

THE INSTITUTE OF  
EDUCATION

Leaving Certificate  
In Practice Investigations

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Biology • Chemistry • Physics

# Leaving Certificate Science subjects

M36 2024L021A1EL

 **Coimisiún na Scrúduithe Stáit**  
**State Examinations Commission**

LEAVING CERTIFICATE EXAMINATION, 2024

**Written paper**

PHYSICS – HIGHER LEVEL

**2.5 hours**

WEDNESDAY 11 JUNE 2024 9:00 AM TO 12:30

Answer three questions from Section A and five questions from Section B

**Worth 60%**

This document will not be returned to the State Examinations Commission.

Relevant data are listed in the *Formulae and Tables* booklet, which is available from the Superintendent.

The 2024 examination papers were adjusted to compensate for disruptions to learning due to COVID-19. This examination paper does not necessarily reflect the same structure and format as the examination papers of past or subsequent years.

2027L021CZEL

 **Coimisiún na Scrúduithe Stáit**  
**State Examinations Commission**

Leaving Certificate Examination, 2027

**Investigation**

Physics in Practice Investigation

**Worth 40%**

200 marks

# What is an In Practice Investigation?

- A major piece of assessed coursework common to both higher and ordinary level.
- Worth 200 marks (40% of your final grade).
- Completed over time under teacher supervision.
- Submitted digitally to the SEC as a report.



# What All Three Subjects Have in Common

- Same investigation process and report structure.
- Same digital submission rules.
- Same marking scheme layout.
- Focus on clear scientific thinking and communication.

# The Investigation Process

1. Respond to the investigation brief (1-2 hrs)
2. Carry out background research (2-3 hrs)
3. Design and plan the experiment (2-3 hrs)
4. Conduct the experiment (under supervision) (1-2 hrs)
5. Analyse data and draw conclusions (1-2 hrs)
6. Finalise and submit the report (4 hrs)

# Your Digital Report – Key Rules

- SEC cover page must be the first page.
- Typed report, using specified formatting rules, converted to PDF before submission.
- Maximum 1500 words (excluding tables, equations, references).
- Maximum 20 images – quality over quantity.

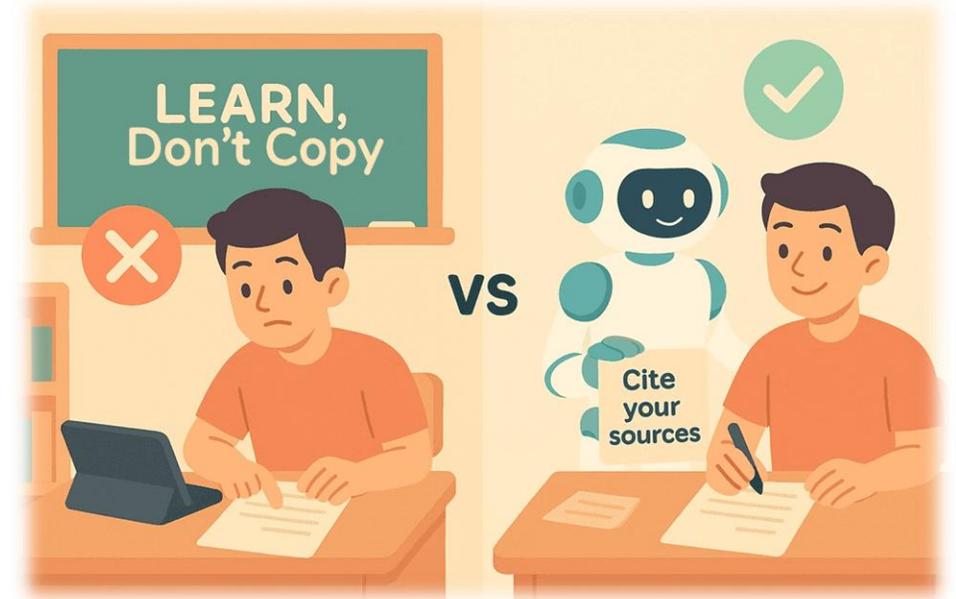


# Images, Graphs and Equations

- Images must support explanation (not replace text).
- Graphs and tables should be clear and labelled.
- Equations may be typed or handwritten and scanned.
- Videos are not allowed.

