Grade 8 Integrated Science

CBC NOTES | Terms 1, 2 and 3 - notes for 8 topics

IN EVERY TOPIC

- What you will learn, the key words and key terms explained.
- Clear notes under headings and subheadings, with labelled pictures and step-by-step procedures.
- Comparison tables, and advantages and disadvantages where methods are compared.
- Key points to remember, then multiple-choice and structured questions.
- All the answers and a glossary at the back.

TOPICS IN THESE NOTES

Topic	Name	Term
1.1	Elements and Compounds	1
1.2	Physical and chemical changes	1
1.3	Classes of fire	1
2.1	The Cell	2
2.2	Movement of materials in and out of the cell	2
2.3	Reproduction in human beings	3
3.1	Transformation of Energy	3
3.2	Pressure	3

A TASTE OF THE FIRST TOPIC

Elements and Compounds

Everything around us, from water to gold to our own bodies, is made of tiny particles called atoms. In this topic we explain how atoms, elements, molecules and compounds are related, learn the symbols of common elements, write word equations for reactions and see how elements are used in daily life.

CONTENTS

Topic	Name	Term	Page
1.1	Elements and Compounds	1	3
1.2	Physical and chemical changes	1	7
1.3	Classes of fire	1	11
2.1	The Cell	2	15
2.2	Movement of materials in and out of the cell	2	19
2.3	Reproduction in human beings	3	23
3.1	Transformation of Energy	3	27
3.2	Pressure	3	30
	Answers		33
	Glossary		37

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Strand 1.0 Mixtures, Elements and Compounds | Term 1

1.1 Elements and Compounds

WHAT YOU WILL LEARN

By the end of this topic you should be able to:

- explain the relationship between an atom, an element, a molecule and a compound
- assign symbols to selected elements
- write word equations to represent reactions of selected elements to form compounds
- outline the applications of common elements in the society

KEY WORDS

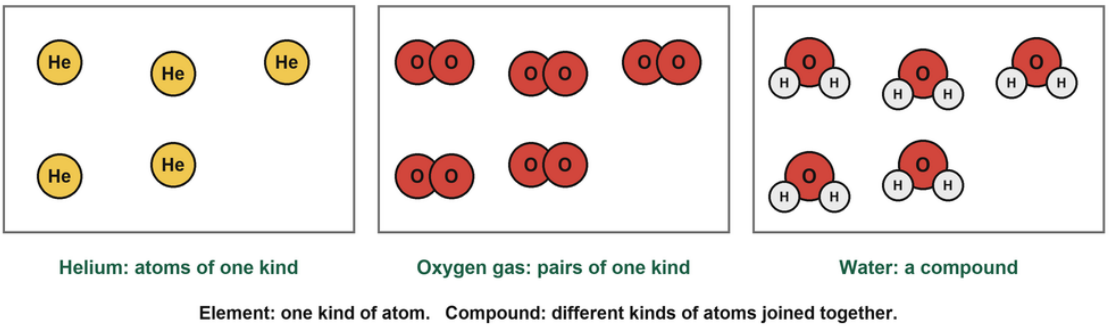
atom, element, molecule, compound, symbol, word equation, reactant, product.

Everything around us, from water to gold to our own bodies, is made of tiny particles called atoms. In this topic we explain how atoms, elements, molecules and compounds are related, learn the symbols of common elements, write word equations for reactions and see how elements are used in daily life.

1. Atoms, elements, molecules and compounds

Four key terms

Term	Meaning	Example
Atom	The smallest particle of an element that can take part in a chemical reaction	An atom of copper
Element	A substance made of only one kind of atom; cannot be broken down by chemical means	Copper, iron, oxygen, carbon, gold
Molecule	Two or more atoms joined chemically	Oxygen gas: two oxygen atoms joined
Compound	Two or more different elements chemically combined	Water (hydrogen and oxygen); sodium chloride



Particle diagrams of elements and compounds

NEW PROPERTIES

A compound has properties different from its elements: sodium is a dangerous metal and chlorine a poisonous gas, but sodium chloride is table salt.

2. Symbols of elements

Every element has a symbol of one or two letters used by scientists everywhere. The first letter is always a capital and a second letter is always small: Co (cobalt) is not the same as CO (carbon and oxygen). Symbols save time and space and avoid confusion between languages.

