

Concept Questions with Answers

8.01
W13D1

Concept Q.: Simple Harmonic Motion

Which of the following functions, $x(t)$ has a second derivative which is proportional to the negative of the function?

$$\frac{d^2x}{dt^2} = -x?$$

1. $x(t) = \frac{1}{2}at^2$
2. $x(t) = Ae^{t^2}$
3. $x(t) = Ae^{t^2-1}$
4. $x(t) = A\cos\left(\frac{2\pi}{T}t\right)$

Simple Harmonic Motion

8.01
Week 12D1
Today's Reading Assignment
MIT 8.01 Course Notes
[Chapter 23 Simple Harmonic Motion](#)
Sections 23.1-23.4

Concept Q. Ans.: SHM

Answer 4. By direct calculation, when

$$x(t) = A\cos\left(\frac{2\pi}{T}t\right)$$

$$\frac{dx(t)}{dt} = -\left(\frac{2\pi}{T}\right)A\sin\left(\frac{2\pi}{T}t\right)$$

$$\frac{d^2x(t)}{dt^2} = -\left(\frac{2\pi}{T}\right)^2 A\cos\left(\frac{2\pi}{T}t\right) = -\left(\frac{2\pi}{T}\right)^2 x(t)$$

Concept Question: SHM Velocity

A block of mass m is attached to a spring with spring constant k is free to slide along a horizontal frictionless surface. At $t = 0$ the block-spring system is stretched an amount $x_0 > 0$ from the equilibrium position and is released from rest. What is the x -component of the velocity of the block when it first comes back to the equilibrium?

- | | |
|------------------------------------|-----------------------------------|
| 1. $v_x = -x_0 \frac{k}{T}$ | 2. $v_x = x_0 \frac{k}{T}$ |
| 3. $v_x = -\sqrt{\frac{k}{m}} x_0$ | 4. $v_x = \sqrt{\frac{k}{m}} x_0$ |

CQ Answer: SHM Velocity

Answer 3. The particle starts with potential energy. When it first returns to equilibrium it now has only kinetic energy. Since the energy of the block-spring system is constant:

$$(1/2)mv_{\text{eq}}^2 = (1/2)kx_0^2$$

Take positive root because object is moving in negative x -direction when it first comes back to equilibrium, and $x_0 > 0$, we require that $v_{\text{eq}} < 0$, therefore

$$v_x = -\sqrt{\frac{k}{m}} x_0$$

Concept Review Answers Simple Harmonic Motion

H. D. Ram, A. K. Chauhan



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Foundations and Applications of Engineering Mechanics H. D. Ram,A. K. Chauhan,2015-03-16 This book offers a comprehensive discussion of the fundamental theories and principles of engineering mechanics Taking the module syllabi of various technical universities and colleges in India into consideration it includes chapters on method of virtual work and mechanical vibration follows a step by step problem solving approach and provides exercises at the end of each chapter

Physics John D. Cutnell,Kenneth W. Johnson,2009-09-08 Designed for medical professionals who may struggle with making the leap to conceptual understanding and applying physics the eighth edition continues to build transferable problem solving skills It includes a set of features such as Analyzing Multiple Concept Problems Check Your Understanding Concepts Calculations and Concepts at a Glance This helps the reader to first identify the physics concepts then associate the appropriate mathematical equations and finally to work out an algebraic solution **Physics, Volume 1** John D.

Cutnell,Kenneth W. Johnson,David Young,Shane Stadler,2019-07-30 A book to help students understand physics concepts and the role the science plays in their lives This text has been written to engage students in the subject of physics and promote their understanding of key concepts The loose leaf volume of Physics 11th Edition Volume 1 is designed to support student success It opens by discussing kinematics forces dynamics and work and energy It also provides students with the concepts related to impulse and momentum as wells rotational kinematic and dynamics An exploration of principles laws and theories in the text includes Newton s laws of motion the ideal gas law and kinetic theory and the principle of linear superposition and interference phenomena Students also learn about electric forces fields circuits and potential energy The concept of light is explored in relation to reflection refraction and the wave nature of light The text s final chapters look at the nature of the atom nuclear physics and nuclear energy Each chapter of the book comes with a concept summary to reinforce what has been presented Students also expand learning through solving problems team problems and concept calculations problems **Student Edition Grades 9-12 2018** Cutnell,2019-03-11 **OAT 2017-2018 Strategies,**

Practice & Review with 2 Practice Tests Kaplan Test Prep,2016-10-04 Issued with 16 pages of detachable study sheets and access to two full length practice tests **Cutnell & Johnson Physics** John D. Cutnell,David Young,Kenneth W.

Johnson,Shane Stadler,2022 The newly revised Twelfth Edition of Cutnell s Physics delivers an effective and accessible introduction to college and university physics It contains easy to follow explanations of critical math and problem solving concepts From kinematics to work and energy temperature heat electricity magnetism and optics as well as foundational concepts in more advanced subjects like special relativity Physics is the ideal introductory text for students from any background The greatest strength of the text is the synergistic relationship it develops between problem solving and conceptual understanding The book lays emphasis on building relevance of physics in day to day living and highlights the physics principles that come into play A wide range of applications that are biomedical in nature and others that deal with

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Study Guide, Student Solutions Manual Raymond A. Serway, John R. Gordon, 1998 **Musical Opinion and Music Trade Review**, 1909 **Physics and the Sound of Music** John S. Rigden, 1985-01-18 A clearly written and organized text on the production propagation and perception of the sound we call music Organized into six major parts each with three chapters treating the sources of sound and production of musical sound the propagation of sound and those environmental features that have an immediate influence on the sound that is propagated and the perceptual aspects of the musical sound The second edition includes new material on the human voice as a musical instrument digital recording and the use of the computer in composing music **Concepts in Physics** Franklin Miller, Thomas J. Dillon, Malcolm K. Smith, 1969

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