Chemistry

HSC · 2017 SYLLABUS · TEACHER BRIEF

What eight HSC papers tell us about 2027

All 344 question parts from 2019–2026, read against the syllabus dot points and marking guidelines · November 2026, for Chemistry teachers

39.5% *start here, page 3*
of all marks went to **9 dot points**, each a main focus in 7 or 8 of the 8 papers

34
marks per paper sit on parts that need a **calculation** (30–42 marks in every paper)

58%
of marks come with a **graph, table or diagram** (45–66% per paper); 93% counting written scenarios

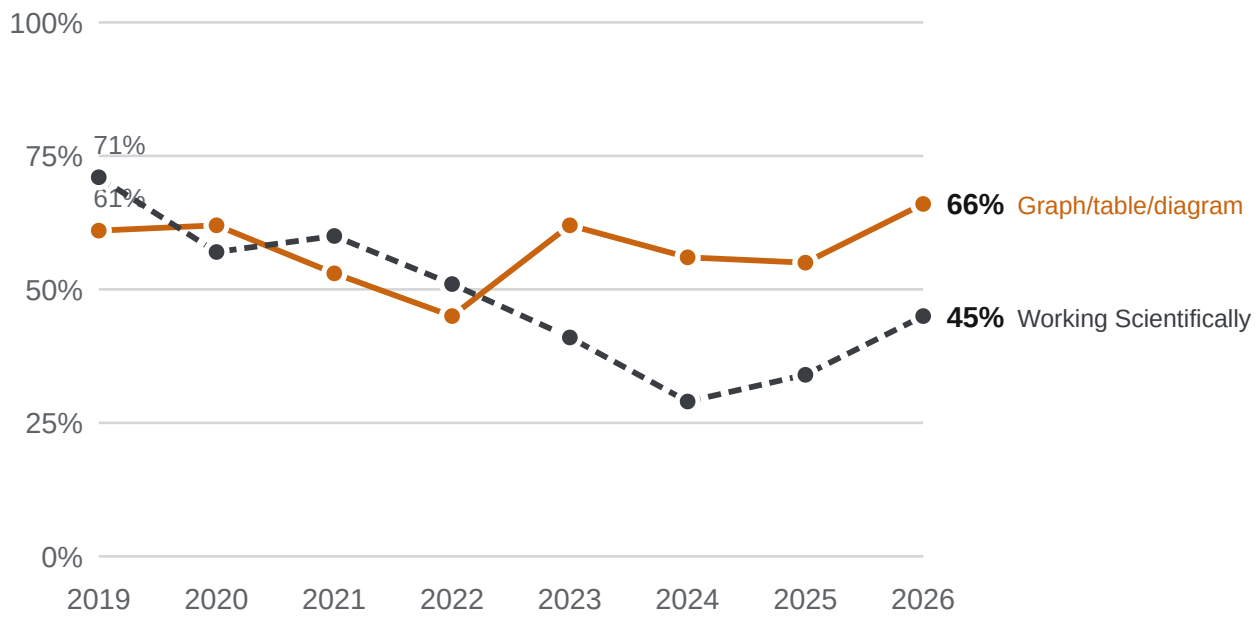
50
marks per 2022–26 paper, on average, on a **top-15 watch-list** made from earlier papers

Five things to act on

1. **Plan for a third of the paper to involve calculation.** Parts needing one carried 30–42 marks in every paper. Ten of the 15 calculations worth 5 or more marks were on titration, K_{eq}, K_{sp} or K_a.
2. **Make structure-from-spectra routine.** Spectroscopy is the largest dot point: at least 9 marks in every paper counting each question that uses it, with a 7–9 mark part in every paper from 2020 to 2025.
3. **Practise the analysis of ions as whole procedures.** Ion tests, gravimetric analysis, and colourimetry and AAS together carried 6–15 marks per paper. The longest question of 2026 (Q35, 8 marks) gave test results for seven unknown ions: five could be identified, and the last two needed a further test.
4. **Teach explanations that name the species.** Explain and Calculate each account for about a quarter of Section II marks. Equilibrium and buffer marks go to which species change and why, not to "by Le Chatelier's principle".
5. **Cover three required ideas that no paper has asked** (page 5): buffers in natural systems, everyday and industrial uses of neutralisation, and static equilibrium. The 2027 and 2028 papers are the last two on this syllabus.