# Authentication & Academic Honesty

- The work must be your own – keep an “investigative log” of your ideas and research throughout the process. This will help you when writing the report and is evidence of your progress.
- All research sources must be referenced.
- Any use of AI must be acknowledged.
- Plagiarism is treated as cheating.



# How Your Investigation Is Marked

The total marks for the investigation are 200 marks, distributed as follows:

- Title, research and references – 50 marks
- Designing and conducting the experiment – 50 marks
- Data, analysis and conclusions – 50 marks
- Scientific literacy throughout – 50 marks

# What Examiners Are Looking For

- Clear and logical explanations.
- Good experimental design and fairness.
- Accurate data handling.
- Concise writing with no unnecessary waffle.

# Common Mistakes: Report & Format

- Ignoring formatting rules (wrong font, spacing, margins).
- Exceeding the word count.
- Using images instead of explanation.
- Using work that is not your own.

# Common Mistakes: Science & Marks

- Poorly controlled or unfair experiments.
- Weak or unclear conclusions.
- Graphs without labels or units.
- Lack of reflection on results.

# The Role of your Teacher

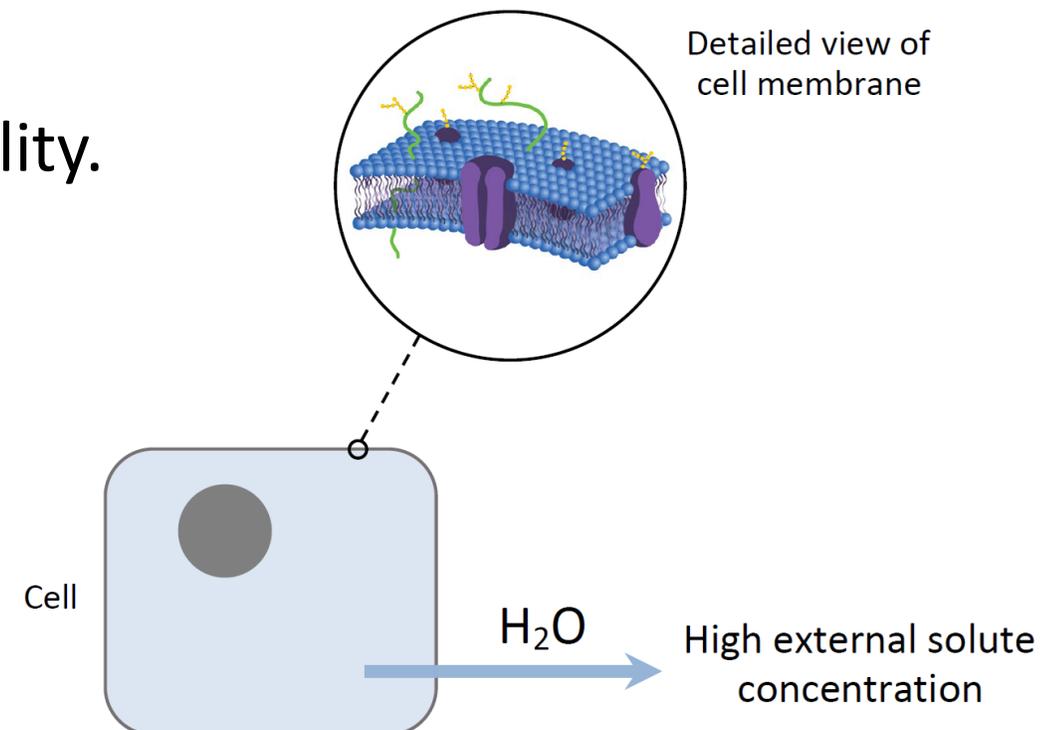
- **Your teacher is there to help you understand, plan, and think — but not to do your work for you.**
- They can guide you, ask questions, check you're on track, and make sure you know the rules — but the ideas, decisions, experiments, data, writing, and conclusions must all come from *you*.
- Your teacher cannot write parts of your report, fix your answers, give you text to copy, or tell you exactly what to say to get marks.
- Your teacher is not allowed to design your investigation for you or edit your final work. This investigation must clearly show *your own thinking and understanding*.

