Answer all the questions below then check your answers.

1. Which of the following properties is not typical of metals?

   a) Malleable b) Brittle c) Ductile d) Good conductors of electricity

2. Which metal is commonly known for its magnetic properties?

   a) Gold b) Aluminium c) Iron d) Copper

3. Which of the following factors does not affect the strength of metallic bonds?

   a) Size of metal cations b) Charge on the metal cations

   c) Number of valence electrons d) Colour of the metal

4. Match the metal property to its correct definition:

property
malleable
ductile
Conductivity
Tensile strength

definition
Ability to be hammered into thin sheets
Ability to conduct electricity and heat
Ability to be drawn into thin wires
Resistance to breaking under tension

b. Account for the following properties of metals in terms of their metallic bonding:

High melting points

Malleability

Ductility

5. Explain why metals are good conductors of electricity.

6. What is meant by the term 'metallic bonding'?

7. Fill in the Gaps to complete the sentences below:

Metals are generally _____ conductors of heat and electricity and have _____ density.

8. The ability of metals to be hammered into thin sheets is known as

b. The strength of metallic bonds increases with increasing _____ of the metal ions.

9. The structure of metals can be described as a lattice of _____ surrounded by a sea of _____.

10. True or False, All metals are magnetic?

b. Metallic bonds get stronger as the number of delocalised electrons increases.

11. Describe how the size of metal cations affects the strength of metallic bonds.

12. Explain the role of valence electrons in determining the strength of metallic bonds.

13. Discuss the factors that affect the strength of metallic bonds.

14. Complete the table below which contrasts the properties of ionic, covalent, and metallic substances.

Property	Ionic	Covalent	Metallic
Bonding	Electrostatic attraction between oppositely charged ions	Shared pair of electrons between two atoms	
Structure	Giant ionic lattice	Molecular or giant covalent lattice	
Conductivity (electrical)	Solid: poor Molten: good	Poor	
Conductivity (thermal)	Poor	Poor	
Melting and boiling points	High	Low- molecular High-Giant covalent lattice	
Examples	NaCl, MgO	H_2O, diamond	

Answers:

1. Which of the following properties is not typical of metals?

   a) Malleable b) Brittle c) Ductile d) Good conductors of electricity

   Answer: b) Brittle

2. Which metal is commonly known for its magnetic properties?

   a) Gold b) Aluminium c) Iron d) Copper

   Answer: c) Iron

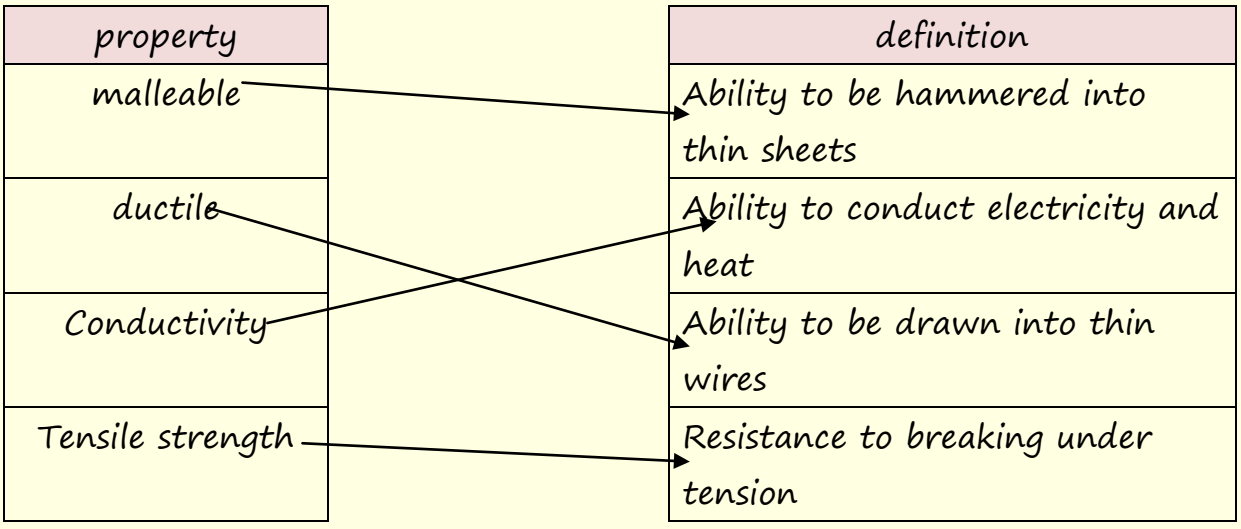
3. Which of the following factors does not affect the strength of metallic bonds?

