Atomic structure

Teacher / technician

YEAR 10 / LESSON 8 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. This model supports counting and location only. It is not evidence of real particle motion, nuclear size or a chemical reaction.

Coverage and delivery

1.14–1.16: atoms, molecules, subatomic particles, atomic number and mass number.

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
Counters labelled p / n / e	12 of each per pair	180 of each
Nucleus / electron-region mat	1 per pair	15
Periodic table	1 per pair	15
Student booklet	1 per student	30

Immediate safety

Desk activity only. Keep small counters out of mouths and off the floor. Use pre-cut paper tokens if needed. No chemicals, heating, radiation sources or glassware are required.

Preparation and delivery

Read alongside the student method

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1. Print the reference tables and use clearly labelled counters rather than colour alone. For 15 pairs, supply 180 tokens of each type. Pre-cut paper tokens are an alternative.

2. Spend about 10 minutes establishing the reference table, 15 minutes calculating/model-building, 10 minutes on atoms versus molecules and 10 minutes on explanation and checking.

3. Keep all species neutral in this lesson. Do not assume learners already know ion charge or shell filling. The two-region model deliberately avoids claiming a literal orbit or scale.

Close of lesson

• Count and return the tokens. Keep the completed particle table and labelled drawing. Recycle unwanted paper pieces.

Verification before use

Check quantities and available apparatus against this requisition. For heated work, complete the school risk assessment and trial the actual setup. This editorial review is not a record of a physical laboratory trial. All supplied calculation datasets are labelled teaching examples.

Answers and teaching notes

Expected explanations • do not give as experimental observations

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• Atomic number is proton count; mass number is protons plus neutrons. Neither is the decimal relative atomic mass printed on many periodic tables.

• Neutral atoms have equal positive proton and negative electron charges: p = e. Carbon-12 therefore has 6 electrons.

• Completed rows p/n/e: hydrogen-1 = 1/0/1; helium-4 = 2/2/2; carbon-12 = 6/6/6; carbon-13 = 6/7/6; sodium-23 = 11/12/11.

• Carbon-12 and carbon-13 have the same proton count and neutral electron count, but different neutron counts and mass numbers.

• Mass number counts nucleons. Electrons have a small non-zero relative mass (about 1/1836); they are not nucleons. Do not call their mass literally zero.

• A molecule contains two or more covalently bonded atoms. H_2 is a molecule of an element. Model size, spacing, stationary tokens and chosen colours do not depict the real atom.

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.