

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} .

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Principles Of Physics Chapter 31 Solutions

Stanley A. Williams



Principles Of Physics Chapter 31 Solutions:

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Fundamentals of Physics David Halliday, Robert Resnick, Jearl Walker, 2001 This is a supplement to the text Fundamentals of Physics 6th Ed This supplement contains additional sample problems checkpoint style questions organizing questions discussion questions and new exercises and problems

Fundamentals of Physics, , Chapters 23 to 49 David Halliday, Robert Resnick, Jearl Walker, 1993-09-13 This historic book may have numerous typos and missing text Purchasers can usually download a free scanned copy of the original book without typos from the publisher Not indexed Not illustrated 1888 edition Excerpt apparel and sought and obtained employment as a teamster in the quartermasters department Her features were very large and so coarse and masculine was her general appearance that she would readily have passed as a man and in her case the deception was no doubt easily practiced Next day she was caught and proved to be a rather prepossessing young woman and though necessarily bronzed and hardened by exposure I doubt if even with these marks of campaigning she could have deceived as readily as did her companion How the two got acquainted I never learned and though they had joined the army independently of each other yet an intimacy had sprung up between them long before the mishaps of the foraging expedition They both were forwarded to army headquarters and when provided with clothing suited to their sex sent back to Nashville and thence beyond our lines to Louisville On January 9 by an order from the War Department the Army of the Cumberland had been divided into three corps designated the Fourteenth Twentieth and Twenty first This order did not alter the 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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