



## Eduqas Physics – Component 2

### Module 5: Solids under stress

This topic introduces the behaviour of different solids under stress and introduces the concepts of stress, strain and Young modulus. The work done deforming a solid is related to the strain energy stored. The behaviour under stress for metals, brittle materials and rubber are compared.

You should be able to demonstrate and show your understanding of:	Progress and understanding:			
	1	2	3	4
Hooke's law and use $F = kx$ where the spring constant $k$ is the force per unit extension				
The ideas that for materials the tensile stress, $\sigma = \frac{F}{A}$ And the tensile strain, $\epsilon = \frac{\Delta l}{l}$ and the Young modulus, $E = \frac{\sigma}{\epsilon}$ When Hooke's law applies				
The work done in deforming a solid being equal to the area under a force-extension graph, which is $\frac{1}{2}Fx$ if Hooke's law is obeyed				
The classification of solids as crystalline, amorphous (to include glasses and ceramics) and polymeric				
The features of a force-extension (or stress-strain) graph for a metal such as copper, to include: <ul style="list-style-type: none"> <li>• elastic and plastic strain</li> <li>• the effects of dislocations, and the strengthening of metals by introducing barriers to dislocation movement, such as foreign atoms, other dislocations, and more grain boundaries</li> <li>• necking and ductile fracture</li> </ul>				
The features of a force-extension (or stress-strain) graph for a brittle material such as glass, to include: <ul style="list-style-type: none"> <li>• elastic strain and obeying Hooke's law up to fracture</li> <li>• brittle fracture by crack propagation, the effect of surface imperfections on breaking stress, and how breaking stress can be increased by reducing surface imperfections (as in thin fibres) or by putting surface under compression (as in toughened glass or prestressed concrete)</li> </ul>				
The features of a force-extension (or stress-strain) graph for rubber, to include: <ul style="list-style-type: none"> <li>• Hooke's law only approximately obeyed, low young modulus and the extension due to straightening of chain molecules against thermal opposition</li> <li>• hysteresis</li> </ul>				



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	1	2	3	4
<b>SPECIFIED PRACTICAL WORK</b>				
Measurement of the density of solids				
Determination of unknown masses by using the principle of moments				