Nearly 60% of marks sit on a graph, table or diagram; the Working Scientifically share has swung from 71% to 29% to 45%

Blue: % of marks on parts with a graph, table or diagram (86–96% with written scenarios). Orange: % of marks NESA maps to Working Scientifically outcomes 1–7*

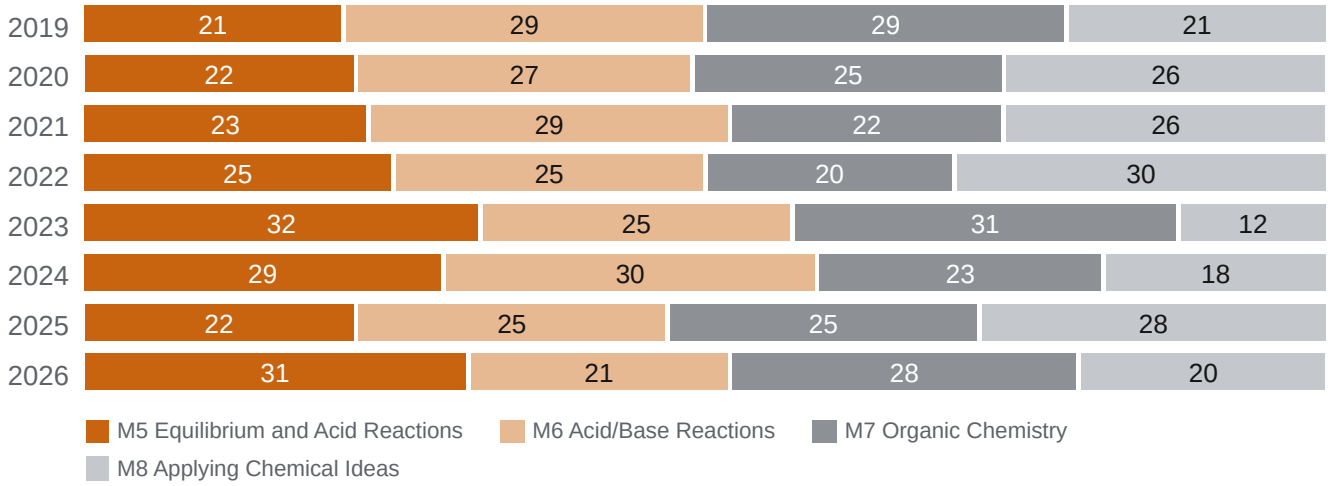


* Each part's marks are split equally across the outcomes NESA maps to it. Counted the other way, 57–100 marks per paper (average 87) sit on parts mapped to at least one Working Scientifically outcome, because most questions test a skill and content together. School assessment tasks set their own Working Scientifically/content split.

How the paper is built

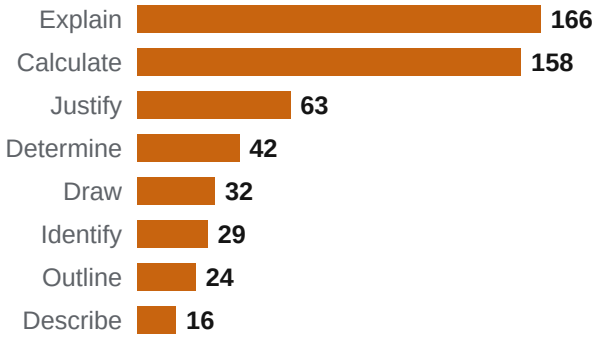
A module can carry anything from 12 to 32 marks, and Module 8 has been the lightest overall

Marks out of 100 by the module each part is mainly about. Totals over eight papers: Module 5, 205; Module 6, 211; Module 7, 203; Module 8, 181. Both extremes came in 2023 (32 and 12).



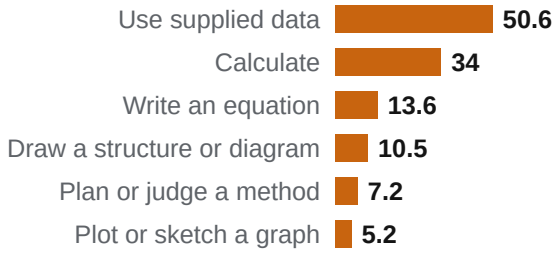
Section II command verbs

Marks out of 640, 2019–26; two-verb parts split. 7 of the 17 parts worth 6 or more marks asked students to justify.



