



Oide

Tacú leis an bhFoghlaim
Ghairmiúil i measc Ceannairí
Scoile agus Múinteoirí

Supporting the Professional
Learning of School Leaders
and Teachers

Senior Cycle Chemistry

Professional Learning Booklet

PLE 4 - 2026/2027

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Supports for Participants

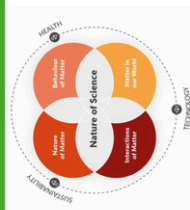
Senior Cycle Chemistry Specification	Guidelines to Support the Chemistry in Practice Investigation	SEC Sample Papers	Chemistry Padlet Half Day
			
Scientific Practices Supporting Materials	AI Webinar	Chemistry Padlet PLE 2	Chemistry Padlet PLE 3
			



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From Learning Outcomes to Scientific Thinking & Practice

A skills-focused teaching, learning and assessment tool grounded in the Unifying Strand



1. Learning Outcome (Contextual Strand)

2. Action Verb

What will students do physically?	What will students think about?	What will students decide / justify / evaluate?
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3. Unifying Strand – The Nature of Science

Where is the thinking and skill development?

Naturally Occurring What skills / practices are already present in this learning?	Requires Intentional Design What will NOT happen unless I plan for it?	Opportunities to Extend Where could students be pushed further?
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4. The Learner Experience What opportunities will I create for students to think, discuss, investigate, and justify their understanding? (e.g. predicting, designing, explaining, evaluating, discussing)

5. Evidence of Learning Beyond written exams and final products, what forms of assessment could be used to support learning, identify strengths or difficulties, and gather evidence of students' thinking and progress?
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6. Reflection How will this activity influence the teaching, learning and assessment approaches in my Chemistry classroom?
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Station 1

Surfactant Function	Independent Variable	Dependent Variable	Chosen Surfactant

Experimental Design

Reflection

Station 2

Pros of Method A Cons of Method A

Pros of Method B Cons of Method B

Pros of Method C Cons of Method C

Pros of Method D Cons of Method D

Success Criteria for a method

Having created the success criteria, what rubric headings would you use to support student learning?

Station 2

Data Set A - Notes

Data Set B - Notes

Data Set C - Notes

Data Set D - Notes

Success Criteria for a method

Having created the success criteria, what rubric headings would you use to support student learning?

Station 3

Analysis of data & data representation

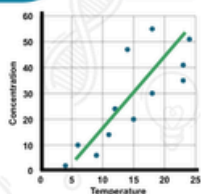
- Use Sentence Starters to help
- Which type of data representation best demonstrates patterns and trends in your selected data?

Guide to Graphs: Visualising Primary Data

1 Scatter Plot & Line of Best Fit

Why?

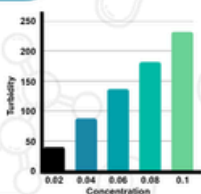
- Shows relationship between two variables (e.g. Temperature vs. solubility)
- Used to find trends, correlation, or interpolate data



2 Bar Chart

Why?

- Compare categorical data or distinct groups (e.g. Yield of different products, volumes of different samples)



3 Pie Chart

Why?

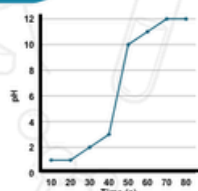
- Represents parts of a whole or percentages (e.g. Percentage composition of elements, reaction products etc.)
- Not for showing relationships



4 Line Graph

Why?

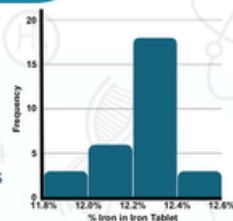
- Shows change in a variable over continuous time (e.g. pH in a titration over time)



5 Histogram

Why?

- Shows the distribution of a continuous variable grouped into intervals (e.g. % iron in iron tablets across a data set or distribution of isotopes of a particular element)



ALWAYS CHECK YOUR GRAPH FOR

S

Scale

A

Axis

L

Labels

T

Title



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Selecting the correct Graph: Step-By-Step Flowchart

What type of primary data have you collected?

Categorical

Numerical

Nominal Data

Categories with no intrinsic order.

Ordinal Data

Categories with a meaningful order.

Discrete Data

Countable numerical values.

Continuous Data

Measurable values that can take any value within a range.

Are you showing how a variable changes over time?

Yes

No

Are the numerical data grouped into class intervals?

Yes

No

Use a bar chart

Use a line graph

Use a scatter plot

Use a pie chart

Use a histogram

Use a bar chart

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Station 4

Results What model is used at this station? What does this model explain, demonstrate or illustrate?? What are the limitations of this model?	Calculations What model is used at this station? What does this model explain, demonstrate or illustrate?? What are the limitations of this model?
Results What model is used at this station? What does this model explain, demonstrate or illustrate?? What are the limitations of this model?	From the stations you have experienced thus far, can you explain how the models can be useful in explaining outcomes from investigations?

