CHEMISTRY YEAR 11 - MODULE 1 - LESSON 8

Metallic Bonding and Properties

Use this worksheet after reading the lesson to practise the key ideas and prove you can meet the success criteria.

Name ______________

Date ______________

Class ______________

1. Key Ideas

In 1897, J.J. Thomson discovered the electron. Within a decade, the "electron sea" model of metallic bonding emerged: a lattice of positive metal ions surrounded by freely flowing valence electrons. This model — over 125 years old — still explains every strange property of metals, from why copper wire bends without breaking to why mercury is liquid at room temperature.

- The electron sea (delocalised electron) model of metallic bonding
- Why the electron sea model explains every key metallic property

2. Success Criteria

By the end, you should be able to:

- The electron sea (delocalised electron) model of metallic bonding
- The physical properties of metals: conductivity, malleability, ductility, lustre, high MP
- How alloy formation changes metallic properties

3. Key Terms

Key idea
The central concept from Metallic Bonding and Properties.

Evidence
Information, observations or calculations used to support an answer.

Explain
Give a reasoned answer that links cause and effect.

Apply
Use a learned idea in a new example, problem or scenario.

4. Activity: Build the Lesson Map

Use the lesson to complete the table. Keep answers brief but specific.

Prompt	Your answer
Main concept	
Important example	
Common mistake to avoid	
How this links to the next lesson	

5. Short Answer Questions

1. 6. Using the electron sea model, explain why metals are good conductors of both electricity and heat. Clearly distinguish the mechanisms for each type of conductivity.

BAND 3 | 3 MARKS

2. 7. Explain why adding carbon atoms to iron produces steel that is harder and less malleable than pure iron. Refer specifically to the effect on the metallic lattice structure.

BAND 4 | 3 MARKS

3. 8. Tungsten (W, Group 6 transition metal, MP 3422°C) has one of the highest melting points of all metals, while caesium (Cs, Group 1, MP 29°C) has one of the lowest. Using the electron sea model, explain this large difference in melting points in terms of the metallic bonding in each metal.

BAND 5 | 4 MARKS

6. Extend: Apply the Idea

BAND 5/6 | 5 MARKS

A student gives a memorised answer about Metallic Bonding and Properties but does not use evidence or reasoning.

Improve the answer by writing a stronger response that uses accurate terminology, a relevant example and a clear explanation.

7. Multiple Choice

1. What is the best first step when answering a question about Metallic Bonding and Properties?

☐ A. Identify the key concept being tested

☐ B. Write every fact from memory

☐ C. Ignore the command word

☐ D. Skip examples and evidence

2. Which answer would show stronger understanding of Metallic Bonding and Properties?

☐ A. An answer with accurate terms and reasoning

☐ B. A copied definition only

☐ C. A single-word response

☐ D. An answer with no example

3. What should you do if a question asks you to explain?

☐ A. Link the idea to a reason or cause

☐ B. List unrelated facts

☐ C. Only draw a diagram

☐ D. Write the shortest possible answer

8. Success Criteria Proof

Finish with evidence that you can do each success criterion.

SUCCESS CRITERION 1

Prove that you can: The electron sea (delocalised electron) model of metallic bonding

BAND 3 | 2 MARKS

SUCCESS CRITERION 2

Prove that you can: The physical properties of metals: conductivity, malleability, ductility, lustre, high MP

BAND 4 | 3 MARKS

SUCCESS CRITERION 3

Prove that you can: How alloy formation changes metallic properties

BAND 5 | 4 MARKS

One thing I still need help with: