Alkane reactions: combustion and substitution

Teacher / technician

YEAR 11 / LESSON 78 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. Written and model-based lesson; no laboratory procedure is implied.

Coverage and delivery

Shared core: 4.12 and 4.22. This lesson is included in Double Award; no radical mechanism is required.

Allow about 60 minutes. Follow the student sequence and use the answers to check reasoning.

Requisition • class of 30, working in 15 pairs

Item	Per pair / setup	Class total
Booklet / writing tools	1 per learner	30 sets
Model kit / periodic table	1 set per pair	15 sets

Immediate safety

Desk activity only; keep small model pieces away from mouths.

Preparation and delivery

Read alongside the student method

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1. Provide 30 booklets and 15 model kits or reusable atom counters; no chemicals are needed.

2. Use 10 minutes retrieval, 25 independent/pair tasks, 15 explanation and 10 corrections. Keep first attempts visible.

3. Keep this explicitly available to Double Award learners. Use counters/drawings; no chlorine, bromine, hydrocarbon fuel or UV lamp is issued.

4. Do not require radical mechanisms or homolytic-fission notation; assess products, condition and classification.

5. Check all carbon valencies, formula subscripts and equation coefficients. Label any supplied numbers as practice data, not class observations.

Close of lesson

• Return shared equipment and retain corrected reasoning.

Check before teaching

Check the cards, reference data and quantities against this requisition. Keep the staff answer guide separate until the checking stage. Supplied numerical practice datasets are labelled examples; they are not class measurements.

Answers and teaching notes

Expected explanations • do not give as experimental observations

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- $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$.
- $2CH_4 + 3O_2 \rightarrow 2CO + 4H_2O$.
- UV light; CH_3Cl and HCl: $CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$.
- A hydrogen is replaced by chlorine and HCl forms; no carbon–carbon double bond is opened.
- $C_2H_6 + Cl_2 \rightarrow C_2H_5Cl + HCl$ under UV.
- Successive substitution and mixtures can occur; the syllabus model is restricted to one replacement.

References and provenance

Pearson Chemistry specification

Prepared 22 November 2026. Original wording, tables and questions. Sources inform the concepts and technique; the lesson scope and classroom quantities are explicitly described here. No laboratory trial or final school risk approval is claimed.