GrindSpot
ONLINE GRINDS PLATFORM

LEAVING CERT 2027

LEAVING CERT CHEMISTRY

Exam Ready

Higher Level · New course · Workbook A

Dyslexia friendly
large, clear text · room to write

Built on the new Leaving Cert Chemistry course and the SEC sample papers, with 9 years of past papers: what comes up, how it's marked, and the practice to nail it.

- **9** years of exam trends, topic by topic
- **60** topic drills with answers
- **1** full practice paper, 300 marks
- ✓ every answer worked out step by step



Know what's coming.
Walk in ready.

Original GrindSpot material written in the style of the Leaving Certificate examination. Not an official SEC paper.

What comes up

2017 to 2026

We read every Higher Level paper of the **old course**, 2017–2026 (no exam in 2020). 2027 is on the new course: rows marked "not on new course" no longer apply. Each number counts questions out of 11; each is listed at grindspot.ie/exam-trends/chemistry. We counted a topic for a question when at least one of its parts could not be answered without it.

	2017	2018	2019	2021	2022	2023	2024	2025	2026	Years
The mole & stoichiometry	5	4	4	4	2	5	3	5	4	9/9
Mandatory experiment	4	3	3	4	4	4	4	5	4	9/9
Bonding & molecular shapes	4	3	4	5	4	5	2	3	3	9/9
Organic reactions & functional groups	4	3	4	4	3	2	4	4	4	9/9
Atomic structure & the periodic table	3	3	4	4	3	3	2	2	3	9/9
Redox & electrochemistry	3	2	2	3	2	3	4	3	3	9/9
Water & the environment	3	2	3	1	3	3	2	2	3	9/9
Hydrocarbons & fuels	2	2	2	3	3	3	2	2	2	9/9
Acids, bases & pH	1	2	1	2	3	1	2	2	2	9/9
Thermochemistry	1	2	2	2	2	2	1	2	2	9/9
Volumetric analysis (titrations)	2	2	1	1	2	1	2	2	1	9/9
Rates of reaction	1	1	1	2	2	2	1	1	1	9/9
Chemical equilibrium	1	1	3	1	1	1	1	1	1	9/9
Metals & crystals (not on new course)	–	2	1	1	1	2	2	–	2	7/9
Radioactivity (not on new course)	2	1	1	1	1	1	1	1	1	9/9
Instrumental analysis (not on new course)	1	1	1	–	–	1	1	3	1	7/9
Industrial chemistry (not on new course)	–	1	–	1	–	–	–	–	–	2/9

Darker = more questions. Source: State Examinations Commission papers, 2017 to 2026, read and grouped by GrindSpot. Every question we counted is listed at **grindspot.ie/exam-trends**. A guide to what has come up, not a prediction of what will.

Calculations every year. Moles came up in 36 of 99 questions, and all through the new sample papers.

Experiments matter. 35 questions were built on a set experiment.

Bonding and organic: every year. 33 and 32 questions. Mechanisms and isomers are big on the new course.

No longer examined. 22 of 99 questions had a part on radioactivity, instruments, metal extraction or industry: skip just those parts.

TOPIC 6

Acids, bases & titrations

Worked answers →

In the real exam

Came up in 25 old-course questions (2 to 4 a paper), 2017 to 2026: on the new sample papers, a whole question each: Sample 1 Q6, Sample 2 Q4.



Fionn's tip: pH = −log[H^+]. For a weak acid, [H^+] = $\sqrt{(K_a \times c)}$. In a titration, use the mole ratio from the equation; never just "$V_1M_1 = V_2M_2$" when the ratio is not 1 : 1.

1. Calculate the pH of (i) 0.020 M HCl and (ii) 0.050 M NaOH, at 25 °C.

2. Calculate the pH of 0.10 M ethanoic acid ($K_a = 1.8 \times 10^{-5}$).

3. Calculate the pH of 0.10 M ammonia ($K_b = 1.8 \times 10^{-5}$), at 25 °C.

Question 6 (50 marks)

Lime is used on Irish farms to raise the pH of acidic soil. Limestone, $CaCO_3$, is quarried in Co. Kilkenny; it is ground and spread, or heated in a kiln to make quicklime, CaO.