Symbols of common elements

From English names	Symbol	From Latin names	Symbol
Oxygen	O	Iron (ferrum)	Fe
Carbon	C	Copper (cuprum)	Cu
Hydrogen	H	Silver (argentum)	Ag
Nitrogen	N	Gold (aurum)	Au
Aluminium	Al	Sodium (natrium)	Na
Chlorine	Cl	Lead (plumbum)	Pb

Symbols from English and Latin names

MEMORY TIP

"Plumbing" pipes were once made of lead (plumbum, Pb).

3. Naming compounds and word equations

A compound of a metal and one non-metal is named with the metal first and the non-metal ending in "-ide": sodium chloride, copper oxide, aluminium oxide. "Carbon dioxide" has two oxygen atoms ("di" = two).

Word equation

A chemical reaction shown in words: reactants on the left, products on the right; the arrow means "form".

Word equations

Reactants		Product
carbon + oxygen	→	carbon dioxide
hydrogen + oxygen	→	water
copper + oxygen	→	copper oxide
aluminium + oxygen	→	aluminium oxide
sodium + chlorine	→	sodium chloride

Word equations for forming compounds

4. Observing reactions

- Copper foil heated in a flame turns black on the surface: copper + oxygen -> copper oxide (teacher demonstration).
- Hydrogen burns in air with a "pop" to form water.
- Charcoal (mostly carbon) burns in plenty of air to form carbon dioxide; in little air poisonous carbon monoxide can form, so never use a jiko in a closed room.
- Aluminium forms a thin, tough oxide layer that protects it; iron forms rust that flakes off and lets rusting continue.
- Sodium and chlorine are too dangerous for school: salt in Kenya comes mostly from sea water at the coast, for example near Malindi.

5. Uses of elements

Elements in daily life

Element	Use	Reason
Gold, silver	Jewellery, coins, medals	Shiny, do not tarnish easily, rare
Copper	Electrical wires; bronze medals	Excellent conductor
Iron (steel)	Building bars, roofing, nails, bridges	Strong
Aluminium	Window frames, sufurias, power cables	Light; does not corrode
Iron, sodium, calcium	Minerals in food	Blood; nerves and water balance; bones and teeth

Packaging labels name elements and compounds: table salt (sodium chloride), toothpaste (sodium fluoride, calcium carbonate), baking powder (sodium hydrogen carbonate). A two-part name is usually a compound. Too much sodium (salt) can raise blood pressure. Kenya mines gold in places such as Migori and Kakamega.

KEY POINTS TO REMEMBER

- Atoms make elements; atoms join into molecules; different elements combine into compounds.
- Symbols: capital first letter, small second letter; some come from Latin (Fe, Cu, Ag, Au, Na, Hg, Pb).
- Metal + non-metal compounds end in "-ide": sodium chloride.
- Word equations: reactants -> products.
- Elements are used in jewellery, wiring, building and as food minerals.

CHECK YOURSELF: MULTIPLE CHOICE

Choose the correct answer: A, B, C or D. The answers are at the back.

1. A substance made of only one kind of atom is

A. a compound
B. an element
C. a mixture
D. a molecule of water

2. The symbol for iron is

A. Fe
B. Ir
C. I
D. In

3. Which is a compound?

A. Gold
B. Oxygen gas
C. Copper
D. Sodium chloride

4. Complete: carbon + oxygen ->

A. carbon oxide
B. water
C. carbon dioxide
D. copper oxide

5. Which metal is used in electrical wires because it conducts well?

A. Mercury
B. Lead
C. Gold
D. Copper

ANSWER THESE

1. Distinguish between an element and a compound, giving an example of each. (4 marks)

2. Write the symbols of: oxygen, aluminium, sodium, copper, silver, lead. (6 marks)

3. Write word equations for: (a) heating copper in air (b) burning hydrogen. (2 marks)

4. Explain why a burning jiko should never be used in a closed room. (2 marks)

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1.2 Physical and chemical changes

WHAT YOU WILL LEARN

By the end of this topic you should be able to:

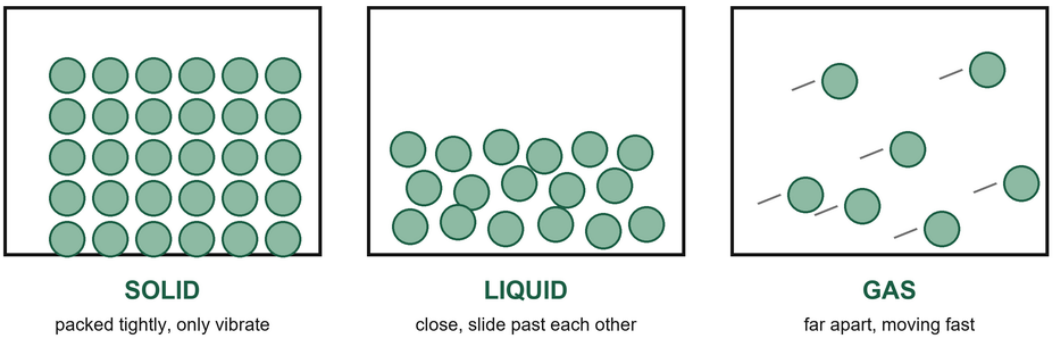
- describe the characteristics of particles in the three states of matter
- explain the effects of impurities on boiling point and melting point of a substance
- distinguish between physical and chemical changes in substances
- outline applications of change of state of matter in day-to-day life

KEY WORDS

kinetic theory, particles, diffusion, melting point, boiling point, heating curve, impurity, physical change, chemical change.

Ice melts, water boils, iron rusts and bread bakes. Some changes only alter a substance's state; others make new substances. In this topic we describe particles in the three states of matter, explain diffusion and the effect of impurities on melting and boiling points, distinguish physical from chemical changes and see how these changes are used every day.

1. Particles in the three states



Particles in solids, liquids and gases

Kinetic theory of matter

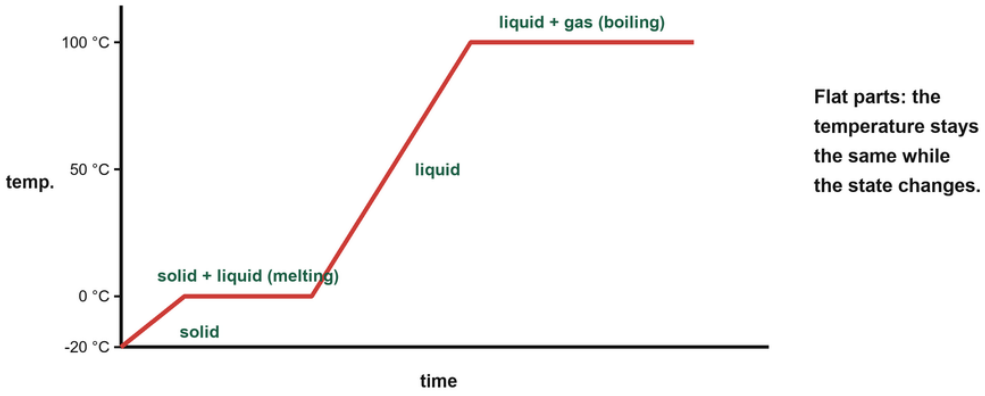
State	Arrangement	Movement	Shape and volume
Solid	Close, regular pattern; strong forces	Vibrate about fixed positions	Fixed shape and volume
Liquid	Close, irregular; weaker forces	Slide past each other	Fixed volume; takes container's shape
Gas	Far apart; very weak forces	Fast and random	No fixed shape or volume

2. Diffusion

Diffusion
The spreading of particles from a region of high concentration to one of low concentration, caused by their random movement.

- A crystal of potassium manganate(VII) in still water slowly colours all the water.
- Perfume sprayed at the front is smelt at the back: diffusion is faster in gases because particles move fast and are far apart.
- Ink spreads faster in warm water than in cold: heat gives particles more kinetic energy.

3. Melting, boiling and impurities



Heating curve of ice

Pure ice melts at 0 °C. Water boils at 100 °C at sea level, but at about 94 °C in Nairobi because the air pressure is lower at high altitude. While melting or boiling, the temperature stays steady because the heat is used to break the forces between particles.

Effects of impurities

Impurity	Effect	Use
Salt in ice	Lowers the melting point; melts over a range	Salt on icy roads; freezing mixtures
Salt in water	Raises the boiling point slightly	Testing purity
Antifreeze in radiators	Lowers the freezing point, raises the boiling point	Protects car engines

Reading a heating curve
A substance's curve is flat at 5 °C and at 80 °C.
Melting point 5 °C; boiling point 80 °C.
At 25 °C (room temperature) it is a liquid.