We will take a brief look at each of the investigations...

# Biology in Practice Investigation: Subject Focus

*There are many factors (temperature, concentration gradient, surface area, etc.) that affect the rate of osmosis. Knowledge and understanding of these factors and how they affect osmosis can help scientists extend food shelf life and improve food safety. Investigate one or more aspects of this topic.*

- Cell membranes and selective permeability.
- Osmosis and movement of water.
- Food preservation by osmosis.
- Effect of factors such as concentration and temperature.
- Microbial growth and food spoilage.



# Biology in Practice: Student Checklist

- Identify a question related to osmosis or membranes.
- Research factors affecting osmosis.
- Design a controlled investigation using biological material.
- Record changes accurately over time.
- Analyse results and link conclusions to cell biology.

# Chemistry in Practice Investigation: Subject Focus

*Chemical reactions can be classified in a number of ways, including: acid-base, decomposition, redox, combination, displacement, precipitation, etc. These reactions can happen at different speeds; some are instantaneous while others take place over longer periods of time.*

*The ability to control the rate of these reactions has wide-ranging impacts across the areas of health, sustainability and technology, from the production and interactions of pharmaceuticals to the rate of electrochemical reactions in battery technology.*

*There are a number of factors that are used to control the rate of chemical reactions, including: concentration, surface area, temperature, pressure, the presence of a catalyst, etc. The effects of these factors can be measured directly or indirectly using a variety of methods depending on the chemical and physical changes that take place.*

*Investigate one or more aspects of this topic.*



# Chemistry in Practice Investigation: Subject Focus

- Types of chemical reactions (acid–base, redox, decomposition, etc.).
- Rates of chemical reactions.
- Factors affecting reaction rate.
- Use of catalysts, temperature, concentration and surface area.
- Applications in health, sustainability and technology.



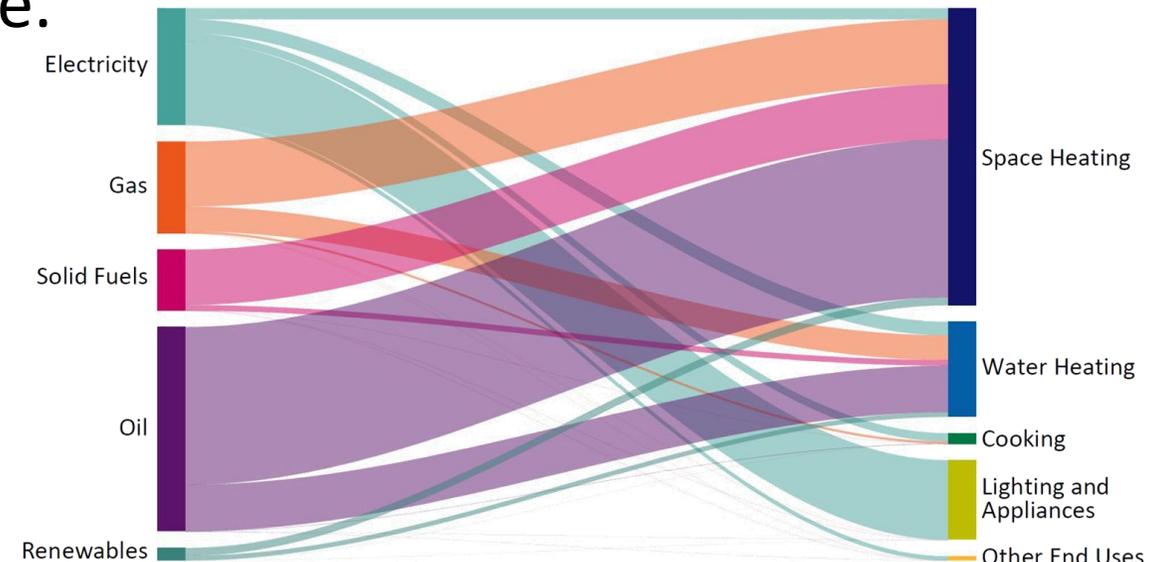
# Chemistry in Practice: Student Checklist