Station 5

A. Cornell Note-Making

Article



Title

Cues

(Key concepts/questions/points/
words **after** reading/listening)

Notes

(Main ideas and concepts **during** reading/listening)

Summary (After reading/watching/listening: one or two sentences capturing the key points)

Station 5

B. Graphic Organiser



Podcast 1

OR



Podcast 2

Problem:

Water Scarcity: Lithium extraction in South America consumes 2.2 million litres of water per ton of lithium, depleting 65% of regional water supplies.

Suggested Actions:

Transition to Sodium-Ion Batteries: Move away from lithium toward sodium, which can be harvested from seawater or abundant mineral deposits.

Possible effect:

Environmental Preservation: Sodium extraction uses 682 times less water than lithium, preventing the "draining of deserts" and saving local ecosystems.

Possible barrier:

Sodium ions are physically larger and heavier than lithium ions. As a result, sodium-ion batteries currently cannot pack the same amount of energy into the same physical space.

Problem:**Suggested Actions:****Possible effect:****Possible barrier:****Problem:****Suggested Actions:****Possible barrier:****Possible barrier::**

Station 5

C. Scaffolded Note Making

Article



Instructions

Read all the questions below. Then use the secondary source on recycling lithium-ion batteries to fill in part 1 of these scaffolded notes.

Use these scaffolded notes to aid you in completing part 2.

Part 1

1. Circle the correct answer.

What happens to greenhouse gas emissions when batteries are recycled instead of mining new metals?

Increasing or decreasing

What happens to energy use when batteries are recycled instead of mining new metals?

Increasing or decreasing

2. What did the study find about recycling compared to mining?

Recycling produces _____ of the greenhouse gas emissions of conventional mining.

3. Complete the sentence.

Battery recycling uses about _____ of the water and energy used in mining new metals.

4. Complete the sentence using numbers from the text.

For the scrap stream, recycling produced (compared to mining and processing):

_____ % of the greenhouse gas emissions

_____ % of the water use

_____ % of the energy use

Station 5

Article



C. Scaffolded Note Making

6. Use the space below to convert miles to kilometres. (Hint: 1 mile = 1.609 km)

Mining and refining transport distance: 35,000 miles

Convert to km: _____ miles $\times$ 1.609 = _____ km

Battery recycling transport distance: 140 miles

Convert to km: _____ miles $\times$ 1.609 = _____ km

7. What are some advantages of recycling lithium-ion batteries instead of mining new metals?

Part 2

Use what you have learned from the article to answer the following questions

8. The study states that conventional mining and refining of active battery metals averages about 35,000 miles (57,000 km) of transport. Recycling transport distance was estimated at 140 miles (225 km).

i. What is the difference in transport distance (in miles)?

35,000 – 140 = _____ miles

ii. What is the difference in transport distance (in km)?

57,000 – 225 = _____ km

iii. How many times greater is the mining transport distance compared to recycling?

35,000 $\div$ 140 = _____ times

Mining and refining requires _____ times more transportation than recycling.

Station 5

Article



C. Scaffolded Note Making

9. The scrap stream results were as follows:

19% of mining's greenhouse gas emissions, 12% of mining's water use, 11% of mining's energy use.

i. Calculate the scrap stream greenhouse gas emissions

(Assume mining produces 500 kg of greenhouse gas emissions.)

$$0.19 \times 500 = \underline{\hspace{2cm}} \text{ kg}$$

ii. Calculate the scrap stream water use

(Assume mining uses 800 L of water.)

$$0.12 \times 800 = \underline{\hspace{2cm}} \text{ L}$$

iii. Scrap stream energy use

(Assume mining uses 900 MJ of energy.)

$$0.11 \times 900 = \underline{\hspace{2cm}} \text{ MJ}$$

Scrap-stream recycling produces kg of greenhouse gases, uses L of water, and uses MJ of energy.

10. In the space below, compare mining new metals and recycling lithium-ion batteries.

You may want to consider: greenhouse gas emissions, water use, energy use, transport distance, long-term supply security

Station 5

Video



D. Sketch note making

Draw and annotate:

the lithium cobalt oxide electrode

the graphite copper electrode

Using different colours, show on your diagram the process of charging and discharging

Describe the impact of fast charging on the electrodes

Explain why batteries degrade over multiple charging cycles.



