Covalent bonding

Teacher / technician

YEAR 10 / LESSON 22 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. Paper models only. All examples are shared-core bonding content; no physical experiment or molecular geometry measurement.

Coverage and delivery

1.44–1.46: shared electron pairs, electrostatic attraction, and dot-and-cross diagrams for the specified simple molecules and up-to-two-carbon organic examples.

Allow about 50 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
Periodic table and writing tools	1 set per pair	15 sets
Counters (or pencil symbols)	24 per pair	360 optional
Blank model paper / ion cards	1 set per pair	15 sets

Immediate safety

Desk activity only. No chemical samples or live reactions. Keep counters out of mouths and return loose pieces; use pencil symbols instead if preferred.

Preparation and delivery

Read alongside the student method

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1. Provide 30 booklets and spare diagram paper, with 15 optional counter sets. No apparatus or chemical samples are needed. Symbols must be distinguishable in monochrome photocopies.

2. Use 10 minutes for H_2/HCl, 10 for water/ammonia/methane, 10 for multiple bonds, 10 for organic examples and 10 for checks. Split practice across classwork/homework if pupils need more time.

3. Model one hydrogen pair first, then insist on a total-electron count and per-atom shell check. For O_2 count 12 outer electrons; N_2 10; CO_2 16.

4. For molecules with several atoms, dots/crosses need only show a consistent origin convention at each bond. Do not imply electrons are physically coloured or change charge.

5. Accept equivalent rotations and symbol choices. Do not accept missing lone pairs where full outer-electron diagrams are requested, or ionic charges on neutral examples.

Close of lesson

• Keep evidence and corrections together. Return shared cards/counters and equipment; close the recording or reference pages. No chemical waste is generated.

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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• A covalent bond is a shared electron pair, with electrostatic attraction between that pair and the positive nuclei of the bonded atoms. Sharing is different from ion formation by transfer.

• H_2: one shared pair, no lone pairs. HCl and Cl_2: one shared pair per bond; each chlorine has three lone pairs. HCl has eight outer electrons in total.

• H_2O: two O–H shared pairs and two lone pairs on O. NH_3: three shared pairs and one lone pair on N. CH_4: four shared pairs and no lone pairs on C.

• O_2: two shared pairs and two lone pairs on each O. N_2: three shared pairs and one lone pair on each N. CO_2: O=C=O, two shared pairs per C=O; two lone pairs per O, none on C.

• C_2H_6: one C–C and six C–H single bonds. C_2H_4: C=C double bond and four C–H single bonds. CH_3CH_2Cl: one C–C, five C–H, one C–Cl; Cl has three lone pairs. Each C has four bonds.

• Dots/crosses mark origins of identical negative electrons. Diagrams omit actual electron distributions, scale and three-dimensional shapes; circular paths are not implied.

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.