   a) Size of metal cations b) Charge on the metal cations

   c) Number of valence electrons d) Colour of the metal

   Answer: d) Colour of the metal

4. Match the metal property to its correct definition:



b. Account for the following properties of metals in terms of their metallic bonding:

High melting points

Malleability

Ductility

Answers:

High melting points: Strong metallic bonds require a large amount of energy to overcome.
Malleability: The layers of metal ions can slide over each other without breaking the metallic bonds, allowing the metal to be hammered into different shapes.

Ductility: The metal ions can be pulled out into a wire without breaking the metallic bonds.

5. Explain why metals are good conductors of electricity.

Answer: Metals are good conductors of electricity because they have a sea of delocalised electrons that can move freely throughout the metallic structure. These free electrons can carry an electric charge, allowing current to flow easily through the metal.

6. What is meant by the term 'metallic bonding'?

Answer: Metallic bonding is the type of chemical bonding that occurs in metals. It involves the attraction between positively charged metal ions and the sea of delocalised electrons that surround them. This type of bonding is responsible for many of the characteristic properties of metals, such as conductivity, malleability, and ductility.

7. Fill in the Gaps to complete the sentences below:

Metals are generally _____ conductors of heat and electricity and have _____ density.

Answer: good, high

8. The ability of metals to be hammered into thin sheets is known as _____.

Answer: malleability

b. The strength of metallic bonds increases with increasing _____ of the metal ions.

Answer: charge

9. The structure of metals can be described as a lattice of _____ surrounded by a sea of _____.

Answer: positive ions (or cations), delocalised electrons

10. True or False, All metals are magnetic?

Answer: False

b. Metallic bonds get stronger as the number of delocalised electrons increases.

Answer: True

11. Describe how the size of metal cations affects the strength of metallic bonds.

Answer: The size of metal cations affects the strength of metallic bonds because smaller cations allow electrons to be closer to the nucleus, increasing the electrostatic attraction between the cations and the delocalised electrons. This results in stronger metallic bonds. Conversely, larger cations have a

weaker attraction due to the increased distance between the cations and the delocalized electrons, leading to weaker metallic bonds.

12. Explain the role of valence electrons in determining the strength of metallic bonds.

Answer: Valence electrons play a crucial role in determining the strength of metallic bonds. Metals with more valence electrons contribute more electrons to the sea of delocalised electrons, resulting in stronger electrostatic attraction between the cations and the delocalized electrons. This leads to stronger metallic bonds. Metals with fewer valence electrons will have weaker metallic bonds due to fewer electrons being available to contribute to the bonding.

13. Discuss the factors that affect the strength of metallic bonds.

Answer:
The charge on the metal ions: higher charge leads to stronger bonds.
The size of the metal ions: smaller ions lead to stronger bonds.
The number of delocalized electrons: more delocalized electrons lead to stronger bonds.

14. Compare and contrast the properties of ionic, covalent, and metallic substances. Use examples to illustrate your answer.

Property	Ionic	Covalent	Metallic
Bonding	Electrostatic attraction between oppositely charged ions	Shared pair of electrons between two atoms	Electrostatic attraction between metal ions and sea of delocalized electrons
Structure	Giant ionic lattice	Molecular or giant covalent lattice	Giant metallic lattice
Conductivity (electrical)	Solid: poor Molten: good	Poor	Good
Conductivity (thermal)	Poor	Poor	Good
Melting and boiling points	High	Low- molecular High-Giant covalent lattice	High
Examples	NaCl, MgO- any suitable ionic substance	H_2O, diamond- Any covalent molecular/giant substance	Cu, Fe, Al or any metal