OMKAR GUJJA
A71

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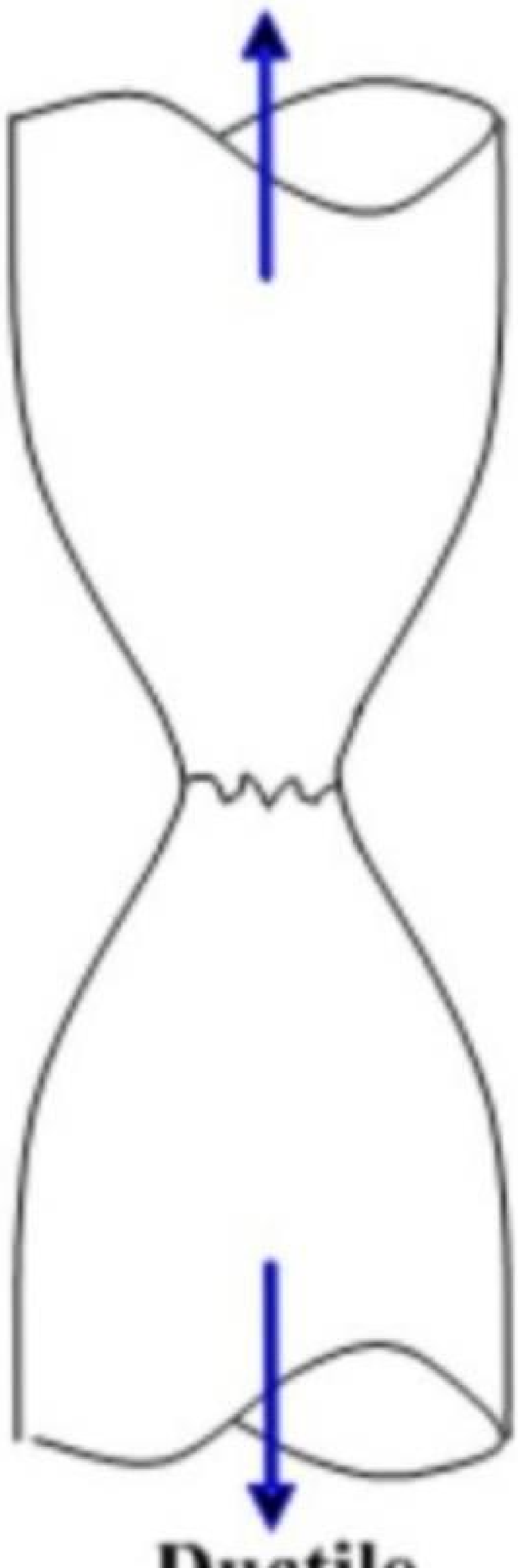
Assignment:-

| ii) Parameter | Ductile fracture | Brittle fracture |
|---|---|---|
| Strain energy required | Higher | Lower |
| Stress, during cracking | Increasing | Constant |
| Crack propagation | Slow | Fast |
| Warning sign | Plastic deformation | None |
| Deformation | Extensive | Little |
| Necking | Yes | No |
| Fractured surface | Rough and dull | Smooth and bright |
| Type of materials | Most metals | Ceramics, glasses. |