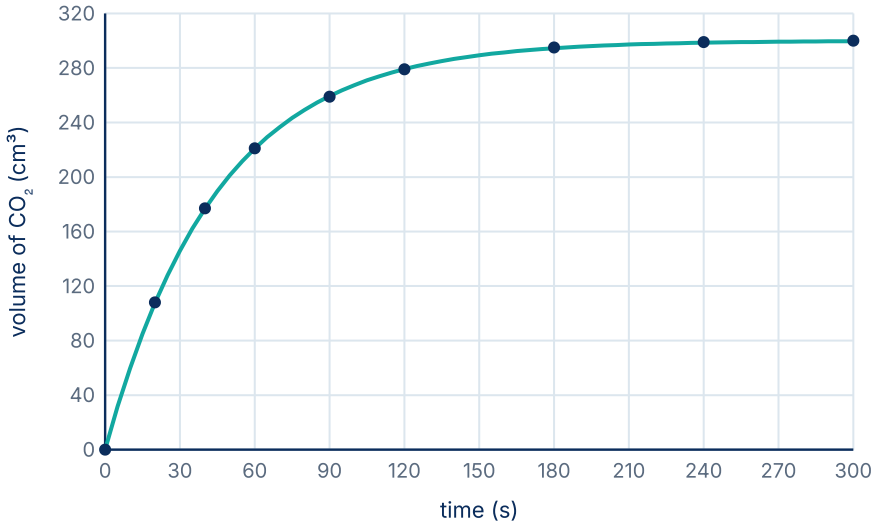
(a) Use these heats of formation to find ΔH for $CaCO_3 \rightarrow CaO + CO_2$: $CaCO_3$ −1207, CaO −635, CO_2 −394 kJ mol^{-1}.

(b) Sketch the energy profile for this reaction, labelling the activation energy and ΔH.

(c) In the soil: $CaCO_3 + 2H^+ \rightarrow Ca^{2+} + H_2O + CO_2$. Explain, using collision theory, why ground limestone works faster than lumps.

(d) Chidi adds 2.0 g of limestone chips to 25.0 cm^3 of 1.0 M hydrochloric acid and measures the volume of CO_2 at room temperature and pressure. Show that the acid is the limiting reagent, and that the final volume of gas should be 300 cm^3. (Take the molar volume of a gas at room temperature and pressure as 24.0 L mol^{-1}.)

time (s)	0	20	40	60	90	120	180	240	300
CO_2 (cm^3)	0	108	177	221	259	279	295	299	300



(e) Use the table to calculate the average rate of reaction over the first 60 s.

(f) Draw a tangent to the curve at $t = 0$ and use it to estimate the initial rate.

(g) Explain why the rate decreases as the reaction goes on.

(h) Calculate the mass of limestone left unreacted at the end.

Each part shows the method, the answer, its marks, and a guide to partial credit in the style of the SEC marking schemes (our guide, not an official scheme: the SEC has not published one for the new course; its chemistry schemes give marks for listed points). Full credit needs the key points and correct working. In calculations, each arithmetic or rounding slip usually costs 1 mark.

Question 1 (50 marks)

(a) (i) An electron has absorbed energy and moved to a higher energy level than its ground state.
(ii) $E = hf = 6.63 \times 10^{-34} \times 4.57 \times 10^{14} =$ **3.03×10^{-19} J**.
(iii) Electrons can only have fixed energies (levels). A falling electron gives out a photon with exactly the energy difference between two levels, so only certain frequencies appear.

10 marks · partial credit: **3** for one of (i), (ii), (iii); **7** for two of the three, or all three with a slip in the calculation

(b) Target $C_2H_4 + H_2 \rightarrow C_2H_6$. Use ethene combustion (−1411), hydrogen combustion (−286) and the reverse of ethane combustion (+1560): $\Delta H = -1411 - 286 + 1560$.
−137 kJ mol^{-1}

10 marks · partial credit: **3** for one equation correctly reversed or used; **7** for correct cycle, sign or arithmetic slip

(c) S has 2 bond pairs and 2 lone pairs: four pairs in a tetrahedral arrangement, so the molecule is V-shaped (bent). Lone pairs repel more than bond pairs and push the bonds closer: less than 109.5° (about 92° in H_2S). The molecule is polar: the bonds are slightly polar and the bent shape means the dipoles do not cancel.
V-shaped; polar

10 marks · partial credit: **3** for correct shape only; **7** for shape and reason for the angle, polarity missing or wrong

(d) Put dilute hydrochloric acid in a conical flask and a few marble chips in a small test tube standing inside it; close the flask with a bung (or a balloon). Weigh the whole sealed set-up. Tilt the flask so that the acid and chips mix; carbon dioxide forms but cannot escape. Reweigh: the mass is unchanged. **mass before = mass after**

10 marks · partial credit: **3** for reactants named or the set-up weighed; **7** for sealed set-up weighed before and after, observation missing