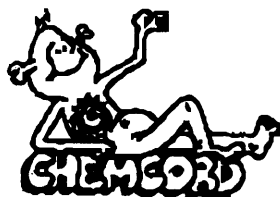


**Revision Notes
for
Standard Grade
Chemistry**

(amended arrangements)



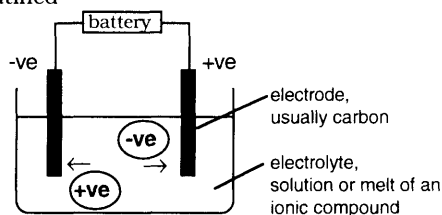
**B. A. Duguid
D. R. Glasby**

Topic 7

Properties of substances

ELECTRICAL CONDUCTIVITY

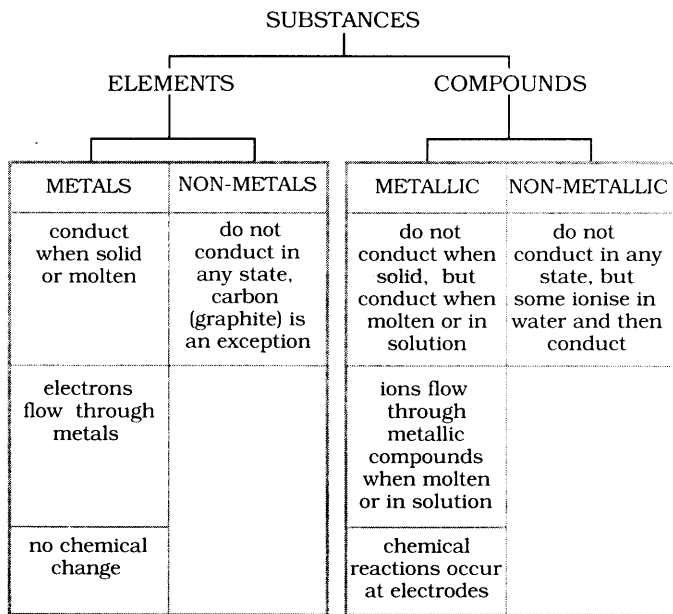
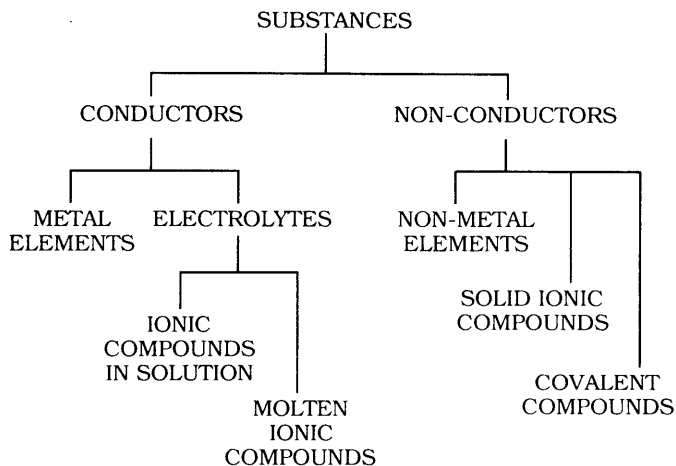
- electric current is a flow of charged particles
- an **electrical conductor** is a substance which allows electricity to pass through it
- an **electrical insulator** is a substance which does not conduct electricity
- electrons flow through metal elements (and graphite)
- the movement of electrons does not chemically change an element
- electrolysis** is the use of electricity to split up an ionic compound in solution or as a melt (an **electrolyte**)
- ions flow through electrolytes
- ions are not free to move in solids
- the movement of ions through an electrolyte causes chemical reactions to occur at the electrodes leading to the decomposition of the electrolyte
- a direct current (d.c.) supply must be used if the products are to be identified



- negative non-metal ions are attracted to the positive electrode, losing electrons to form atoms,
e.g. $2Cl^-(aq) \rightarrow Cl_2(g) + 2e$
- positive metal ions are attracted to the negative electrode, gaining electrons to form atoms,
e.g. $Cu^{2+}(aq) + 2e \rightarrow Cu(s)$

Solution/melt	Product at positive electrode	Product at negative electrode
copper chloride solution	chlorine	copper
lead iodide melt	iodine	lead

- substances can be classified in different ways



IONS

- are charged particles formed when atoms lose or gain electrons
- a **crystal lattice** is a network of oppositely charged ions
- metal atoms lose electrons to form positive ions,
e.g.

Ion	Charge
sodium	Na^+
magnesium	Mg^{2+}
aluminium	Al^{3+}

- non-metal atoms gain electrons to form negative ions,
e.g.

Ion	Charge
chloride	Cl^-
oxide	O^{2-}
nitride	N^{3-}

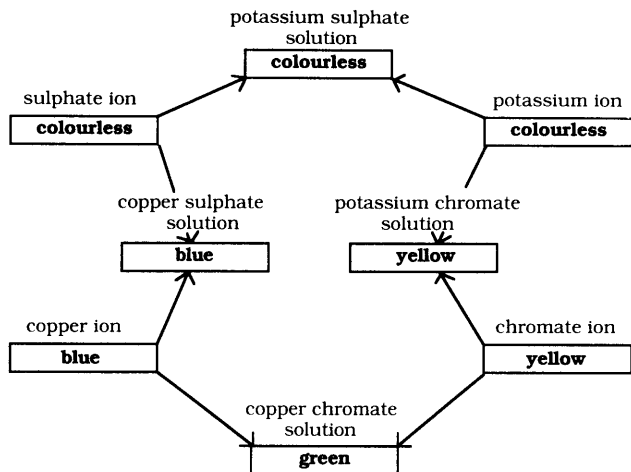
- these ions have the stable arrangements of the atoms of the noble gases
- some of the transition metals have ions with more than one charge (see Formulae),
e.g. Cu^+ , Cu^{2+}
- group ions contain more than one kind of atom (see Formulae),
e.g. ammonium (NH_4^+), sulphate (SO_4^{2-})

Properties

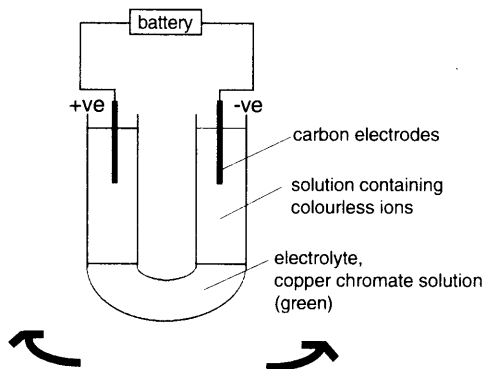
- all ionic compounds are solid at room temperature
- covalent compounds can be solid at room temperature
- compounds which exist as liquids or gases at room temperature are covalent
- ionic compounds dissolve in water with the lattice breaking up completely
- some covalent substances are soluble in water,
e.g. sugar
- covalent substances which are insoluble in water can dissolve in other solvents,
e.g. paints are soluble in turpentine, nail varnish is soluble in acetone

Colours of ionic compounds

- the colours of ionic compounds depend on the colours of the positive and negative ions



Electrolysis of copper chromate solution



- movement of yellow colour towards the positive electrode; chromate ions (negative) are attracted towards this electrode and lose electrons
- movement of blue colour towards the negative electrode; copper ions (positive) are attracted towards this electrode and gain electrons

□, substances can be classified as solids, liquids and gases

CREDIT

