

Bonding and Periodic Table Review

Look at all Labs and Worksheets from this unit!! You should be able to:

Describe how atoms react to form bonds:

What are the two types of bonds and how does each form? (Be specific and use the valence electrons for each atom.)

Ionic - one atom gives electrons and another atom takes electrons

Covalent - atoms share electrons, electrons go around both

Explain what determines what type of bonding occurs between two atoms. nuclei

The electronegativity difference. If the difference between the two atoms is large (1.8 or higher) it is ionic. If low (0.2 or lower) it is pure covalent. In between is polar covalent

Use your periodic table to predict what type of bonding will occur in a given compound. For example: Are the following compounds ionic or covalent? How do you know?

Ionic Mg - Cl

What is the formula for the compound?

MgCl₂ (because Cl only wants one electron + Mg has 2 to give away.)

Polar Covalent $\xrightarrow{\quad}$ C - Cl

If polar, what is the direction of polarity?

Cl is the negative pole because it is more electronegative

Pure Covalent C - Se

If polar, what is the direction of polarity?

Because electronegativity difference is less than 0.2, the bond is nonpolar (pure) covalent

Ionic CaCl₂

Why are there two chlorine atoms?

Calcium has 2 valence electrons to give, but Cl only wants one electron, so each takes one.

Ionic NaF

Why only one fluorine atom?

Na has one valence electron to give and F wants one electron.

Describe compounds formed by reactions:

Draw electron dot diagrams for covalent compounds. Draw the electron dots for the covalent compounds above.

CCl₄
SO₃
SiO₂
AlCl₃

NCl₃
OBr₂
BeI₂
HBr

*Attached at
end*

Describe the shape of covalent molecule:

Explain VSEPR and how that relates to the shape of molecules.

The electron pairs around the central atom want to be as far away as possible. (They all take up space)

Use the electron dot diagram to predict the shape of a molecule. Predict the shapes of the covalent molecules that you made diagrams of above.

CCl_4 tetrahedral

SO_3 trigonal planar

SiO_2 linear

AlCl_3 trigonal planar

NCl_3 pyramidal

OBr_2 angular (bent)

BeI_2 linear

HBr linear

Describe how the type of bonding and the shape of a molecule relate to the properties of that compound:

List the properties common to ionic compounds.

Solubility: Soluble in water

Conductivity: Highly conductive in solution

Melting point and boiling point: High melting & boiling points

List the properties common to the two types of covalent compounds. What causes the poles in the polar molecule?

Poles are caused when electrons spend more time around one nucleus than the other.

Polar Covalent:

Solubility: Slightly soluble in water

Conductivity: Slightly conductive in solution

Melting point and boiling point: medium m.p. & b.p.

Pure Covalent (nonpolar)

Solubility: Not soluble in water

Conductivity: low conductivity (to none)

Melting point and boiling point: low m.p. & b.p.

Describe polar molecules: (How does that differ from a polar bond?)

Polar Bonds + non symmetrical molecule

What makes a molecule polar? What is true about the electrons? Where is the negative pole? Predict if the covalent compounds above are polar.

CCl_4 Nonpolar

SO_3 Nonpolar

SiO_2 Polar

AlCl_3 Nonpolar

NCl_3 NonPolar - the e^- diff is below 0.2

OBr_2 Polar

BeI_2 NonPolar

HBr Polar

Spends more time around one nucleus than the other

Explain the properties seen when a molecule is polar using the concept of intermolecular attractions?

Why are polar molecules soluble?

Water grabs the + and - poles and pulls molecules apart

Why do polar molecules have higher m.p. and b.p.?

Polar molecules have strong attractions from one molecule to another

Make predictions about the solubility, m.p., b.p., evaporation rate, and conductivity about a compound given its structure. Rate the compounds listed in terms of solubility, m.p., b.p., evaporation rate, and conductivity.

NaCl - Ionic so high m.p./b.p. (low evap) high conductivity in soln.
high solubility

CH_4 - Nonpolar so not soluble in H_2O , no conductivity, low m.p./b.p. and high evaporation

PCl_3 - Polar middle on everything!

Explain why* Ionic have (+) + (-) that are very attracted - don't let go

* Polar molecules have Dipole-Dipole Forces that hold the molecules together (they are holding hands) and make it hard for the molecules to separate themselves + evaporate

* Nonpolar don't care about each other - let go easily as they only have dispersion forces

