Year 9
Subject: Chemistry
Topic/Unit: C2 Bonding, Structures, and Properties
When: Half Term 4 and 5

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Overview: Why this? Why now?
This unit explores how atoms interact to form the world around us. By understanding **ionic, covalent, and metallic bonding**, students can explain why different materials have specific physical properties. This knowledge is vital for understanding chemical reactions and the development of modern technologies, such as medicine and electronics.

Building on...building to:
This unit builds upon prior knowledge of the **Periodic Table** and **atomic structure**. It provides the necessary foundation for future study in **quantitative chemistry** and the chemical properties of groups, where bonding determines how substances behave in reactions.

Sequence summary:
- **Introduction to Bonding:** Students identify the three main types of chemical bonds: **ionic** (metal and non-metal), **covalent** (non-metals), and **metallic** (metals).
- **Ionic Bonding and Structures:** Lessons cover the formation of **ions** through electron loss or gain. Students learn to represent these using **dot and cross diagrams** and explore the properties of **giant ionic lattices**, such as high melting points and electrical conductivity when molten.
- **Covalent Bonding and Molecules:** The curriculum focuses on shared electron pairs. Students compare **simple molecules** (with weak intermolecular forces) to **giant covalent structures** like diamond, graphite, and graphene.
- **Metallic Bonding:** Students examine the regular arrangement of atoms in metals and the "sea" of **delocalised electrons** that allows for conductivity and malleability.
- **Nanoparticles:** The unit concludes with an introduction to matter on the **nanoscale**. Students calculate **surface area to volume ratios** and evaluate the benefits and risks of using nanoparticles in sunscreens and medicine.

Key Vocabulary:
Ionic Bond, Covalent Bond, Metallic Bond, Ion, Electrostatic Force, Delocalised Electron, Intermolecular Force, Giant Lattice, Allotrope, Nanoparticle, Surface Area to Volume Ratio.

Assessments:
- **Formative:** Retrieval "Do Now" tasks, mini-whiteboard activities for drawing ions, and quick quizzes on bonding rules.
- **Summative:** Exam-style questions requiring students to describe the bonding in specific compounds (e.g., Magnesium Chloride) and explain the properties of different structures.

Able and interested:
Learners will investigate the complex geometry of **fullerenes** and the potential of **carbon nanotubes** in future engineering. They will also practice writing complex **ionic formulae** using the bar model.

Inclusion, Personal Development and Wider Skills:
Lessons use various models, such as **ball-and-stick** and **3D representations**, to support visual learners. Discussion of the risks of "grey goo" scenarios and environmental impacts of nanoparticles encourages ethical thinking in science.

Homework and Independent Learning:
Students will complete a task set on the SPARX online platform. The task is based on the current topic but also includes consolidation on previous topics. It will automatically adjust the level of challenge as the student complete the activities.