What students have to do

Average marks per paper on parts whose marking guideline requires each task (a part can need several)



Marks for planning or judging a method vary: 5 or fewer in 2019, 2023, 2024 and 2025; 15 in 2022. Graphs were drawn in 7 of 8 papers.

The biggest questions: two parts worth 7–9 marks in every paper

Year	What the two parts asked (marks)
2019	Q29c (7) AAS: does treated stormwater meet a discharge limit? · Q34 (7) reagents and product tests for a three-step synthesis
2020	Q25 (7) graph temperature data to find an NaOH concentration · Q30 (7) draw a structure from spectra
2021	Q29 (7) relate spectra to pentane-1,5-diamine · Q35 (7) back titration: does the product meet its ethanol specification?
2022	Q30 (7) draw and name a compound from spectra · Q33 (8) design a school-laboratory organic synthesis
2023	Q31 (7) graph absorbance data, calculate K_{eq} · Q36 (9) structures in a reaction pathway, justified from data
2024	Q35 (7) identify three acids from titration and reaction data · Q38 (7) structures of two isomers and an ester
2025	Q33 (7) titration: which brand of chalk? · Q36 (7) predict the infrared, NMR and mass spectra of a compound
2026	Q32 (7) justify the conditions for making an ester, plus two safety points · Q35 (8) identify seven ions, or say what further test is needed

What it means for teaching

- None of the 16 is an essay. All but 2022 Q33 give data or a scenario to work from, so rehearse whole solutions under time.
- Seven need or allow organic spectra (one a year, 2019–2025); five are quantitative analysis from raw data (2019, 2020, 2021, 2023, 2025).
- Eight draw on two modules, four of them Module 7 with Module 8.

Teach these reliably

These 9 dot points were the main focus of a question in **7 or 8 of the 8 papers**, and questions mainly on them carried **316 of the 800 marks**.

Dot point	Papers	Share of all marks 2019–26	How it is examined, and what earns the marks
Spectroscopy of organic compounds *proton and carbon-13 NMR, mass spectrometry, infrared* M8.IQ2.DP2	**8/8**	**8.1%**	One to four MCQs per paper, plus written parts: draw a structure from spectra (2020, 2022), relate spectra to a named compound (2021), predict spectra (2025). Tie each shift, splitting, absorption or fragment to a structural feature.
K_{eq} calculations *equilibrium concentrations, Q and direction* M5.IQ3.DP2	**7/8**	**7.0%**	Equilibrium concentrations or K from initial amounts (about 4 marks, most years), Q against K (2023 Q37), K from absorbance or conductivity data with a graph (2023, 2026). Use concentrations, not moles.
Titration *concentration of an unknown acid or base* M6.IQ3.DP1	**8/8**	**6.2%**	A 5–7 mark calculation from raw titres in most papers: standardisation, back titration, real products (soft drink 2022, fertiliser 2023, chalk 2025). Leave out any outlier titre; carry the dilution factor.
Testing for ions *flame, precipitation and complexation tests* M8.IQ1.DP2	**7/8**	**4.5%**	MCQs on flame tests and precipitates; 4–8 mark parts to outline a test sequence (2020, 2023), judge a procedure (2021, 2024) or identify unknown ions from results (2026). Give each observation and the equations asked for.
Solubility product, K_{sp} *expressions and solubility calculations* M5.IQ4.DP4	**8/8**	**3.6%**	An MCQ every year; 4–5 mark calculations in 2021–2024: K_{sp} from solubility data, ion concentrations, the common-ion effect. Markers note K_{sp} confused with K_{eq} expressions.
Le Chatelier's principle *temperature, concentration, volume, pressure* M5.IQ2.DP1	**8/8**	**3.4%**	MCQs on yield and on concentration–time graphs; 2–4 mark explanations (2021 Q22, 2023 Q33b, adding argon in 2025 Q29). Marks go to what happens to the named species, not the shift alone.
Colourimetry, UV-visible and AAS *concentration from absorbance* M8.IQ1.DP4	**7/8**	**2.6%**	Eight MCQs (calibration curves, choice of lamp or wavelength), but 13 of the 21 marks were written: AAS (2019 Q29, 9 marks) and colourimetry (2024 Q25, 4). Markers flag the dilution step.
Buffers *preparing one and explaining how it works* M6.IQ3.DP7	**7/8**	**2.2%**	Explain why pH barely changes when acid or base is added (2019, 2023, 2026) and why a buffer eventually fails (2021 Q34). Say which species reacts with the added H^+ or OH^-.
Naming organic compounds *IUPAC, up to C8* M7.IQ1.DP1	**8/8**	**1.8%**	A name-or-structure MCQ in every paper from 2019 to 2025. In 2026, 5 marks to name and draw a halogenated compound, justified from its spectra.

