Year 12 Chemistry
Depth Study Assessment Task 2025

TOPIC: Depth Study – Equilibrium and Acid Reactions Module 5 Equilibrium and Acid Reactions, Module 6 Acid/Base Reactions	**MARKS:** /25	
SUBMISSION REQUIREMENTS: All components of the assessment will be submitted on Friday 21 st March 2025 (Term 1, Week 8). The report should be submitted via CANVAS by 23:59.	**WEIGHTING:** 25%	**COMPONENTS:** **Knowledge and understanding 5%** **Skills and working scientifically 20%**

ASSESSMENT CRITERIA:

Module 5 – Equilibrium and Acid Reactions

Inquiry question: *What factors affect equilibrium and how?*

- *investigate the effects of temperature,* ***concentration****, volume and/or pressure on a system at equilibrium and explain how Le Chatelier's principle can be used to predict such effects*

Module 6 – Acid/Base Reactions

Inquiry question: *What is an acid and what is a base?*

conduct an investigation to demonstrate the preparation and use of indicators as illustrators of the characteristics and properties of acids and bases and their reversible reactions (ACSCH101)

1. Conduct research on indicators. Information should include (but is not limited to):
    - what indicators are, what they are used for, what properties allow them to be used for this purpose, where they have originated from, examples of indicators (natural and synthetic).
    - Relate how indicators work to equilibrium reactions, and how Le Chatelier's Principle, specifically concentration, are the basis of their use.
    - natural materials that can be used as an indicator, and how they can be prepared.

2. Select a minimum of five (5) materials that could be tested for their potential indicator properties. You may choose from the list below, or identify your own substances. *Hint: materials with coloured pigments are good test subjects*.

- Red cabbage
- Beetroot
- Strawberries or other berries
- Flowers (various, coloured)
- Leafy greens e.g. spinach
- Tomato
- Capsicum (any or all colours)
- Carrots
- Butterfly pea flower tea
- Black tea
- Herbal tea e.g. berry/fruit
- Turmeric
- Red or brown onion skin

3. Using the investigation aim "*To determine which natural pigments can be used as natural indicators to distinguish between acidic, neutral and basic solutions"*, **develop** a hypothesis that their investigation will endeavour to answer.

4. **Design** an investigation to test this hypothesis. This should include appropriate methods to extract the pigments from the selected materials.

5. [in class] **Conduct** the planned investigation, including recording the results and taking relevant photographs of the test solutions.

6. **Analyse** the primary (the first hand investigation) and secondary (the research) data.

7. Prepare a scientific report in order to **communicate** information about the use of indicators (research) and the findings of the first hand investigation.

   The scientific report should include the following sections:
   - Aim
   - Research - Indicators
   - Hypothesis
   - Variables
   - Equipment
   - Risk Assessment
   - Method
   - Results (include photos of the testing of the different indicators)
   - Conclusion
   - Discussion
   - Reference list – sources should be listed using APA referencing style

8. Review marking criteria to ensure all components are addressed.

OUTCOMES TO BE ASSESSED:

CH12-1 – Develops and evaluates questions and hypotheses for scientific investigation.
CH12-2 – Designs and **evaluates** investigations in order to obtain primary and secondary data and information.

CH12-3 – Conducts investigations to collect valid and reliable primary and secondary data and information.
CH12-7 – Communicates scientific understanding using suitable language and terminology for a specific audience or purpose.
CH12-13 – Describes, explains and quantitatively analyses acid and bases using contemporary models.

DIRECTIONAL VERBS:

Communicate – to convey knowledge or information; can occur through different methods, such as written, oral or visual
Explain – Relate cause and effect; make the relationships between things evident; provide why and/or how
Describe – provides characters and features
Evaluate – make a judgement based on criteria

ASSESSMENT MARKING CRITERIA *Outcomes CH12-1, CH12-2, CH12-3, CH12-7, CH12-12, CH12-13*		
	Mark	**Grade**
Student **designs** and conducts a comprehensive **investigation** on Indicators. The scientific report indicates clear and sophisticated evidence of in-depth **analysis** and **explanation** into the use of indicators, including properties that allow them to be used as indicators, how the use of indicators is related to Le Chatelier's Principle, substances that have been used as indicators, and how natural materials can be used and prepared as natural indicators. The data is collected from a wide range of sources, and the sources are accurately listed and cited in-text using the APA referencing style. The scientific report is **communicated** expertly, with all components of a scientific report present, accurate and well-developed.	21-25	A
Student **designs** and conducts a thorough **investigation** on Indicators. The scientific report indicates clear and sophisticated evidence of in-depth **analysis** and **explanation** into the use of indicators, including properties that allow them to be used as indicators, how the use of indicators is related to Le Chatelier's Principle, substances that have been used as indicators, and how natural materials can be used and prepared as natural indicators. The data is collected from a wide range of sources, and the sources are accurately listed and cited in-text using the APA referencing style. The scientific report is **communicated** succinctly, with minor errors in the presentation, accuracy and composition of the scientific report.	16-20	B
Student **designs** and conducts a sound **investigation** on Indicators. The scientific report indicates clear and detailed evidence of in-depth **analysis** and **explanation** into the use of indicators, including properties that allow them to be used as indicators, how the use of indicators is related to Le Chatelier's Principle, substances that have been used as indicators, and how natural materials can be used and prepared as natural indicators. The data is collected from a range of sources, and the sources are accurately listed and cited in-text using the APA referencing style, with minor errors. The scientific report is **communicated** clearly, with several errors in the presentation, accuracy and composition of the scientific report.	11-15	C
Student **designs** and conducts a basic **investigation** on Indicators. The scientific report indicates some evidence of **analysis** and **explanation** into the use of indicators, including properties that allow them to be used as indicators, how the use of indicators is related to Le Chatelier's Principle, substances that have been used as indicators, and how natural materials can be used and prepared as natural indicators. The data is collected from several sources, and the sources are listed. The scientific report is **communicated** appropriately, however there are several errors in the presentation, accuracy and composition of the scientific report.	6-10	D
Student **designs** and conducts a limited **investigation** on Indicators. The scientific report indicates little evidence of **analysis** and **explanation** into the use of indicators, including properties that allow them to be used as indicators, how the use of indicators is related to Le Chatelier's Principle, substances that have been used as indicators, and how natural materials can be used and prepared as natural indicators. The is little or no evidence that data has been collected from more than one source. There is an attempt to **communicate** the information in the form of a report with scientific terminology, and/or scientific inaccuracy present.	1-5	E