Simple covalent molecules

Teacher / technician

YEAR 10 / LESSON 23 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. Desk modelling and reference data. No alkane-heating method, invented temperature measurements or universal M_r law.

Coverage and delivery

1.47–1.48: simple molecular structures, relatively low melting/boiling points and the general relationship with relative molecular mass. Consolidates non-conduction in simple molecular substances.

Allow about 45 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
Student booklet	1 per student	30
Writing tools / blank paper	1 set per student	30 sets
Six diatomic molecule cards	1 set per pair	15 sets / 90 cards
Periodic table / calculator	1 per pair	15

Immediate safety

Desk activity only. Use pre-cut blunt modelling pieces and keep small parts out of mouths. Keep the workspace clear; no chemicals, flames or electrical supply are required.

Preparation and delivery

Read alongside the student method

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1. Prepare 15 sets of six diatomic cards: draw two circles joined by one solid line on each card. Dashed intermolecular lines are drawn on the work mat, not on the cards. No chemical samples are required.

2. Remove the inherited alkane water-bath method, burner list and heating precautions from this desk activity. The old method referred to an absent equipment image and unspecified samples; it is not retained as a usable heating procedure.

3. Allow 10 minutes for the cards, 15 for data and M_r, 15 for explanations and 5 for corrections. Reuse the Lesson 20 data so pupils can distinguish new reasoning from repeated measurements.

4. Keep the account at IGCSE level: more electrons and stronger intermolecular attractions for these comparable molecules. Do not turn “in general” into an absolute mass-only law.

5. Emphasise that boiling overcomes intermolecular attractions; the strong covalent bonds within these molecules remain intact. Use “usually” for non-conduction: ion formation in some aqueous solutions is a different situation.

Close of lesson

• Keep your evidence and corrections. Count and return reusable model pieces; recycle unwanted paper. No chemical waste is produced.

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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• Solid line inside Cl_2: covalent bond. Dashed line between molecules: intermolecular attraction. The cards stay intact when modelling boiling.

• M_r: Cl_2 = 70.90; Br_2 = 159.80; I_2 = 253.80. M_r is dimensionless. Both reference melting and boiling points rise across this series.

• For these comparable molecules, increasing size/electron count leads to stronger intermolecular attractions; more energy is required to separate molecules. This does not mean the internal covalent bond must break on boiling.

• Simple molecular substances have relatively low phase-change temperatures because attractions between molecules are weaker than covalent bonds within them. Do not describe all covalent bonds as weak.

• Pure simple molecular liquids usually lack mobile ions and delocalised electrons. Neutral molecules moving does not produce an electric current.

• The M_r relationship is general for comparable substances. Different shapes and types of intermolecular interaction can change the trend; no universal exact boiling point follows from M_r alone.

References and provenance

Pearson Chemistry specification

RSC: teaching intermolecular forces

RSC chlorine reference

RSC bromine reference

RSC iodine reference

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.