General Physical Properties of Transition Elements

- **Atomic Radii**

Transition elements show little variation in their atomic radii.

As the proton No. increases electrons are also added to the inner shell (3d subshell).

The inner electrons are between the nucleus and 4s subshell and are able to shield the outer electrons from the increasing nuclear force, therefore cancelling the effect of the increasing nuclear force across a period.

General Physical Properties of Transition Elements

- **Ionisation energy**

There is little change in the first ionisation energy of the transitionelements from Ti to Cu. This is because:-

(a) The atomic radii remain almost constant from Ti to Cu

(b) The attractive forces on the outer electrons remain almost constant from Ti to Cu.

Variable Oxidation States

- **Variable Oxidation States**
- One of the characteristic properties of the transition elements is that they have variable oxidation states.
- This is because the five inner d orbitals are at a similar energy level to the outer s orbital.
- In the transition elements, d electrons as well as s electrons are involved in bonding. Ionic bonds form when 4s and then 3d electrons are lost to produce positively charged ions. Covalent bonds are formed as unpaired electrons pair up with those on other atoms.
- The table below shows the main oxidation states (bold being the most important) and the electronic structures of the elements titanium to copper.

Quiz

(d) State and draw the electronic configuration for Chromium(p.n 24), manganese(p.n 25), iron(p.n 26), cobalt(p.n 27) and nickel(p.n 28).

(e) Explain with comparison s-block elements the explain in changes in

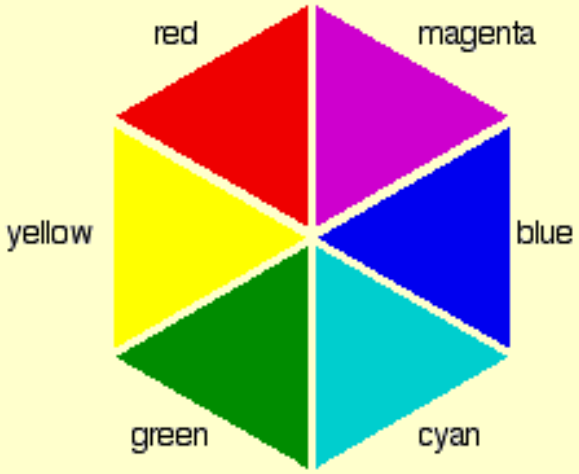
(i) Melting point
(ii) Atomic radii
(iii) Ionisation energy

across the block

Colour of complexes

Complementary colours

If you arrange some colours in a circle, you get a "colour wheel". The diagram shows one possible version of this. An internet search will show up many different versions!



Colours directly opposite each other on the colour wheel are said to be complementary colours. Blue and yellow are complementary colours; red and cyan are complementary; and so are green and magenta.

Mixing together two complementary colours of light will give you white light.

Transition Elements as Catalyst

Catalytic activity

- Transition metals and their compounds are often good catalysts.

Transition metals and their compounds function as catalysts either because of their ability to change oxidation state or, in the case of the metals, to adsorb other substances on to their surface and activate them in the process. All this is expored in the main catalysis section.