steps that are performed
* Balanced chemical equations, including whether each reaction is endothermic or exothermic
* The **specific** conditions used, including temperatures, pressures and catalysts used
* How each choice of condition is related to reaction rate, equilibrium yield and economic costs

Unlike the exam question about nitric acid, a question about the Haber process and/or Contact process would **not** need to give you chemical equations or reaction conditions because you are supposed to know them.

**TASK:** In Week 2 you will complete an in-class extended response to demonstrate your understanding of conditions used in industrial processes.

You will receive a task sheet which will provide background about an industrial process you haven’t seen before, including chemical equations and operating conditions. Then it will ask you to:

**This will say either Haber or Contact**

**These processes will be described in the background information**

Using the information provided:

* discuss the conditions used in the process of **xxxxxxxxxxxxxxxxxx**
* compare and contrast the conditions used in the **xxxxxxxxxxxxxxxxxx** and the **xxxxxxxxxxxx** process

Your answer should demonstrate your understanding of theories related to reaction rates and equilibrium.

Your answer should be approximately 2 pages in length. Your answer should take the form of a structured written response. In addition to content, marks will be awarded for structure and clarity. Include chemical equations, diagrams and tables where appropriate.

*Note: Compare means explore/discuss similarities. Contrast means to explore/discuss differences.*

You will have 10 minutes to read the question and plan your response, and then the remainder of the lesson to write your response. You will not be permitted to bring any notes. Note that you will not know ahead of time whether you need to compare & contrast to the Haber or Contact process, so you will need to learn information about **both** processes to prepare for this task.

**Marking:** The response will be marked /40. A majority of the marks will be for the *content* of your answer (35/40). Five marks will be for the quality of your writing, including your organisation of ideas, use of subheadings and paragraphs, use of concise language that avoids needless repetition, and legibility / spelling / grammar.