
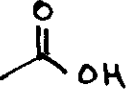


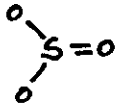
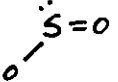
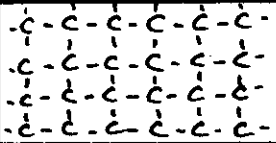
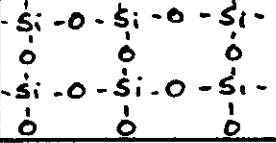
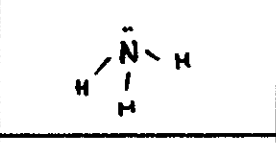
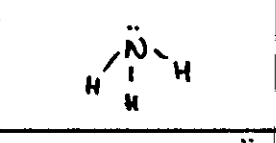
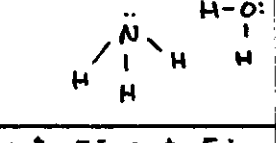
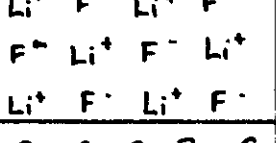
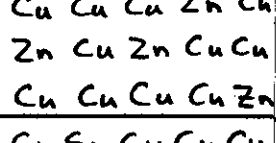
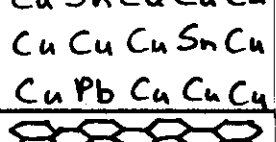
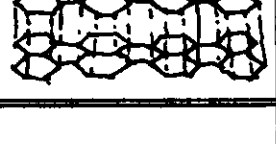


| SUBSTANCE            | STRUCTURE   | ALL FORCES PRESENT (state if intramolecular or intermolecular etc.) | MACROMOLECULE OR DISCRETE COVALENT | SOLUBILITY IN H <sub>2</sub> O (given state)  | SOLUBILITY IN HEXANE (given state)                         | CONDUCTIVITY (given state)  |
|----------------------|---|---|------------------------------------|---|--|---|
| ethyl alcohol (l)    |    | intramolecular = covalent<br>intermolecular = hydrogen bond         | discrete covalent                  | excellent (fully miscible), H-bonds with H <sub>2</sub> O   | moderate, interactions between non-polar region of alcohol | poor to nil, slight dissociation: C <sub>2</sub> H <sub>5</sub> O <sup>-</sup> + H <sup>+</sup> |
| acetic acid (l)      |    | intramolecular = covalent<br>intermolecular = hydrogen bond         | discrete covalent                  | excellent (fully miscible), H-bonds with H <sub>2</sub> O   | moderate, interactions between non-polar region of acid    | slight better dissociation: CH <sub>3</sub> COO <sup>-</sup> + H <sup>+</sup>                   |
| acetone (l)          |    | intramolecular = covalent<br>intermolecular = dipole interact.      | discrete covalent                  | excellent (fully miscible), receives H-bond from H <sub>2</sub> O                                     | moderate to good, more similar polarities                  | nil<br>no free moving charged particles   |
| pentane (l)          |    | intramolecular = covalent<br>intermolecular = v.d.W.                | discrete covalent                  | poor to nil, unlike molecules, polar vs non-polar   | excellent, very similar polarities                         | nil<br>no free moving charged particles   |
| bromine (l)          | Br - Br   | intramolecular = covalent<br>intermolecular = v.d.W. (dipole!)      | discrete covalent                  | fair due to temporary Br <sub>2</sub> polarization  | excellent, very similar polarities                         | nil<br>no free moving charged particles   |
| helium (g)           | He  | no intra or intermolecular forces                                   | individual atoms                   | poor to nil, unlike molecules, polar vs non-polar   | fair, helium will prefer the high kinetic energy gas state | nil<br>no free moving charged particles   |
| wax (s)              | C <sub>50</sub> H <sub>102</sub>  | intramolecular = covalent<br>intermolecular = v.d.W.                | discrete covalent                  | poor to nil, unlike molecules, polar vs non-polar   | excellent, very similar polarities                         | nil<br>no free moving charged particles   |
| sulphur trioxide (g) |  | intramolecular = covalent<br>a gas ∴ no intermolecular forces       | discrete covalent                  | reacts H <sub>2</sub> O + SO <sub>3</sub> → H <sub>2</sub> SO <sub>4</sub><br>(otherwise poor to nil) | should have good solubility, similar polarity              | nil<br>no free moving charged particles   |
| sulphur dioxide (g)  |  | intramolecular = covalent<br>a gas ∴ no intermolecular forces       | discrete covalent                  | fair, slight polarization in SO <sub>2</sub>  | should have fair solubility, less similar solubility       | nil<br>no free moving charged particles   |

