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Student worksheet

3.5 Metal cations and non-metal anions combine to form ionic compounds

Pages 78–79

Ionic compounds

1 What is the difference between an atom and an ion?

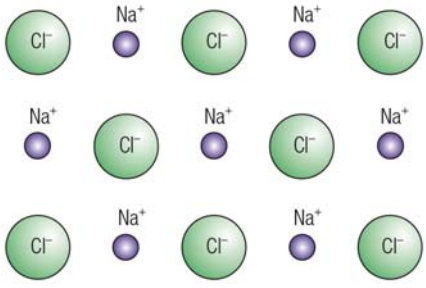
2 What name is given to a metal when it forms an ion, and what type of charge does it have?

3 What name is given to a non-metal when it forms an ion, and what type of charge does it have?

4 What is an ionic bond?

5 An ionic bond is between which two types of elements?

6 Explain what happens to an ionic compound when it is struck with a hammer. Include diagrams in your explanation.

Before being struck:	After being struck:
	

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7 Complete the following table to demonstrate the number of electrons gained or lost by atoms to form ions.

Group number	Number of valence electrons	Number of electrons gained or lost
1		
2		
13		
15		
16		
17		
18		

8 Draw the electron configuration of lithium and fluorine, and then redraw these configurations to demonstrate how an electron is donated between the atoms.

9 Other than being brittle, what is the other main property of ionic compounds? Explain this property.

10 What is a polyatomic ion? Give an example.

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Extend your understanding

11 Access a valency table (your teacher may have one or you can search for one on the internet). Use the valency table to determine the formulas of the follow ionic compounds.

a Sodium chloride

b Sodium nitrate

c Potassium nitrate

d Calcium hydroxide

e Aluminium oxide

f Hydrogen phosphate

g Sodium Hydrogen carbonate

h Ammonium hydroxide

i Sodium sulfate

j Calcium sulfate

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3.6 Non-metals combine to form covalent compounds

Pages 80–81

Covalent bonding

1 Between which types of atoms does covalent bonding occur?

2 What do these atoms do when they covalently bond?

3 Draw the covalent bonding in the following molecules.

Ammonia (NH_3)	Methane (CH_4)
Hydrofluoric acid (HF)	Carbon tetrachloride (CCl_4)
Carbon dioxide (CO_2)	Phosphorous trifluoride (PF_3)

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4 What is a diatomic molecule? Give an example.

5 What is the difference between an atom and a molecule? Give an example.

6 Where do electrons reside in covalent bonding?

7 Why are covalent bonds so strong?

Extend your understanding

8 Suggest the most likely chemical formula between the following atoms and draw their covalent bonding.

Atoms	Chemical formula	Diagram
Carbon and fluorine		

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Silicon and oxygen		
Hydrogen and chlorine		
Phosphorous and chlorine		
Carbon and sulfur		

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3.7 Metals form unique bonds

Pages 82–83

Metallic bonding

1 What are three of the structural properties that metals have in common?

2 Where do delocalised electrons come from?

3 Why are they referred to as ‘delocalised’?

4 Why are metals able to conduct electricity?

5 What is the relationship between temperature and conductivity in metals?

6 Why are metals shiny?

7 What is an alloy?

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8 What are the benefits of using alloys?

9 What is a smart alloy?

10 How are the properties of smart alloys beneficial to society?

11 Explain one use of a smart alloy.

Extend your understanding

12 An essential tool in chemistry is the process of electrolysis. Conduct some research and answer the following questions:

a What is electrolysis?

b Which scientist paved the way for electrolysis in modern chemistry?

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c In electrolysis, what does ‘reduction’ mean?

d In electrolysis, what does ‘oxidation’ mean?

e A transformation of energy occurs in electrolysis. What is this transformation?

f Why is electrolysis essential to modern society? Name two applications of this process.

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