

Physics

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

(Class 11)

Question 9.13:

What is the density of water at a depth where pressure is 80.0 atm, given that its density at the surface is $1.03 \times 10^3 \text{ kg m}^{-3}$?

Answer 9.13:

Let the given depth be h . Pressure at the given depth, $p = 80.0 \text{ atm} = 80 \times 1.01 \times 10^5 \text{ Pa}$

Density of water at the surface, $\rho_1 = 1.03 \times 10^3 \text{ kg m}^{-3}$

Let ρ_2 be the density of water at the depth h , let V_1 be the volume of water of mass m at the surface.

Let V_2 be the volume of water of mass m at the depth h and let ΔV be the change in volume.

$$\Delta V = V_1 - V_2$$

$$= m \left(\frac{1}{\rho_1} - \frac{1}{\rho_2} \right)$$

$$\therefore \frac{\Delta V}{V_1} = 1 - \frac{\rho_1}{\rho_2} \quad \dots(i)$$

$$\text{Bulk modulus, } B = \frac{pV_1}{\Delta V}$$

$$\frac{\Delta V}{V_1} = \frac{p}{B}$$

$$\text{Compressibility of water} = \frac{1}{B} = 45.8 \times 10^{-11} \text{ Pa}^{-1}$$

$$\therefore \frac{\Delta V}{V_1} = 80 \times 1.013 \times 10^5 \times 45.8 \times 10^{-11} = 3.71 \times 10^{-3}$$

For equations (i) and (ii), we get:

$$1 - \frac{\rho_1}{\rho_2} = 3.71 \times 10^{-3}$$

$$\rho_2 = \frac{1.03 \times 10^3}{1 - (3.71 \times 10^{-3})} = 1.034 \times 10^3 \text{ kg m}^{-3}$$

Therefore, the density of water at the given depth (h) is $1.034 \times 10^3 \text{ kg m}^{-3}$.

Question 9.14:

Compute the fractional change in volume of a glass slab, when subjected to a hydraulic pressure of 10 atm.

Answer 9.14:

Hydraulic pressure exerted on the glass slab, $p = 10 \text{ atm} = 10 \times 1.013 \times 10^5 \text{ Pa}$

Bulk modulus of glass, $B = 37 \times 10^9 \text{ Nm}^{-2}$

$$\text{Bulk modulus, } B = \frac{p}{\frac{\Delta V}{V}}$$

Where, $\frac{\Delta V}{V}$ = Fractional change in volume

$$\therefore \frac{\Delta V}{V} = \frac{p}{B} = \frac{10 \times 1.013 \times 10^5}{37 \times 10^9} = 2.73 \times 10^{-5}$$

Hence, the fractional change in the volume of the glass slab is 2.73×10^{-5} .

Principles Of Physics Chapter 31 Solutions

Illinois State University



Principles Of Physics Chapter 31 Solutions:

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composition of the former grand divisions nor change the commanders but the new nomenclature was a decided improvement over the clumsy designations Right Wing Centre and Left Wing which were well calculated to lead to confusion sometimes McCooks wing became the Twentieth Corps and my division continued of the same organization and held the same number as formerly the Third Division Twentieth Corps My first brigade was now commanded by Brigadier General William H Lytle the second by Colonel Bernard Laiboldt and the third by Colonel Luther P Bradley On the 4th of March I was directed to move in light marching order toward Franklin and

Nuclear Science Abstracts, 1975 Study Guide to Accompany Halliday and Resnick Fundamentals of Physics 2nd Ed. and Physics, Combined, 3rd Ed. Stanley A. Williams, 1981-04-27 This popular book incorporates modern approaches to physics It not only tells readers how physics works it shows them Applications have been enhanced to form a bridge between concepts and reasoning Teachers' Manual Including Answers to End of Chapter Questions for Health for Life James Roswell Gallagher, 1961 **Student Study Guide to Accompany Fundamentals of Physics, Rev. Printing, Physics, 3d Ed., Parts 1 and 2** Stanley A. Williams, 1978 *Principles of Physics* Raymond A. Serway, 1997-08 *Enrichment Physics: Princ and Problems* Zitzewitz, 1998-06 The Feynman Lectures on Physics Richard Phillips Feynman, 1965 *Modern Electrical Theory: Chapter 16. Relativity* Norman Robert Campbell, 1923 *Introduction to the Principles of Mechanics* Walter Hauser, 1965 **Catalogue ...** Illinois State University, 1928 **Physics for Scientists and Engineers with Modern Physics** Ginsberg, 1994-11

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