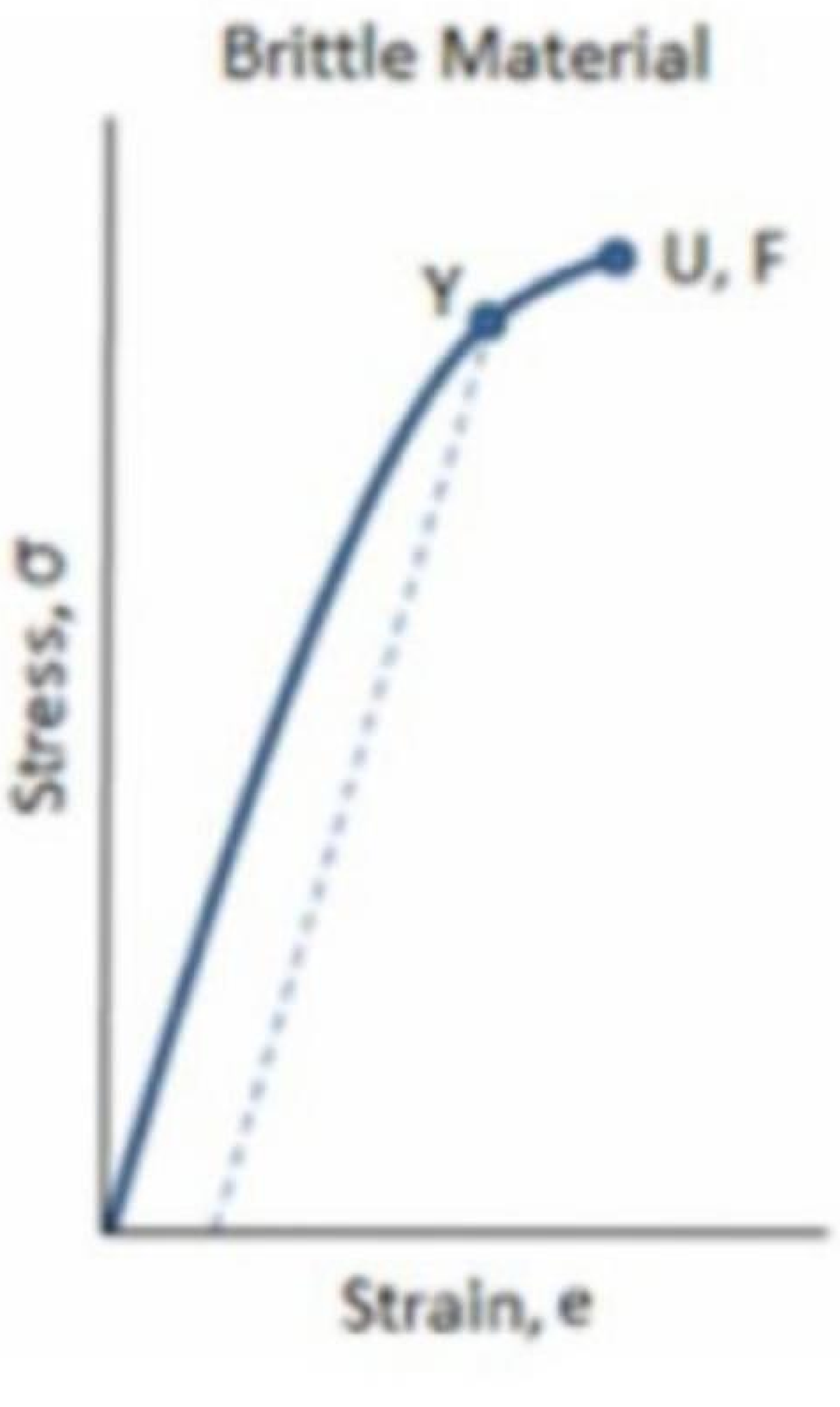
# Ductile and brittle fractures

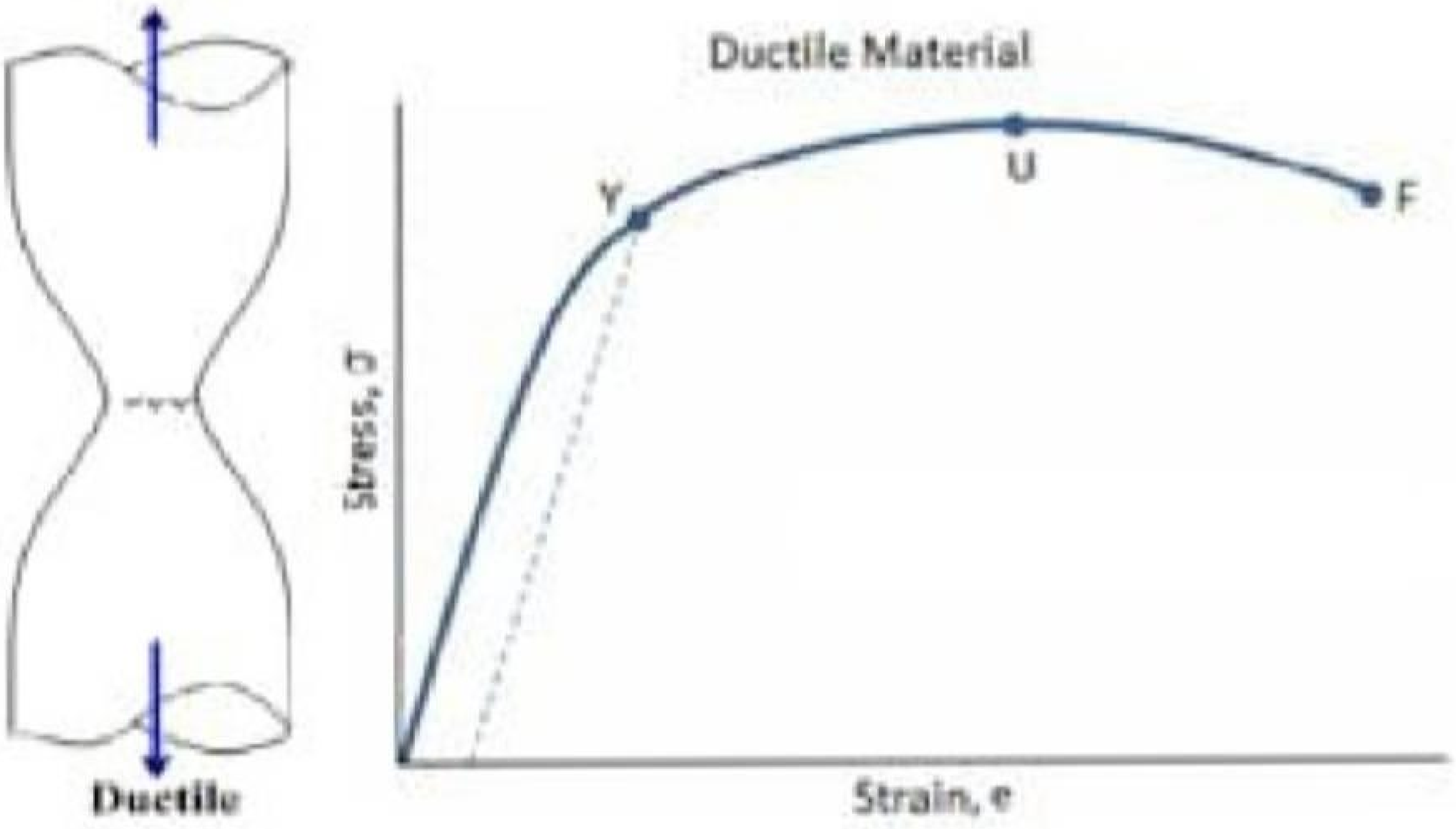


Ductile

Brittle

Brittle





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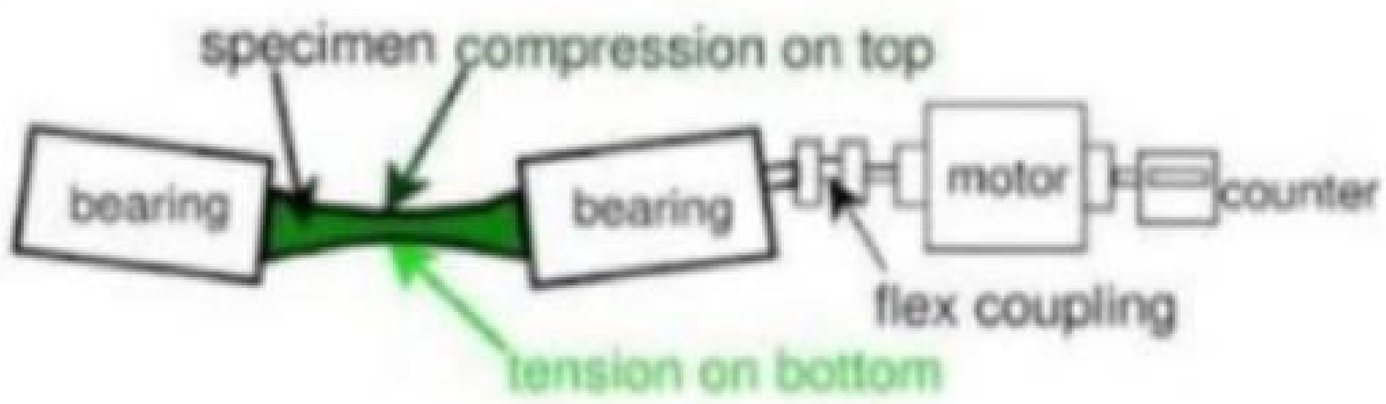
2) Define fatigue and explain its significance of cyclic stress.

→ In material science, fatigue is the weaking, of a material caused by cyclic process loading that results in progressive and structural damage and the growth of cracks cyclic process is the distribution of force that change over time in a repetitive fiesion when cyclic stresses do not causes deformation the material may fail due to fatigue. facture is typically molded by decomposing. there are different type of cyclic process like cyclic bendby stress, cyclic torsional stress and cyclic axial stress.

