



NON-FERROUS METALS DO NOT CONTAIN IRON



Alloys
Brass
Bronze
Pewter
Duralamin



ALLOY METALS: TWO METALS COMBINED TO MAKE ONE WITH IMPROVED PROEPRITIES

Properties/Strengths of Materials:

Elasticity - stretch and return to original position

Ductility - to be drawn out in wire or pipe

Toughness - does not break or shatter when hit

Hardness - resist scratching and indentation

Malleability - reshaped with force without cracking



Properties/Strengths of Materials:

Conductivity – conducts electricity/heat well

Durability- resist wear and tear

Corrosion resistance – good resistance to decay

Tensile strength - pulled without stretching

Environmental Degradation- decay due to sun, air, water, soil etc...

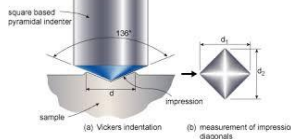


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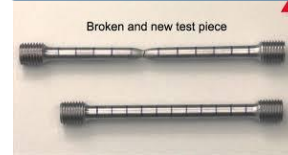
Brinell/Vickers hardness test



Charpy toughness test



Hounsfield tensile strength test



Alloy Steels
Stainless Steel
Tool Steel
Generally high carbon steel



High Carbon Steel
Stainless Steel
High Speed Steel HSS (one of the tool Steels)
High Tensile Steel

Cast Iron
Mild Steel
Medium Carbon Steel



FERROUS METALS CONTAIN IRON ARE MAGNETIC AND RUST

Ferrous Metals

What do all ferrous metals contain?

All ferrous metals have what properties?

Can you identify five objects made using ferrous metals?

Name two alloy steels and products made from them.

Non-Ferrous Metals

What is meant by the term non-ferrous metal?

Identify three non-ferrous metals

Can you identify some objects made using these non-ferrous metals?

Alloys

What is the definition of an alloy?

Can you give three examples of alloys?

Can you identify three products made from these alloys?

What alloy are aircraft often made from and why?

Two mark questions

What are garden shears made out of and why?

What are water pipes made out of and why?

Eight mark question (on a separate sheet):

Design a test in the workshop to test and measure the hardness of an aluminium sheet.

Two mark questions

What alloy are step ladders often made out of and why?

Electric wire is made of a ductile material. What is it and state another reason why it is used.

Three mark questions. Say three things one can be a qualification and one an example:

Load bearing cables in a suspension bridge must have which type of strength and why?

Name one metal and explain what happens if it is left, without a finish, outside

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Properties/ strengths of materials

Define and give examples of the following material properties:

Tensile Strength-

Hardness-

Toughness-

Malleability-

Ductility-

Elasticity-

Conductivity-

Corrosive Resistance-

Environmental Degradation-

Metals treatments and finishes:

Anodising - electrolysis that leaves a, usually coloured, layer of oxide to protect and colour aluminium



Galvanising -dip steel in zinc to stop rust



Pickling - clean-up metals in strong acid

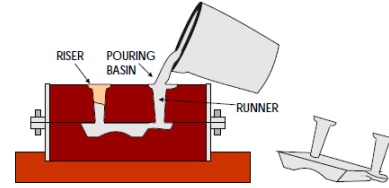
Etching - etch a pattern on metal with a strong acid



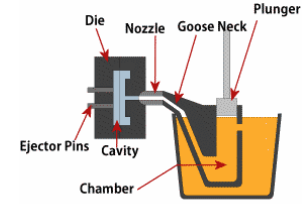
Epoxy Resin



Aluminium Casting



Pressure Die Casting



Case Hardening

Heat to orange 900 and dip in carbon powder: this gives a hard skin and a tough core for a hammer

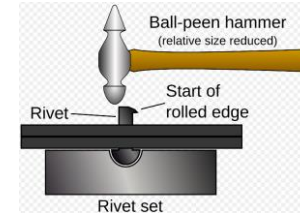


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Snap Riveting



Pop Riveting

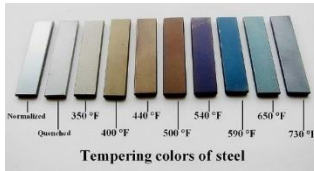


Hardening



Used in toolmaking. Heat to orange 900 and quench

Tempering



Puts some toughness back. Heat to 220 -315 degrees depending on tool.
Blue =tougher= wood saws.
Straw = harder =lathe tools

Normalising

Heat to cheery red 650 and cool in air



Annealing

Softens metal so it can be cold worked.. Heat to cherry red 650 and cool in sand or oven



Work Hardening

Repeatedly bend a paper clip and it will snap



Soft Soldering



Welding - filler rod of same metal, 4000 degrees heat, gas shield to stop oxidisation, melts metals together



Tapping a Hole

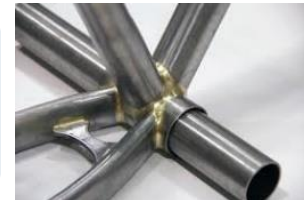


M4, M5, M6, M8 etc...
Cutting compound

Threading a Rod



Brazing (hard soldering) - 900 degrees, clean joint, use flux to stop oxidisation, melt brass on top of joint



Metals Processes

State two advantages and two disadvantages of sand casting an engine block for a car (4)

Heat treatments

Hardening is used on steel in tools Y/N
Tempering makes the tools harder Y/N
Annealing makes the metals softer so they can be cold worked Y/N
Tempering uses the oxide colour bands to show the temperature of the steel Y/N
Lathe tools are tougher than wood saws Y/N
Hammers are case hardened Y/N
Work hardening can lead to the metal snapping Y/N

Casting

Sand casting = mass production process Y/N
Toy cars are generally mass produced from zinc alloy pressure die casting Y/N
List the PPE for sand casting:

Complex shapes can be produced in sandcasting and pressure die casting Y/N
Sand casting produces identical products whereas pressure die casting does not Y/N

List the steps for aluminium sand casting including health and safety:

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Permanent Joins

Name all the tools used in tapping and threading

What is the advantage of pop riveting in terms of access the sheets metal join?

What is epoxy resin?

Tapping and threading

List the steps in order for tapping a hole and/or threading a rod (5)

Metal surface treatment and finishes

Surface finishing enhances the appearance and protects the metal. Describe with examples of use the following metal surface treatments or finishes:

Galvanising-

Anodising-

Pickling-

Etching-

Welding and Brazing

Brazing is a fusion process where the two parent metals are melted together. Y/N
Welding uses flux to prevent oxidation Y/N
Brazing uses brass rod on the joint Y/N
Welding is much hotter than brazing Y/N
In welding you need to clean the joint very carefully to take the oxide layer off Y/N
Soft soldering needs no heat Y/N
Soft soldering = circuits and plumbing Y/N