

I am able to:

- Describe how positive and negative ions are formed.
- Give the formulae of the ions formed by the following elements: Li Ba Al Br O N
- State the formulae (with charges) of the following ions: nitrate sulphate hydroxide ammonium carbonate hydrogencarbonate phosphate(V)
- Work out the formulae of the following ionic compounds:

Lithium fluoride	Sodium hydrogencarbonate	Iron(II) phosphate
magnesium chloride	Calcium nitrate	Sodium carbonate
ammonium sulfate	Barium hydroxide	Copper(II) nitrate

- Classify each of the following as having mainly ionic or mainly covalent bonding:  
CO<sub>2</sub> CaS PCl<sub>3</sub> OF<sub>2</sub> MgO

- Explain what is meant by *ionic bonding*.

- Describe the structure of ionic compounds

- Explain why ionic compounds

- have high melting point,
- are non-volatile
- are often soluble in water
- do not conduct electricity when solid
- conduct electricity when molten or in aqueous solution

- Explain what is meant by a *covalent bond*

- Draw Lewis structures for:

O <sub>2</sub>	C <sub>2</sub> H <sub>2</sub>	N <sub>2</sub>
HCN	NH <sub>4</sub> <sup>+</sup>	N <sub>2</sub> H <sub>4</sub>
CO <sub>2</sub>	C <sub>2</sub> H <sub>4</sub>	CO <sub>3</sub> <sup>2-</sup>

- State and explain the differences in bond length and bond energy in

- C<sub>2</sub>H<sub>6</sub>, C<sub>2</sub>H<sub>4</sub> and C<sub>2</sub>H<sub>2</sub>
- N<sub>2</sub>, N<sub>2</sub>H<sub>4</sub> and N<sub>2</sub>H<sub>2</sub>

- Understand what is unusual about the Lewis structures for BCl<sub>3</sub> and BeCl<sub>2</sub>

- Explain what is meant by the term *coordinate covalent bond*

- Explain which of the following contain coordinate covalent bonds

O<sub>3</sub> CO PCl<sub>3</sub> NH<sub>4</sub><sup>+</sup> NO<sub>2</sub><sup>+</sup>

- Explain the valence shell electron pair repulsion theory for predicting shapes of molecules.

- Predict the electron domain geometry, shape and bond angles of:

CH <sub>4</sub>	H <sub>2</sub> O	C <sub>2</sub> H <sub>4</sub>	H <sub>3</sub> O <sup>+</sup>	CO <sub>3</sub> <sup>2-</sup>	O <sub>3</sub>
NH <sub>3</sub>	CO <sub>2</sub>	C <sub>2</sub> H <sub>2</sub>	NH <sub>4</sub> <sup>+</sup>	BF <sub>3</sub>	PCl <sub>3</sub>

- 17 Explain what is meant by *electronegativity*
- 18 State and explain which of the following bonds is most polar: H-C H-Cl H-F
- 19 Explain which of the following molecules is/are polar:
- |                |                 |                                 |
|----------------|-----------------|---------------------------------|
| N <sub>2</sub> | NH <sub>3</sub> | PCl <sub>3</sub>                |
| CO             | CO <sub>2</sub> | CH <sub>2</sub> Cl <sub>2</sub> |
- 20 Explain what is meant by a resonance structure
- 21 Draw two resonance structures for O<sub>3</sub>.
- 22 Draw resonance structures for each of the following  
CO<sub>3</sub><sup>2-</sup> C<sub>6</sub>H<sub>6</sub> CH<sub>3</sub>COO<sup>-</sup> NO<sub>2</sub><sup>-</sup> NO<sub>3</sub><sup>-</sup>
- 23 Explain the origin of London (dispersion) forces.
- 24 Explain what van der Waals forces are.
- 25 For each of the following pairs, explain in terms of intermolecular forces, which has the higher boiling point.
- Cl<sub>2</sub> or Br<sub>2</sub>
  - CH<sub>3</sub>Cl or CH<sub>3</sub>Br
  - CH<sub>3</sub>CH<sub>2</sub>CH<sub>3</sub> or CH<sub>3</sub>OCH<sub>3</sub>
  - CH<sub>3</sub>CH<sub>2</sub>OH or CH<sub>3</sub>OCH<sub>3</sub>
  - NH<sub>3</sub> or PH<sub>3</sub>
- 26 Draw a diagram to show the hydrogen bonding between molecules of water.
- 27 Explain which of the following will have hydrogen bonding between molecules
- |    |     |                   |                    |                               |
|----|-----|-------------------|--------------------|-------------------------------|
| HF | HCl | CH <sub>3</sub> F | CH <sub>3</sub> OH | N <sub>2</sub> H <sub>4</sub> |
|----|-----|-------------------|--------------------|-------------------------------|
- 28 Explain why covalent molecular compounds:
- have low melting and boiling points
  - are volatile
  - do not conduct electricity when liquid
  - tend to be soluble in organic solvents
- 29 Explain which of the following chlorides will have the lowest boiling point  
NaCl MgCl<sub>2</sub> SiCl<sub>4</sub>
- 30 Explain which of the following chlorides will be the best conductor of electricity in the liquid state  
NaCl SiCl<sub>4</sub> SCl<sub>2</sub>
- 31 Explain the relative solubilities of ionic and covalent substances in polar and non-polar solvents.
- 32 Describe the structure and bonding of
- Diamond
  - Graphite
  - Graphene
  - C<sub>60</sub> buckminsterfullerene

- 33 Describe the structure and bonding of silicon dioxide
- 34 Explain why diamond has a much higher melting/boiling point than C<sub>60</sub> buckminsterfullerene
- 35 Explain why graphite and graphene are better conductors of electricity than diamond and C<sub>60</sub> fullerene.
- 36 Explain what is meant by *metallic bonding*.
- 37 Explain why metals conduct electricity and are malleable.
- 38 Explain why magnesium has a higher melting point than sodium
- 39 Explain what an *alloy* is.
- 40 Explain why alloys tend to be stronger than pure metals.