Fatigue occur when a material is subjated to required stresses, of facts at stress below yield point stress. such type of factures of material is known as fatigue. cyclic stress is repetitive occurance material periodic or regular cyclic stress condition lead to increasing. Thus increasing the rate of material degrada. and failure.

# Fatigue

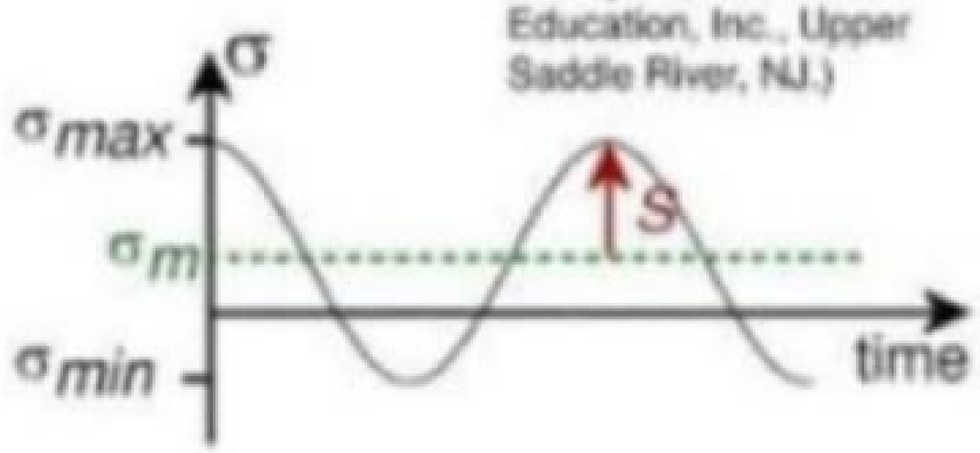
- Fatigue = failure under cyclic stress.




Adapted from Fig. 11.18, *Callister's Materials Science and Engineering, Adapted Version.*

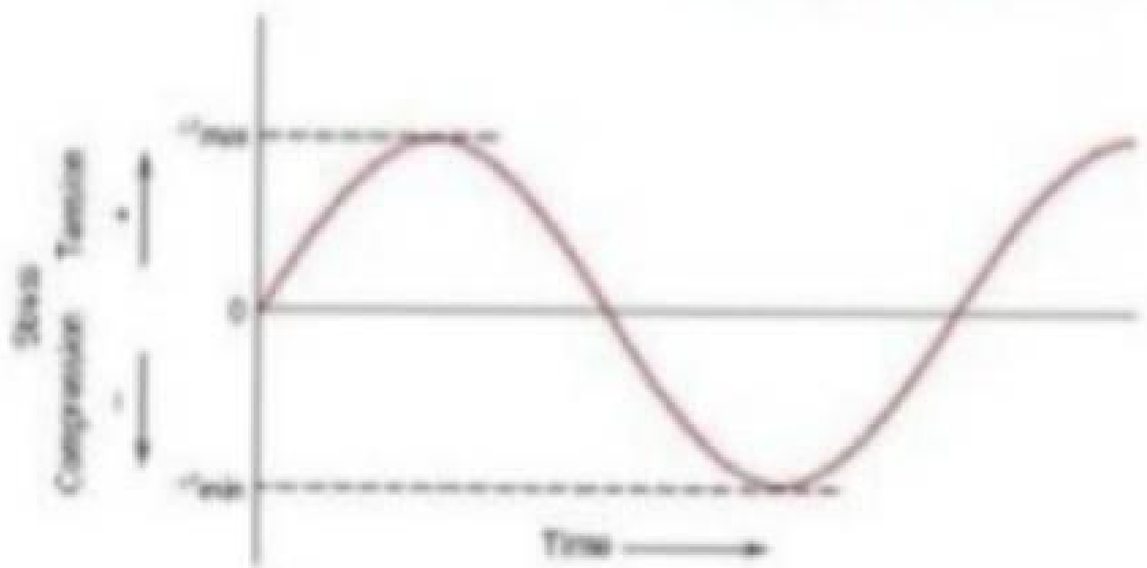
(Fig. 11.18 is from *Materials Science in Engineering*, 4/E by Carl A. Keyser, Pearson Education, Inc., Upper Saddle River, NJ.)