Seen in all eight papers, whatever the topics

- Two parts worth **7–9 marks**, nearly all built on supplied data.
- **Spectroscopy, titration, K_{sp}, Le Chatelier and naming:** the five dot points examined in all 8 papers.
- **About a third of the marks on parts needing a calculation**, and 37–57 marks needing supplied information to be used.
- **Equations on demand:** 8–19 marks per paper sat on parts that required a balanced equation.

The 2027 watch-list

How it is ranked: each dot point's average marks per paper, plus a bonus for appearing in more papers. Built from earlier papers only, the top 15 held **50 of the 100 marks** in each 2022–26 paper, on average (how we tested it: page 6).

	Dot point	19	20	21	22	23	24	25	26	Papers	Marks per paper
1	**Spectroscopy of organic compounds** M8.IQ2.DP2	11	13	10	10	1	6	9	5	8/8	8.1
2	**K_{eq} calculations** M5.IQ3.DP2	6	12	4	5	14	9	·	6	7/8	7.0
3	**Titration** M6.IQ3.DP1	4	3	8	9	6	8	7	5	8/8	6.2
4	**Testing for ions** M8.IQ1.DP2	·	5	6	2	5	5	3	10	7/8	4.5
5	**Solubility product, K_{sp}** M5.IQ4.DP4	1	1	7	6	7	5	1	1	8/8	3.6
6	**K_a and pK_a** M6.IQ3.DP4	5	·	6	1	6	·	12	1	6/8	3.9
7	**Le Chatelier's principle** M5.IQ2.DP1	3	2	4	2	7	2	5	2	8/8	3.4
8	**Colourimetry, UV-visible and AAS** M8.IQ1.DP4	10	·	1	3	1	4	1	1	7/8	2.6
9	**Gravimetric analysis and precipitation titration** M8.IQ1.DP3	·	4	5	7	·	·	4	4	5/8	3.0
10	**Designing a chemical synthesis** M8.IQ3.DP1	·	4	·	8	3	3	5	·	5/8	2.9
11	**Enthalpy of neutralisation** M6.IQ1.DP5	·	12	4	4	·	·	·	4	4/8	3.0
12	**Buffers** M6.IQ3.DP7	4	1	5	·	3	1	1	3	7/8	2.2
13	**Reaction pathways** M7.IQ5.DP6	7	·	·	·	9	7	·	·	3/8	2.9
14	**Naming organic compounds** M7.IQ1.DP1	2	1	1	2	1	1	1	5	8/8	1.8
15	**Enthalpy, entropy and ΔG** M5.IQ1.DP3	3	·	6	·	·	3	1	5	5/8	2.2

Marks per paper: 0 1–2 3–4 5–7 8+

Next on the list (16–20)

- Dissociation equations and conjugate pairs M6.IQ2.DP4 · 6/8 papers, 1.9 marks per paper
- Collision theory and equilibrium M5.IQ2.DP2 · 4/8 papers, 2.2 marks per paper
- Enthalpy of combustion of alcohols M7.IQ4.DP3 · 4/8 papers, 2.2 marks per paper
- Properties of acids, amines and amides M7.IQ5.DP2 · 5/8 papers, 2.0 marks per paper
- Titration and conductivity curves M6.IQ3.DP2 · 6/8 papers, 1.8 marks per paper

Three blocks the dot-point list splits up

- **Equilibrium constants in every form.** K_{eq}, K_{sp}, K_a and K_b, and predicting precipitation sit in five dot points but share a method: write the expression for the reaction given, then solve it. Together they carried 11–28 marks in every paper.
- **Organic reactions and pathways.** Seven dot points in M7.IQ3–IQ5 (addition, substitution, the reactions, production and oxidation of alcohols, esters, and pathways) carried 6–16 marks in every paper, yet only reaction pathways makes the top 20. The pathway questions of 2019, 2023 and 2024 were worth 7–9 marks each.
- **Calorimetry.** Enthalpy of neutralisation (rank 11) and of combustion (rank 18) were a main focus in 6 of the 8 papers, and a 5-mark calorimetry calculation in 2024 (Q36) was set on an acid–carbonate reaction. Only 2025 had no q = mcΔT question.

