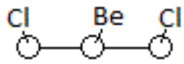
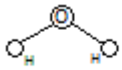
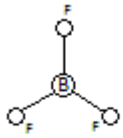
<u>Shapes of Molecules</u>

1) O_2, H_2 etc. (two atoms) → <u>linear shaped</u>, e.g.) $BeCl_2$ 

$BeCl_2$

2) Three atoms <u>v-shaped</u>, e.g.) H_2O  H_2O – V shaped

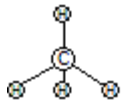
3) Four atoms (central atom + three bonded atoms)

→ <u>Triagonal Planar</u> e.g.) BF_3  BF_3 – Triagonal

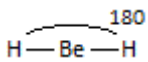
4) Four atoms (central atom above other three)

→ <u>Pyramidal</u> e.g.) NH_3  NH_3 – Pyramidal

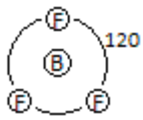
5) Five atoms (four atoms bonded to central atom)

→ <u>Tetrahedral</u> e.g.) CH_4  CH_4 – Tetrahedral

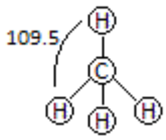
Electron pair repulsion theory → electron pairs in outer shell of the central atom repel each other and end up as far apart as possible

e.g.) BeH_2 H : Be : H 

Bond angle = 180°

e.g.) BF_3 

Bond angle = 120°

e.g.) CH_4 

Bond angle = 109.5°

No. of Electron Pairs	e.g.	Arrangement	Bond Angle	Shape
2	BeH_2	Linear	180°	Linear

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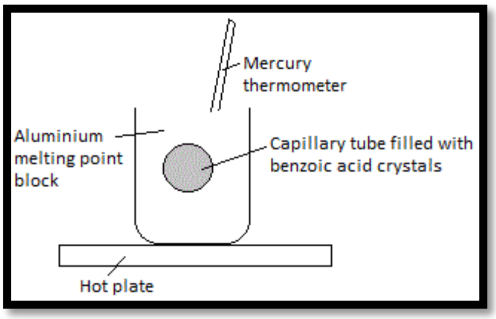
Experiment: Recrystalisation and Melting Point of Benzoic Acid

A) Find pure sample → recrystalisation (separated solid from solid impurities)

1) Measure 1g benzoic acid and place in beaker. Add 10 cm^3 of water and add (minimum amount of water)
2) Place over B.B. and stir until dissolved
3) Heat Büchner funnel by holding by stem and immersing it in boiling water (prevents crystalisation of benzoic acid while filtering)
4) Set up Büchner flask and funnel, and place filter papers in funnel. Turn on water to operate suction pump.
5) Pour solution through filter paper and collect filtrate in flask.
6) Allow crystals to recrystalise

B) Melting Point → temperatures between C° when melting begins and C° when entire solid has liquefied (melting point of impure is lower and wider than pure substance)



1) Seal end of capillary tube by holding over Bunsen B and rotating
2) Place benzoic crystal in tube, and place tube in meting point block on hot plate
3) Place thermometer in block and record melting point
   → when turns colourless = (120°C)

* Low melting point → covalent molecule crystals

% purified e.g.) 2.4g + 2.1g pure $\frac{2.1}{2.4} x\ 100 = 87.5\%$

* Important to use minimum water → saturated solution.
* Use of benzoic acid → food preserve

Trends	Across	Down
1) Atomic Radius	**Decreases** * increasing nuclear charge → greater attractive forces attract shells closer to nucleus → atomic radius decreases * no increase in screening effect → no additional shells added to counteract increasing + forces of nucleus	**Increases** * extra shell * screening effect of inner electron → inner shells shield outer electron from positive charge of nucleus
2) Ionisation Energy	**Increases** * decreasing atomic radius → increased attraction between electron and nucleus → difficult * increasing nuclear charge → attraction between nucleus and outermost electrons increasing → requires more energy	**Decreases** * increasing atomic radius → easier to remove electron * screening effect → shielded from positive forces
3) Electronegativity	**Increases** * decreasing atomic radius → greater attraction between electrons * increasing nuclear charge → electrons more strongly attracted to the nucleus	**Decreases** * increasing atomic radius → smaller attraction between a shared pair of electrons * screening effect → attraction of nucleus for these electrons decreases