Worksheet: Mechanical Properties of Solids

IB · Class 11 · Physics · 10 questions · 31 marks

Name: _____	Date: _____	Score: _____ / 31

Q1. A wire of cross-sectional area 2.0 mm^2 carries a load of 40 N. Find the tensile stress. *[2 marks]*

Q2. Why is Young's modulus not defined for a liquid? *[2 marks]*

Q3. On a stress-strain curve, which feature gives the stiffness of the material and which gives its strength? *[2 marks]*

Q4. A steel wire 2.0 m long and of cross-sectional area 1.0 mm^2 is stretched by a 100 N load. Find its elongation (Y = 2.0 x 10^11 Pa). *[3 marks]*

Q5. Find the fractional change in volume of a copper block under a hydraulic pressure of 2.0 x 10^7 Pa (B = 1.4 x 10^11 Pa). *[3 marks]*

Q6. A wire of volume 1.0 x 10^-6 m^3 is under a strain of 2.0 x 10^-3. If Y = 2.0 x 10^11 Pa, find the elastic energy stored. *[3 marks]*

Q7. A hollow steel column has inner radius 10 cm and outer radius 20 cm and carries 3.0 x 10^5 N. Find the compressive stress. *[3 marks]*

Q8. Distinguish ductile from brittle materials, giving one example of each and stating what the difference looks like on a stress-strain curve. *[3 marks]*

Q9. Two wires of the same material and the same length have radii r and 2r. They are joined end to end and a force F is applied to the free ends. Compare the stress, strain and elongation in the two wires. *[5 marks]*

Q10. A steel wire has a breaking stress of 7.8 x 10^8 N/m^2 and density 7800 kg/m^3. Find the greatest length that can hang vertically without breaking under its own weight (g = 9.8 m/s^2), and explain why thickening the wire does not help. *[5 marks]*