Required content never or hardly examined

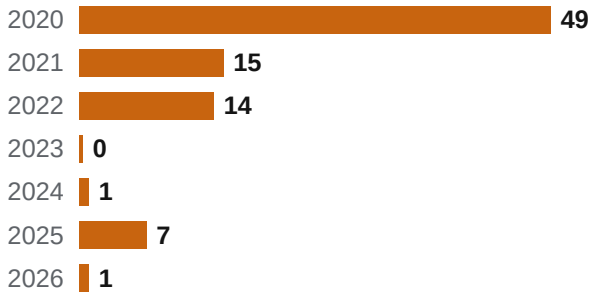
watch this space

Three required ideas have **never been asked** in 8 papers and five more only lightly. Each was checked against the full text of every question, marking guideline, sample answer and figure description. Only the 2027 and 2028 papers remain on this syllabus, and each of the eight is quick to teach.

Required content never examined	Syllabus wording	Examined so far	One thing to prepare
The importance of buffers in natural systems M6.IQ3.DP8	Whole dot point	never	Buffers are a main focus in 7 of 8 papers, but always a laboratory or pool mixture. Add one natural buffer with its equation, such as carbonic acid/hydrogencarbonate in blood or sea water, and why a steady pH matters there.
Uses of neutralisation in everyday life and industry M6.IQ1.DP4	Whole dot point	never, beyond titration	Titration of real products is common (soft drink 2022, fertiliser 2023, chalk 2025), but no question asks about neutralising to fix a problem. Two examples with equations: antacids, lime on acidic soil, or correcting the pH of effluent.
Static equilibrium, as distinct from dynamic M5.IQ1.DP2	"static and dynamic"	never	Dynamic equilibrium and open against closed systems have been examined (12 marks); no question or marking guideline uses the word static. Static: both processes have stopped. Dynamic: forward and reverse continue at equal rates.
Examined only lightly			
Structure and action of soaps and detergents M7.IQ5.DP5	Whole dot point	2 MCQ marks (2021, 2025)	The MCQs covered how soap anions arrange in an emulsion and a use for saponin. No written question has asked how micelles lift grease, or how a detergent differs from a soap in hard water.
Aboriginal and Torres Strait Islander Peoples removing toxins from foods M5.IQ4.DP2	Whole dot point	1 MCQ mark (2024)	Leaching in running water as a solubility equilibrium: the dissolved toxin is carried away, so more dissolves. Aboriginal and Torres Strait Islander contexts have so far been one MCQ a year since 2024.
Acid/base analysis techniques used by Aboriginal and Torres Strait Islander Peoples M6.IQ3.DP5.b	Listed sub-point	no acid/base question	The one MCQ set in this context (2026 Q4) was about dehydrating gypsum. The other sub-points, industry and digital probes, are met through titration and conductivity questions. Prepare one example your class has studied.
Testing for iron(II) ions M8.IQ1.DP2.a	Listed ion	never the ion identified	The only listed cation no question has needed identified; it has appeared in MCQs, including a K_{sp} calculation (2022 Q19). Fe^{2+} gives a green precipitate with hydroxide; the brown Fe^{3+} one was examined in 2022 (Q28a).
The need for monitoring the environment M8.IQ1.DP1	Whole dot point	2 marks directly (2025)	Monitoring is often the setting (mine stormwater 2019, waste water 2024), but the reason for it was asked once: why both qualitative and quantitative analysis matter for water quality (2025 Q22).

New dot points have almost stopped appearing

Marks on parts that drew on a dot point no earlier paper had used



Since 2023 at most 7 marks per paper have involved a dot point for the first time, so a gap is most likely to arrive as an MCQ or a short part.

