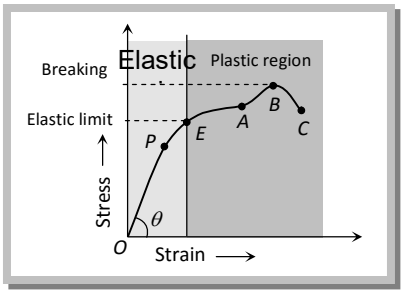
Stress-strain Curve.

If by gradually increasing the load on a vertically suspended metal wire, a graph is plotted between stress (and load) and longitudinal strain (or elongation) we get the curve as shown in figure. From this curve it is clear that:

(1) When the strain is small (< 2%) (i.e., in region OP) stress is proportional to strain. This is the region where the so called Hooke's law is obeyed. The point P is called limit of proportionality and slope of line OP gives the Young's modulus Y of the material of the wire. If θ is the angle of OP from strain axis then $Y = \tan\theta$.

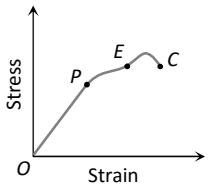
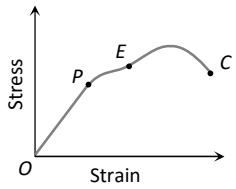
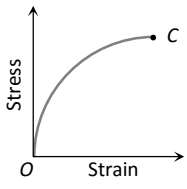


(2) If the strain is increased a little bit, i.e., in the region PE, the stress is not proportional to strain. However, the wire still regains its original length after the removal of stretching force. This behavior is shown up to point E known as elastic limit or yield-point. The region OPE represents the elastic behavior of the material of wire.

(3) If the wire is stretched beyond the elastic limit E, i.e., between EA, the strain increases much more rapidly and if the stretching force is removed the wire does not come back to its natural length. Some permanent increase in length takes place.

(4) If the stress is increased further, by a very small increase in it a very large increase in strain is produced (region AB) and after reaching point B, the strain increases even if the wire is unloaded and ruptures at C. In the region BC the wire literally flows. The maximum stress corresponding to B after which the wire begins to flow and breaks is called breaking or tensile strength. The region EABC represents the plastic behavior of the material of wire.

(5) Stress-strain curve for different materials.

Brittle material	Ductile material	Elastomers
		

The plastic region between E and C is small for brittle material and it will break soon after the elastic limit is crossed.	The material of the wire have a good plastic range and such materials can be easily changed into different shapes and can be drawn into thin wires	Stress strain curve is not a straight line within the elastic limit for elastomers and strain produced is much larger than the stress applied. Such materials have no plastic range and the breaking point lies very close to elastic limit. Example rubber