**231**

**Metal Alloying Fundamentals**

****

****

**Acknowledgement**

Mr John Gibson is a highly regarded educator and engineer. John taught Industrial Arts at a number of high schools before taking a position at Sydney Teachers’ College, then University of Sydney. He had an engineering education consultancy and has extensive experiencing working with NESA on Engineering Studies syllabus development and the HSC examination committee. The STEM Industry School Partnerships (SISP) Program asked John for his responses to the iTeachSTEM topic discussion questions. SISP is grateful to John for submitting these example discussion responses.

# List the main alloys of common metals such as iron (Fe), copper (Cu), aluminium (Al), nickel (Ni).

* steel (Fe-C)
* brass (Cu-Zn)
* phosphor bronze (Cu-Sn-P)
* tin bronze (Cu-Sn)
* aluminium bronze (Cu-Al)
* monel (Cu-Ni)
* duralumin (Al-Cu)

Note the effect of changing composition on structures, melting points and properties.

When studying an alloy system, the grain/crystal structure can change in composition, and temperature. Particular compositions of metal alloys are chosen for specific properties that are valuable for industrial applications.

# Define the difference between:

* element: a body that is unique in its structure and cannot be split up to simpler substances. Identified with the chemical symbol of the substance. Examples: zinc (Zn), iron (Fe), tin (Sn), copper (Cu), aluminium (Al).
* mixture: is where only mechanical mixing occurs between discrete substances. Example: powdered sulphur and iron filings; separable with a magnet.
* compound: is formed where there is a chemical junction between two or more different atoms. Example: iron carbide.
* Solution: where one substance is distributed amongst the structure of a second substance, without a chemical reaction. Solid solutions and liquid solutions exist in metallic alloys. Identified with a letter of the Greek alphabet.