- Choose a reaction or factor affecting reaction rate.
- Research relevant chemical theory.
- Plan a safe and fair investigation.
- Measure reaction progress accurately.
- Analyse results and relate them to reaction kinetics.

# Physics in Practice Investigation: Subject Focus

*Sustainable practices in a domestic setting have led to ways of reducing domestic energy losses, allowing for a comfortable indoor environment with less energy input. Investigate one or more aspects of domestic sustainability – energy sources, energy usage and/or energy losses.*

- Domestic sustainability and energy use.
- Energy sources in the home (electricity, gas, renewables, fuels).
- Energy usage (heating, lighting, appliances, water heating).
- Energy losses and efficiency.
- Reducing energy loss in domestic settings.



# Physics in Practice: Student Checklist

- Identify an aspect of domestic energy use or energy loss.
- Carry out background research on energy, efficiency or sustainability.
- Design a fair test related to energy usage or loss.
- Measure, record and present energy-related data clearly.
- Analyse results and link conclusions to physics principles.

# What Students Should Do Now

- **Understand the Brief**  
Begin by carefully reading the subject-specific brief to fully grasp the topic and requirements.
- **Maintain Investigative Log**  
Create a log to record ideas, references, and reflections to organise thoughts and track progress.
- **Brainstorm and Consult**  
Begin background research and brainstorm investigation ideas that align with the brief.  
Discuss feasibility and safety with your teacher.
- **Plan and Prepare Report**  
Check subject timelines and set up your digital report document following official formatting guidelines.



# Writing the report

- **1500 words and 20 images (limit not a target)**
- **Digital and printed copy of PDF submitted**
- **7 headings**
  1. Title and Introduction
  2. Background Research
  3. Designing and planning
  4. Conducting the experiment
  5. Data and Data Analysis
  6. Conclusions
  7. References



Section headings	Each section should be numbered and begin on a new page of the report. The heading should use the following font: Arial, black, font size 14 and bold. Refer to <b>Section 6</b> for section heading names.
Main body text	Arial, black, font size 12 with 1.5 line spacing.
Text editing features permitted	Bold, italics, numbering, and bullets.
Text editing features <b>not</b> permitted	Coloured text (black text only), highlighted text, different fonts (Arial only).
Page orientation	Portrait only.
Page numbering	Bottom-centre of each page.
Page margins <b>No work should appear in the margins as it may not be visible to an examiner.</b>	Left margin 20 mm Right margin 20 mm Top margin 20 mm Bottom margin 20 mm

# Consideration for Report Writing

- **Communication**  
Concise writing.
- **Coherence**  
The report demonstrates understanding of the investigation.
- **Consistency**  
Information mentioned in the background research, design and planning should be referred to again in data analysis and conclusion.
- **Relevance**  
Keep to the research question.  
Can you link it to the unifying strands of health, sustainability and technology.
- **Reflective Approach**  
Was the research question achieved?  
Identify source of error.  
Possible improvements.

# Title and Introduction

- Research Question
- Hypothesis

Testable statement or educated prediction that forms the basis of the experiment.



