Subject: Chemistry

Topic: Metal

Level: S.3

Learning objectives:

i. Content:

Students should be able to use the metallic bond model to explain the common properties of metals.

ii. Language:

Students should be able to use the following sentence patterns to explain the common properties of metals using the metallic bond model:

Metals have high density because the metal atoms inside metals are closely packed.

Metals have high melting points because the force holding the metal atoms inside metals is very strong.

Metals are good conductors of electricity because the outer-shell electrons inside metals are free to move.

S.3 Chemistry
Metal
Common Properties of Metals: The Metallic Bond
Worksheet 2

Name:_____ Class:_____ No.:_____ Date:_____

Activity 1: Common Properties of Metals

1. Find out about the properties of the following two metals from the data book and complete the table:

	Magnesium	Iron
a) density		
b) melting point		
c) electricity conductivity		

2. Work in pairs.
   a) Pick up one sample of metal from your bench.
   b) Describe the properties of the chosen metal orally to your partner. The following sentence pattern may help you. You can draft your sentence(s) before speaking to your partner.
   Zinc is shiny. It is silver in colour. It is flexible. It can be bent into different shapes.

3. Complete the following with the appropriate word:

   a) Metals usually have a _____(high / low) density

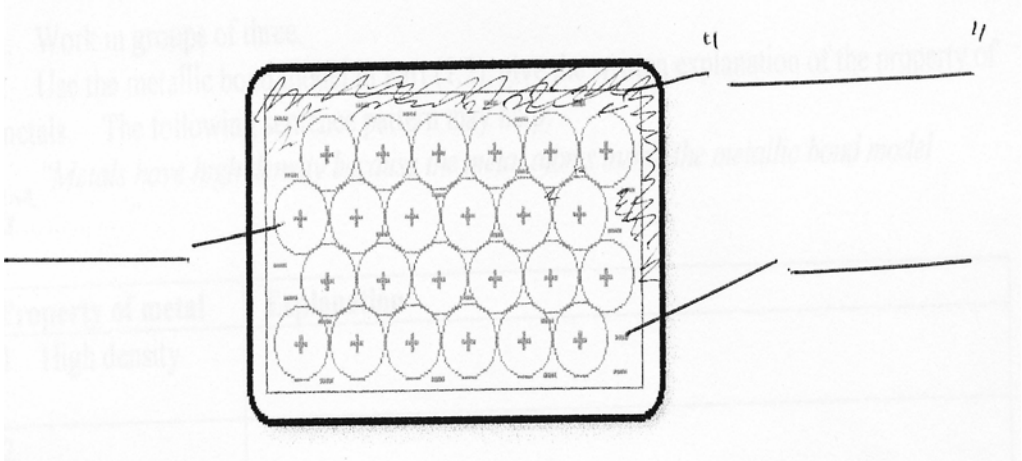
   b) The melting points of metals are usually_____ (high / low).

   c) Metals are_____ (good / bad) conductors of electricity.

4. Read the sentences in **Q3** to your partner.

Activity 2: The Metallic Bond

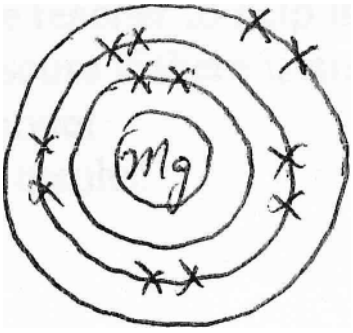
1. Work in pairs.
2. The following diagram shows the internal structure of the metal magnesium.



3. Label the diagram with the following words:
   metal atoms, electron, sea of electrons

4. The electron arrangement of the metal magnesium is (2,8,2).

An atom of magnesium



   a) The number of electrons in the outermost shell of the magnesium atom is ___. These electrons are free to move between the _____ within the metal structure.
   b) When a magnesium atom loses the outer-shell electrons, it becomes a _____ (positive / negative) ion.
   c) The magnesium atoms in the whole structure _____ (lose / gain) the outer-shell electrons to form the "_____". This means that the space in between the magnesium atoms are filled with _____.
   d) The _____ between the positive ion and the "sea of electrons" is called the metallic bond model. This force holds the metal atoms together.

5. Explain orally to your partner how metal atoms are held inside the metal structure using the diagram in Q2. The sentences in Q4 may help you.

Activity 3: Explaining the Properties of Metals (Worksheet for Student A)

1. Work in groups of three.

2. Use the metallic bond model in Activity 2 to give a written explanation of the property of high density of metals. The following sentence pattern may help you.

   Metals have high density because the metal atoms inside metals are……

   Write in the table below.

Property of metal	**Explanation**
1. High density	
2.	
3.	

3. After you completed the explanation, read to your partners. Your partners should write down what you said in the appropriate box.

4. When all members in the group have finished, you should check if the explanations are correct. Ask the teacher for help if necessary.

5. When you are sure the explanations are correct, discuss if there is any other property of metals that can be explained by the metallic bond model.

6. A few groups will be invited to present their results.

Activity 3: Explaining the Properties of Metals (Worksheet for Student B)

1. Work in groups of three.

2. Use the metallic bond model in Activity 2 to give a written explanation of the property of high melting point of metals. The following sentence pattern may help you.

   Metals have high melting points because …

   Write in the table below.

Property of metal	**Explanation**
1.	
2. High Melting point	
3.	

3. After you completed the explanation, read to your partners. Your partners should write down what you said in the appropriate box.

4. When all members in the group have finished, you should check if the explanations are correct. Ask the teacher for help if necessary.

5. When you are sure the explanations are correct, discuss if there is any other property of metals that can be explained by the metallic bond model.

6. A few groups will be invited to present their results.

Activity 3: Explaining the Properties of Metals (Worksheet for Student C)

1. Work in groups of three.

2. Use the metallic bond model in Activity 2 to give a written explanation of the property of good conductors of electricity of metals. The following sentence pattern may help you.

   Metals are good conductors of electricity because …

   Write in the table below.

Property of metal	**Explanation**
1.	
2.	
3. Good conductors of electricity	

3. After you completed the explanation, read to your partners. Your partners should write down what you said in the appropriate box.

4. When all members in the group have finished, you should check if the explanations are correct. Ask the teacher for help if necessary.

5. When you are sure the explanations are correct, discuss if there is any other property of metals that can be explained by the metallic bond model.

6. A few groups will be invited to present their results.