- Stress varies with time.
  -- key parameters are $S$, $\sigma_m$, and frequency

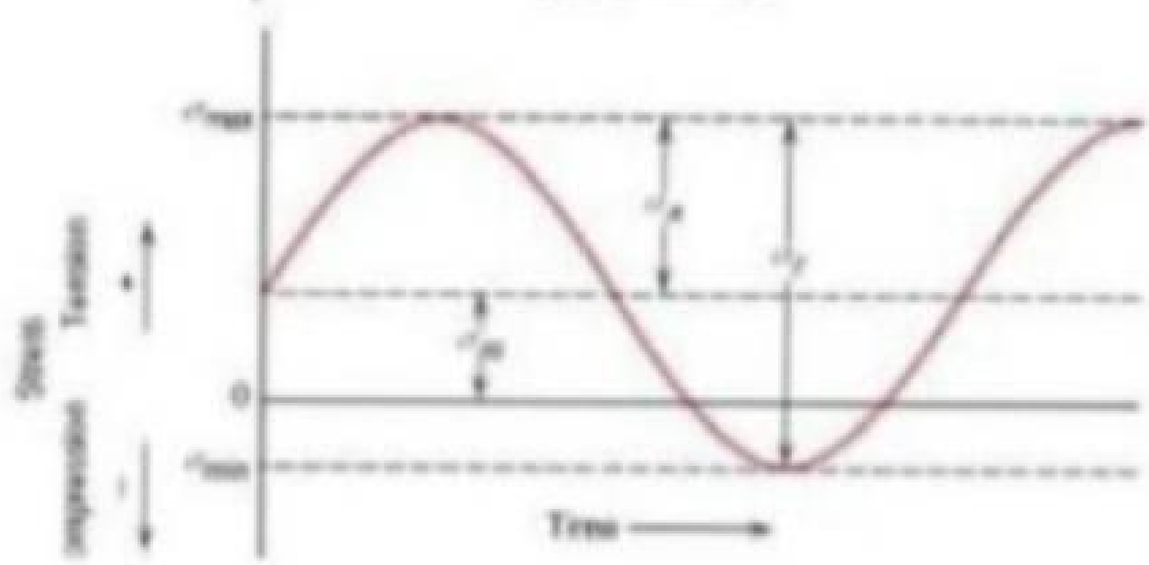



- Key points: Fatigue...
  --can cause part failure, even though $\sigma_{max} < \sigma_c$.
  --causes ~ 90% of mechanical engineering failures.

# Cyclic stress




## Reversed stress cycle

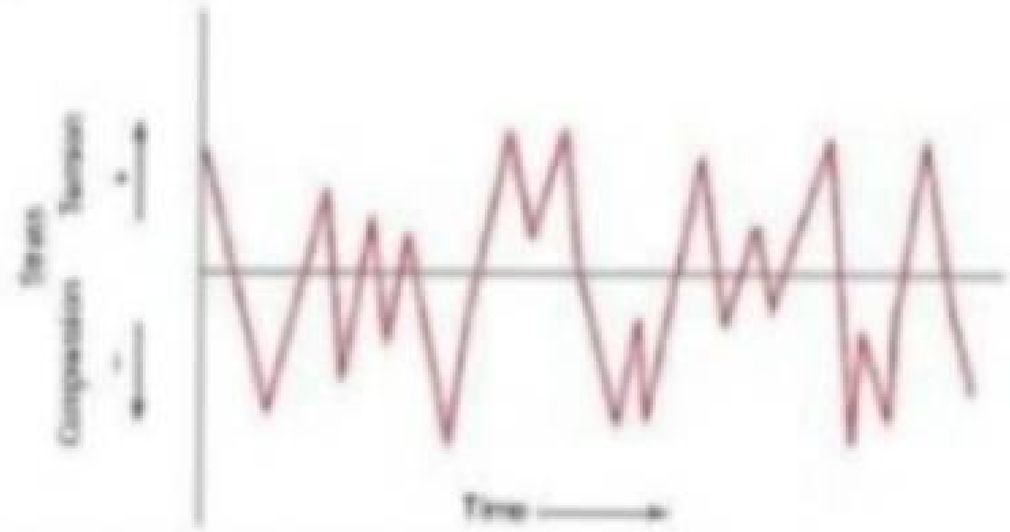



## Repeated stress cycle

$$\sigma_m = \frac{\sigma_{max} + \sigma_{min}}{2}$$

$$\sigma_r = \sigma_{max} - \sigma_{min}$$

$$\sigma_a = \frac{\sigma_r}{2} = \frac{\sigma_{max} - \sigma_{min}}{2}$$




## Random stress cycle