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**Material Properties and Applications**

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**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.

# Discuss methods of determining property values and units of measuring.

1. **Define elasticity of a material and nominate a material that has high elasticity.**

**Elasticity**: the ability of a material to be stretched by a force and, to return to its original length when the force is removed. Examples ~ poly vinyl chloride, annealed 70/30 brass.

1. **Define stiffness of a material and nominate a material that has high stiffness.**

**Stiffness**: how rigid, or stiff, a material might be. Examples ~ glass, steel.

1. **Define plasticity of a material and nominate a material that has high plasticity.**

**Plasticity**: the ability of a material to be deformed without fracture (but not elastic).

1. **Define ductility of a material and nominate a material that has high ductility.**

**Ductility**: a material that extends when a force is applied until it fractures. Example ~ aluminium.

1. **Define malleability of a material and nominate a material that has high malleability.**

**Malleability**: the capacity of a material to withstand deformation under compression without rupture. Example ~ pure iron.

1. **Define brittleness of a material and nominate a material that has high brittleness.**

**Brittleness**: a material that, when stretched by a force, has low resistance and fails. Example ~ zinc.

1. **Define toughness of a material and nominate a material that has high toughness.**

**Toughness**: a material that, when acted on by a force, up to the point of fracture, without permanent deformation, is known as toughness. Example ~ high tensile steel.

1. **What properties of clay ceramic would make them suitable for use in common bricks?**

* strength
* porosity
* melting point

1. **Discuss the relative sizes of the measuring units used for each property.**
2. **Relate materials’ properties to how they are used in engineering during product-manufacturing and, when the product is in-service.**