

Physics

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(Chapter 9) (Mechanical Properties of Solids) (Exercises)
(Class 11)

Question 9.3:

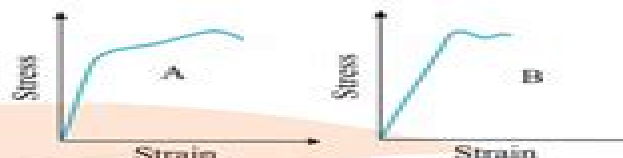
The stress-strain graphs for materials **A** and **B** are shown in Figure. The graphs are drawn to the same scale.

- (a) Which of the materials has the greater Young's modulus?
(b) Which of the two is the stronger material?

Answer 9.3:

- (a) A material has the greater Young's modulus.
(b) A material is the strongest in both.

For a given strain, the stress for material **A** is more than it is for material **B**, as shown in the two graphs.



$$\text{Young's modulus} = Y_1 = \frac{\left(\frac{F_1}{A_1}\right)}{\left(\frac{\Delta L_1}{L_1}\right)}$$

For a given strain, if the stress for a material is more, then Young's modulus is also greater for that material. Therefore, Young's modulus for material **A** is greater than it is for material **B**.

The amount of stress required for fracturing a material, corresponding to its fracture point, gives the strength of that material. Fracture point is the extreme point in a stress-strain curve. It can be observed that material **A** can withstand more strain than material **B**.

Hence, material **A** is stronger than material **B**.

Question 9.4:

Read the following two statements below carefully and state, with reasons, if it is true or false.

- (a) The Young's modulus of rubber is greater than that of steel;
(b) The stretching of a coil is determined by its shear modulus.

Answer 9.4:

- (a) False
(b) True

For a given stress, the strain in rubber is more than it is in steel.

$$\text{Young's modulus, } Y = \frac{\text{stress}}{\text{strain}}$$

$$\text{For a constant stress: } Y \propto \frac{1}{\text{strain}}$$

Hence, Young's modulus for rubber is less than it is for steel.

Shear modulus is the ratio of the applied stress to the change in the shape of a body. The stretching of a coil changes its shape. Hence, shear modulus of elasticity is involved in this process.

Question 9.5:

Two wires of diameter 0.25 cm, one made of steel and the other made of brass are loaded as shown in Fig. 9.13. The unloaded length of steel wire is 1.5 m and that of brass wire is 1.0 m. Compute the elongations of the steel and the brass wires.

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Chapter 9 Exercises Physics

John Guthrie Kerr



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Global Attractors in Abstract Parabolic Problems Jan W. Cholewa, Tomasz Dlotko, 2000-08-31 This book investigates the asymptotic behaviour of dynamical systems corresponding to parabolic equations

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Quantum Mechanics on the Personal Computer Siegmund Brandt, Hans D. Dahmen, 1989 Index of IQ commands

-1st year's course. Elementary physics John Guthrie Kerr, 1898

Manifolds, Groups, Bundles, and Spacetime R. Dale Gray, 2015-07-23 Manifolds Groups Bundles and Spacetime was written for those who are interested in modern differential geometry and its applications in physics The primary material is suitable for a graduate level course in the theory of differentiable manifolds Lie groups and fiber bundles The first two chapters are an introduction to concepts from linear algebra and tensors and can be read to

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