# Background Research

- Collection of secondary data from other scientists that have previously carried out a similar experiment.
- Evaluation of secondary data.



# Design and Planning

- Experimental design.
- Equipment selection.
- Safety and risk identification.
- Consideration of fairness, accuracy, precision.



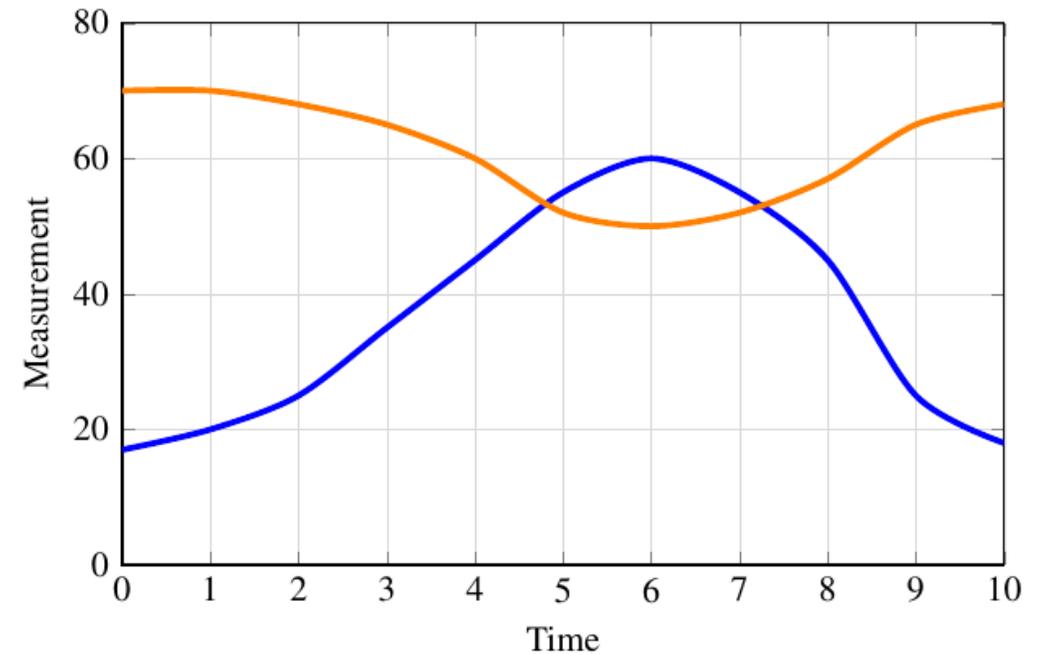
# Conducting the experiment

- Experimental method description.



# Data and Data Analysis

- Collection of results  
primary data.
- Data presentation  
Table, graph etc...
- Evaluate results obtained  
put results into word description.
- Sources of error.



# Conclusion



Summary of  
results obtained  
from conducting  
investigation



Link back to  
research  
question/hypothesis



Link to brief



Benefit to health,  
technology,  
sustainability and  
other real-world  
applications  
(unifying strands)



Revisions and  
Improvements

# References

- Not included in word count
- Should be incorporated into the body of the report and reference section
- Acknowledges where the information was sourced
- Examples of suitable referencing given in “Guidelines to support X in Practice Investigation” published by the NCCA

[https://curriculumonline.ie/getmedia/fc6493fa-f5d7-4c8e-9c82-3fcd268ce1ba/AAC\\_Guidelines\\_Biology\\_Final.pdf](https://curriculumonline.ie/getmedia/fc6493fa-f5d7-4c8e-9c82-3fcd268ce1ba/AAC_Guidelines_Biology_Final.pdf) ->

# Additional Information

- [www.examinations.ie](http://www.examinations.ie)  
examination material tab on left hand side of page
- [www.curriculumonline.ie/senior-cycle/senior-cycle-subjects/](http://www.curriculumonline.ie/senior-cycle/senior-cycle-subjects/)



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