Not required: "for example" content

The syllabus lists these as examples, so NESA cannot require them, though a paper can supply one students have not met. Teach the skill and practise transferring it.

- Nylon, PVC and PTFE have never been named. Polymers examined include PET, Kevlar, silk, polyethylene, polystyrene and poly(vinyl fluoride).
- Photosynthesis as a non-equilibrium system: only combustion has been asked.
- Cycad fruit has not appeared; iron(III) thiocyanate only as a coloured complex (2026 Q17), not as an equilibrium. Cobalt chloride (2024, 2025) and NO_2/N_2O_4 were used.

Also on the radar

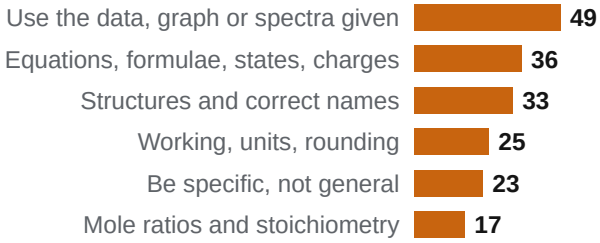
Other dot points with 2 marks or fewer as the main focus

- Practical on reversible reactions M5.IQ1.DP1 · never the main focus; cobalt chloride equilibria examined in 2024 and 2025
- Finding K_{eq} by experiment M5.IQ3.DP4 · done as a 7-mark calculation, 2023 Q31
- Practical: measuring pH M6.IQ2.DP1 · never the main focus
- Naming inorganic acids and bases M6.IQ1.DP1 · never the main focus
- Analysing a household substance M6.IQ3.DP6 · met in the 2022 soft-drink titration
- Properties of alkanes M7.IQ2.DP4 · never the main focus
- Organic acids compared with organic bases M7.IQ5.DP4 · 1 mark as main focus
- Substitution of alkanes with halogens M7.IQ3.DP2 · 2 marks
- Formulae of homologous series M7.IQ2.DP1 · 2 marks
- Primary, secondary and tertiary alcohols M7.IQ4.DP1 · 2 marks

What markers reward

What NESA's markers ask for most often

Number of questions with 2019–2025 feedback whose "areas to improve" raise each theme; keyword match, so approximate



- **Work from what is given.** Read values off the graph or spectrum and ignore information the question does not need (2021 Q35, 2024 Q28).
- **Get the equation right.** Balanced, with states and charges; an equilibrium arrow only where it belongs.
- **Name the species.** Which ions rise or fall, which force is overcome.
- **Annotate calculations.** Say what each line finds, use the mole ratio, round once at the end.
- **Draw structures that can be read.** Four bonds on every carbon.

Ideas markers report students confusing

- pH and pOH (2019)
- K_{sp} and K_{eq} expressions (2020)
- equilibrium position and K_{eq} (2022)
- equal rates and equal concentrations (2023)
- molar solubility and ionic product (2025)
- intermolecular forces and covalent bonds (2020, 2022)
- hydroxyl group and hydroxide ion (2019)
- base peak and molecular ion peak (2020, 2021)
- accuracy and reliability (2025)

Method and limitations

- **Data:** all 344 marked parts (160 multiple choice, 184 written) of the 2019–2026 HSC Chemistry papers. Each part is matched to the one dot point it is mainly about, guided by NESA's mapping grid.
- **What each part requires** (a calculation, an equation, a graph, supplied data) was read from the question and its marking guideline; every part was classified twice, independently, and disagreements settled against the guideline.
- **Marker feedback** covers 2019–2025 (about 450 comments, each theme counted once per question); 2026 is due 16 December.
- **Patterns, not knowledge of the paper.** NESA can examine any dot point.
- **Watch-list test:** each year's list (2022–26) was built from earlier papers only; questions mainly on its top 15 were worth 52, 58, 50, 50 and 42 of that paper's 100 marks (50 on average). **Topics are not "due":** a Chemistry dot point absent from one paper returned in the next 44% of the time (71% if it had appeared); a "due" bonus made the list worse.

References

1. NESA. *HSC exam papers: Chemistry*, 2019–2026 (papers, marking guidelines, mapping grids, marker feedback), nsw.gov.au/education-and-training/nesa/curriculum/hsc-exam-papers/chemistry; and *Chemistry Stage 6 Syllabus* (2017).

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