Reflection Passport

Station	Naturally occurring: What skills and/or practices are already present in this learning?	Requires Intentional Design: What will NOT happen unless I plan for it?	Opportunities to Extend Where could students be pushed further?	Reflection: How will this activity influence the teaching, learning and assessment approaches in your classroom?
Station 1				
Station 2				
Station 3				
Station 4				
Station 5				



Planning Considerations Notes/Reflection



Planning Considerations Notes/Reflection





Writing and design checklist

This checklist offers a quick way for you to review a letter, leaflet, booklet, short report or text on a website page to see if it uses **plain English** and is easy to follow. Not all questions will apply to every document but try to answer 'yes' as much as possible to the questions that do apply.

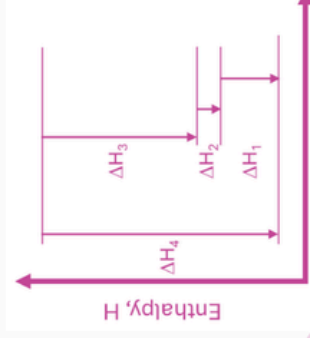
	Yes	No
Language, punctuation and grammar		
1. Does the document use 'you' and 'we', where possible?	☐	☐
2. Does it use the active voice most of the time?	☐	☐
3. Does it keep technical terms and abbreviations to a minimum?	☐	☐
4. Does it define any necessary terms and abbreviations clearly?	☐	☐
5. Does it keep 'corporate jargon' to a minimum?	☐	☐
6. Does it avoid Latin and French phrases and Latin abbreviations?	☐	☐
7. Does it use the same term for the same concept throughout?	☐	☐
8. Does it have an average of 15 to 20 words in each sentence?	☐	☐
9. Does it use the simplest verb tense possible?	☐	☐
10. Does it avoid abstract nouns where possible?	☐	☐
11. Does it use correct punctuation?	☐	☐
12. Do nouns and verbs agree (singular noun with singular verb, for example)?	☐	☐
Structure		
13. Does it organise information according to the reader's needs and interests?	☐	☐
14. Does it use informative headings or questions to break up text?	☐	☐
15. Does it include a natural flow from one point to the next?	☐	☐
16. Are paragraphs relatively short?	☐	☐
17. Does it use bullet point lists for detailed or complicated information?	☐	☐
Page design		
18. Does it avoid underlining, groups of italics and unnecessary capital letters?	☐	☐
19. Is text in a readable typeface (font), aligned to the left and 1.5 spaced?	☐	☐
20. Are images, charts or blocks of colour, if any, clear and relevant to the text?	☐	☐

$$E_m - E_n = hf$$

KEY CONSIDERATIONS FOR

UNITS OF LEARNING

IN CHEMISTRY



SUBJECT SCHEME OF WORK

The overall curriculum plan guiding teaching & learning

- Outlines sequencing across the year
- Identifies key assessment moments
- Reflects whole school activities and links to school calendar
- Adapted for opportunities to link to real world events

UNIT OF LEARNING

The building blocks of curriculum you are teaching

- Connects learning outcomes to classroom practice
- Shapes learning experiences, assessments and skills development
- Adapted to suit specific student cohorts and contexts

INDIVIDUAL LESSON PLANNING

Responsive classroom practice informed by the Unit of Learning

- Daily learning experiences and activities
- Ongoing assessment and feedback
- Adjusted based on student needs and progress.

FUTURE PLANNING

Use insights to inform and improve future Units of Learning

REFLECTION

Teacher and department reflection. What worked well? Student feedback & assessment evidence. How might learning be improved?

STUDENT VOICE

Listen to learners, value their feedback and involve them in the learning process

MAKE ADJUSTMENTS

Adapt strategies, resources and assessments based on student strengths, needs and progress



UNIT OF LEARNING

- Learning Outcomes
- Action Verbs
- Key Learning

PRIOR KNOWLEDGE & LEARNING CONNECTIONS

To include:

- Building on Junior Cycle knowledge
- Progression to Senior Cycle Competencies
- Cross-curricular links that complement learning
- Misconceptions

LEARNER EXPERIENCES

To include:

- Suitable methodologies
- Purpose
- Resources available
- Tasks and activities appropriate to the Learning Outcomes & Action Verbs

EVIDENCE OF LEARNING

To include:

- How can students show their learning?
- Formative and summative
- Alignment to Learning Outcomes & Action Verbs
- How do we know the student has developed understanding?

SCIENTIFIC THINKING & PRACTICES

Consider:

- Build on Junior Cycle Skills
- Continuum of Inquiry
- Build student agency and confidence
- Progression of scientific practices and thinking

IDENTIFY AND REMOVE BARRIERS TO LEARNING

Supporting all learners:

- Multiple representations
- Varied responses
- Offer choice
- Relevance
- Real world connections