

Worksheet 5.2

A bonding summary

NAME:

CLASS:

1 Complete the table below by placing a tick in the relevant column to indicate the type of bonding exhibited by each substance.

Substance	Ionic	Covalent	Metallic
Aluminium oxide			
Hydrogen sulfide			
Zinc hydroxide			
Brass			
Graphite			
Tungsten			

Plastic

2 Classify the bonding present in each of the following substances as ionic, metallic or covalent.

- a A hard but malleable substance with a high melting temperature that conducts electricity well in either a solid or molten state.
- b A gaseous substance at room temperature that cannot conduct electricity, even when cooled to a liquid.
- c A hard but brittle substance with a very high melting point. Dissolves readily in water to produce a solution that conducts electricity.

3 You are provided with a sample of a white solid substance, a magnifying glass, some water, a Bunsen burner, tripod and crucible, and electrical conductivity testing equipment. Explain how you would use some or all of this equipment to determine whether the substance is ionic, metallic or covalent molecular.

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- 4 Complete the following summary table, using the notes below as a guide.
- a Use the words: 'atoms', 'ions', 'electrons', 'cations' or 'molecules'.
 - b Include a simple sketch of each lattice type.
 - c Use 'hard' or 'soft', and include 'brittleness' or 'malleability'.
 - d Use 'high', 'low', 'generally high', 'generally low' or 'very high'.
 - e Use 'yes', 'no' or 'not applicable'.

		Ionic	Metallic	Covalent molecular	Covalent network
a	Particles present				
b	Structure				
c	Hardness (at room temperature)				
d	Melting point				
e	Conductivity:				
	Solid				
	Liquid				
	Aqueous solution				

- 5 Draw and annotate sketches to show:

a ionic solids are brittle.	b metals are malleable.	c the change in conductivity when an ionic solid melts.
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Worksheet 5.2: Solutions

A bonding summary

1	Substance	Ionic	Covalent	Metallic	
	Aluminium oxide	•			
	Hydrogen sulfide		• molecular		
	Zinc hydroxide	•	•		
	Brass			•	
	Graphite		• network		
	Tungsten			•	
	Plastic		• molecular		
2	<p>a Metallic</p> <p>b Covalent</p> <p>c Ionic</p>				
3	<p>Test the conductivity of the solid. If it conducts, it is a metal (as it is white, it cannot be graphite. Also metals are normally not white unless covered with material from corrosion). If it does not conduct, continue testing:</p> <p>Try to dissolve the solid in water. If it dissolves, test the conductivity of the aqueous solution. If it does not conduct, it is molecular. If it does, it most likely ionic but there is a small possibility that it could be molecular (where the molecules ionise in water).</p> <p>Try to melt the substance. If it melts, test the conductivity. If it conducts, it is ionic.</p>				
4		Ionic	Metallic	Molecular	Covalent network
a		Positive and negative ions	Positive ions and electrons	Molecules	Atoms
b		See figure 3.2, page 54 in textbook	See figure 2.12, page 37, textbook	See figure 4.1, p 89 (show both inter- and intramolecular bonds)	See figure 5.7, page 111, textbook
c		Hard, but brittle	Generally hard, but malleable	Generally soft	Very hard
d		High	Generally high	Low	Very high
e					
s		No	Yes	No	No
l		Yes	Yes	No	No
aq		Yes (if soluble)	Not applicable	Often no, but sometimes yes (those that ionise)	Not applicable
5	<p>a See figure 3.3, page 55 in textbook.</p> <p>b See figure 2.11, page 37 in textbook.</p> <p>c See figure 3.5, page 56 in text book.</p>				

1. 1. 1.

2. 2. 2.

3. 3. 3.

4. 4. 4.