| SUBSTANCE                             | STRUCTURE   | ALL FORCES PRESENT (state if intramolecular or intermolecular etc.)  | MACROMOLECULE OR DISCRETE COVALENT | SOLUBILITY IN H <sub>2</sub> O (given state)                               | SOLUBILITY IN HEXANE (given state)   | CONDUCTIVITY (given state)  |
|---------------------------------------|---|--|------------------------------------|--|--------------------------------------|---|
| diamond (s)                           |    | intramolecular = covalent<br>no intermolecular forces present  | macromolecule                      | completely insoluble   | completely insoluble                 | nil<br>no free moving charged particles   |
| quartz (s)                            |    | intramolecular = covalent<br>no intermolecular forces present  | macromolecule                      | completely insoluble   | completely insoluble                 | nil<br>no free moving charged particles   |
| ammonia (g)                           |    | intramolecular = covalent<br>a gas ∴ no intermolecular forces  | discrete covalent                  | excellent, H-bonds with H <sub>2</sub> O, forms saturated sol. at 28 - 30% | poor to nil<br>dissimilar polarities | nil<br>no free moving charged particles   |
| ammonia (l)                           |    | intramolecular = covalent<br>intermolecular = hydrogen bond  | discrete covalent                  | temperature would be - 33.35 °C ∴ hard to dissolve                         | poor to nil<br>dissimilar polarities | nil<br>no free moving charged particles   |
| ammonia (aq)                          |    | intramolecular = covalent (present within NH <sub>3</sub> and H <sub>2</sub> O)<br>intermolecular = hydrogen bond (involves both NH <sub>3</sub> and H <sub>2</sub> O) | discrete covalent                  | N.A.   | poor to nil<br>dissimilar polarities | slight to fair<br>NH <sub>3</sub> + H <sub>2</sub> O ⇌ NH <sub>4</sub> <sup>+</sup> + OH <sup>-</sup> |
| lithium fluoride (s)                  |   | intramolecular = ionic bond<br>no intermolecular forces present  | macromolecule                      | soluble but poor for ionic compounds, high lattice energy                  | completely insoluble                 | nil<br>no free moving charged particles in solid state  |
| brass (s)<br>(alloy of Cu and Zn)     |  | intramolecular = metallic<br>no intermolecular forces present  | macromolecule                      | completely insoluble   | completely insoluble                 | excellent,<br>free moving electrons   |
| bronze (s)<br>(alloy of Cu Sn and Pb) |  | intramolecular = metallic<br>no intermolecular forces present  | macromolecule                      | completely insoluble   | completely insoluble                 | excellent,<br>free moving electrons   |
| graphite (s)                          |  | "intraplanar" covalent bond<br>"interplanar" v.d.W.  | macromolecule                      | completely insoluble   | completely insoluble                 | good within planes (delocalized e <sup>-</sup> ), nil between planes                                  |

| SUBSTANCE            | STRUCTURE  | ALL FORCES PRESENT (state if intramolecular or intermolecular etc.)  | MACROMOLECULE OR DISCRETE COVALENT                                   | SOLUBILITY IN H <sub>2</sub> O (given state)                  | SOLUBILITY IN HEXANE (given state)                             | CONDUCTIVITY (given state)  |
|----------------------|--|--|--|---|--|---|
| ammonium nitrate (s) |  | "intraionic" covalent bond<br>"interionic" ionic bond<br>(classified as ionic compound)  | macromolecule  | excellent, highly soluble ionic comp. high hydration energy   | completely insoluble   | nil<br>no free moving charged particles                               |
| sodium sulphate (aq) | $2 [Na]^{1+}$<br>  | "intraionic" covalent in SO <sub>4</sub> <sup>2-</sup><br>dipole interaction between H <sub>2</sub> O and hydrated ions<br><b>hydrated ions!</b> | H <sub>2</sub> O discrete covalent, discrete poly and monatomic ions | N.A.  | completely insoluble   | good<br>free moving ion in solution                                   |
| oxygen (l)           |  | intramolecular = covalent<br>intermolecular = v.d.W.   | discrete covalent  | poor, unlike molecules, polar vs non-polar (fish breath D.O.) | fair to moderate, O <sub>2</sub> would prefer to be a free gas | nil<br>no free moving charged particles                               |
| silicon carbide (s)  |  | intramolecular = covalent<br>no intermolecular forces present  | macromolecule  | completely insoluble  | completely insoluble   | nil<br>no free moving charged particles                               |
| calcium chloride (s) | $[Ca]^{2+} + 2 [Cl:]^{1-}$   | intramolecular = ionic<br>no intermolecular forces present   | macromolecule  | good, soluble ionic comp. good hydration energy               | completely insoluble   | nil<br>no free moving charged particles                               |
| gold (s)             | Au Au Au Au Au<br>Au Au Au Au Au<br>Au Au Au Au Au   | intramolecular = metallic<br>no intermolecular forces present  | macromolecule  | completely insoluble  | completely insoluble   | excellent, free moving electrons                                      |
| NaCl (l)             | $[Na]^{1+} [Cl:]^{1-}$   | ionic attraction between Na <sup>+</sup> and Cl <sup>-</sup> ions  | discrete monatomic ions  | temperature is 650 °C, otherwise soluble                      | completely insoluble   | good<br>free moving ions in liquid state                              |
| Fe (g)<br>Oooo! Hot! | Fe   | no forces of attraction present  | individual atoms   | temperature is 2750 °C or greater                             | completely insoluble   | if hot enough a plasma state will result with free ion and electrons! |
| I <sub>2</sub> (s)   | I <sub>2</sub> I <sub>2</sub> I <sub>2</sub> I <sub>2</sub><br>I <sub>2</sub> I <sub>2</sub> I <sub>2</sub> I <sub>2</sub> | intramolecular = covalent<br>intermolecular = v.d.W.   | discrete covalent  | poor to fair, unlike molecules                                | fair to moderate, similar solubilities                         | nil<br>no free moving charged particles                               |