

## Vocabulary

Each of the definitions below is for a common word or term used in chemistry. Identify the correct word or term to go with each definition and write it in the space provided.

Definition	Word/Term
The smallest particle of an element	
Positive nuclei held together by delocalised electrons	
Different physical structures of atoms of the same element	
The change in concentration of a reactant or product over time	
Chemically combined elements in a fixed ratio	
Able to dissolve in a particular solvent	
Breaking a substance apart using an electrical current	
A reaction in which a substance is burned in oxygen	
A substance able to speed up a chemical reaction that remains unchanged after the reaction is complete	
A bond formed by the sharing of a pair of electrons	
Negatively charged particle found within atoms	
The loss of electrons	
The reaction between an acid and a base to produce water and a solution of pH 7	
A bond formed by the exchange of electrons and resulting attraction between ions	
Positively charged particle found within atoms	
A type of reaction that gives out heat and causes a rise in temperature	
Centre of an atom, containing protons and neutrons	
Gain of electrons	
Particle with no charge found within atoms	
The amount of a dissolved substance in a given volume of solvent	
A type of reaction that takes in heat and causes a decrease in temperature	
A charged particle	
A more reactive element taking the place of a less reactive element	

## Atomic Structure

Every substance around you is made from atoms. But what is an atom and what does an atom contain?

In the space below produce a drawing that shows what makes up an atom. You should label your diagram fully and give explanations where necessary.

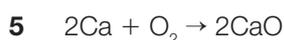
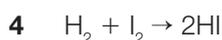
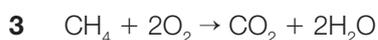
Once you are happy that you have included everything, compare it with the completed diagram in the Answers to check you have all the essential points.

## Chemical Equations and Reactions

Chemists tell the story of reactions by using equations. These can be word equations, which give the names of chemicals, but most often they use formulae equations. You are going to study a series of equations and interpret the information they can tell you.

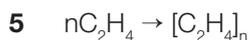
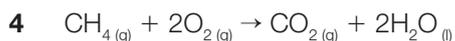
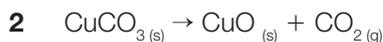
### Task 1

Write word equations for each of the following formulae equations:



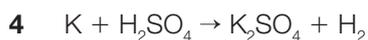
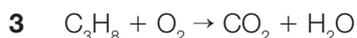
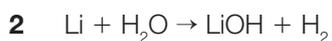
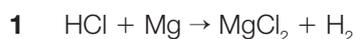
### Task 2

Choosing from displacement, thermal decomposition, neutralisation, polymerisation or combustion, identify which type of reaction is occurring for each of the following formulae equations:



### Task 3

Balance the following equations:



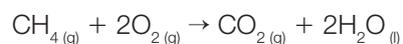
Atoms can join together to form molecules of elements and chemical compounds. They do this by using bonds. Complete the following table on the different types of bonding.

Type of bonding	Ionic	Covalent	Metallic
Example of substance with this bonding	NaCl	Cl <sub>2</sub>	Fe
Diagram of the bonding within this substance (ensure you accurately represent any outer electrons)			
What happened to the electrons to form this type of bond?			
Would a substance with this type of bond conduct electricity?			
Does a substance with this type of bond contain charged particles?			

## Endothermic and Exothermic Reactions

All chemical reactions involve bonds being broken and bonds being formed. Every time a bond is broken or formed, energy is either required or released by the reaction. These energy transfers that occur during reactions cause temperature changes. The amount of energy required or released depends on the bond being broken or formed.

Methane, CH<sub>4</sub>, reacts with oxygen in the following way:



Average bond enthalpies (kJ mol <sup>-1</sup> )			
C-H	O=O	C=O	H-O
412	496	743	463

- 1 Use the average bond enthalpies provided to calculate the energy change for this reaction. Show all your workings.
- 2 Would this energy change be endothermic or exothermic?
- 3 What would happen to the temperature during this reaction?
- 4 Sketch an 'energy level diagram' to represent this reaction.

## Mini Quiz

You will need a periodic table and a calculator for this quiz.

- The atomic number tells you the number of:
  - electrons
  - protons
  - neutrons
- An ion is a particle containing:
  - a different number of neutrons
  - an even number of electrons
  - a charge
- The nucleus contains:
  - protons and neutrons
  - protons and electrons
  - neutrons only
- The number of electrons found in an element's outer shell is the same as its:
  - atomic number
  - group number in the periodic table
  - row in the periodic table
- A bond involving a shared pair of electrons is called:
  - covalent
  - ionic
  - metallic
- Metals will bond with non-metals using:
  - metallic bonding
  - covalent bonding
  - ionic bonding
- The relative formula mass of nitric acid,  $\text{HNO}_3$ , is:
  - 61
  - 62
  - 63
- The formula for magnesium chloride is:
  - $\text{MgCl}$
  - $\text{Mg}_2\text{Cl}$
  - $\text{MgCl}_2$
- In ionic equations, aluminium ions would be written as:
  - $\text{Al}^{2+}$
  - $\text{Al}^{3+}$
  - $\text{Al}^{4+}$

**Mini Quiz**

- 10** During an endothermic reaction the temperature:
- a) decreases
  - b) increases
  - c) stays constant
- 11** The formula for limestone is:
- a) CaO
  - b) CaCO<sub>3</sub>
  - c) Ca(OH)<sub>2</sub>
- 12** In terms of crude oil fractions, what effect will a longer carbon chain have on the boiling point?
- a) increase the boiling point
  - b) decrease the boiling point
  - c) have no effect
- 13** As you move down group 7 from fluorine to iodine, the reactivity:
- a) decreases
  - b) increases
  - c) stays the same
- 14** An alkali is a type of base that is:
- a) insoluble in water
  - b) soluble in water
  - c) produces solutions above pH 10
- 15** A catalyst increases the rate of reaction by:
- a) providing energy
  - b) blocking reversible reactions
  - c) lowering the activation energy