

## Worked Example 11.2

A block is kept on a horizontal table. The table is undergoing simple harmonic motion of frequency 3 Hz in a horizontal plane. The coefficient of static friction between the block and the table surface is 0.72. Find the maximum amplitude of the table at which the block does not slip on the surface.

**Step 1:** Write the known quantities and point out the quantities to be found.

Frequency;  $f = 3 \text{ Hz}$   
 Coefficient of friction;  $\mu = 0.72$   
 Amplitude;  $x_0 = ?$

**Step 2:** Write the formula and rearrange if necessary.

Acceleration  $a = \omega^2 x_0$

Maximum force of static friction is given as

$$F = \mu mg$$

Assume that the body does not slip;

$$ma = \mu mg$$

$$m \omega^2 x_0 = \mu mg$$

$$x_0 = \mu g / \omega^2 = \mu g / (2\pi f)^2$$

**Step 3:** Put the values in the formula and calculate.

Amplitude ( $x_0$ ) =  $0.72 \times 9.8 / (2 \times 3.14 \times 3)^2 = 0.0198 \text{ m}$  or 1.98 cm

## Self-Assessment Questions:

Figure A shows a 10-coil spring that has a spring constant  $k$ . When this spring is cut in half, so there are two 5-coil springs, is the spring constant of each of the shorter springs remains same or changed?

The drawing in figure B shows plots of the displacement  $x$  versus the time  $t$  for three objects undergoing simple harmonic motion. Which object I, II, or III has the greatest maximum velocity?

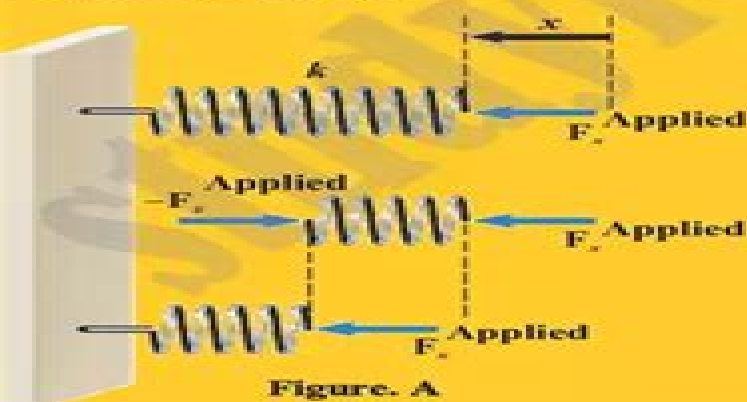


Figure. A

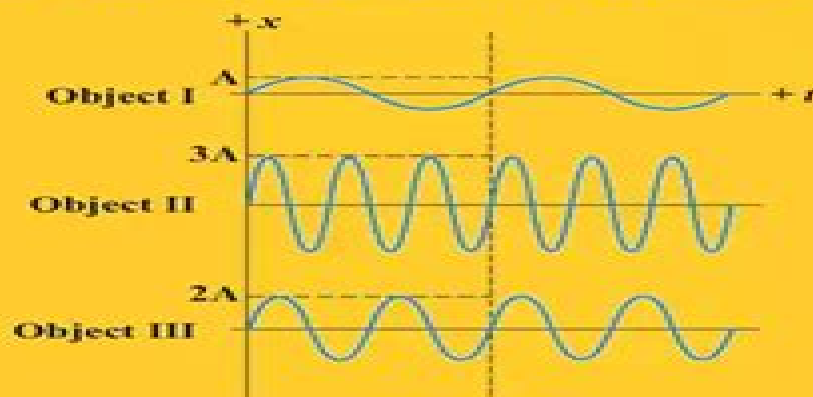


Figure. B

# 12th Science Physics Chapter Oscillations

**Dudley Williams, John Spangler**



## 12th Science Physics Chapter Oscillations:

**Nuclear Science Abstracts**, 1969      **History of Nonlinear Oscillations Theory in France (1880-1940)** Jean-Marc Ginoux, 2017-04-18 This book reveals the French scientific contribution to the mathematical theory of nonlinear oscillations and its development. The work offers a critical examination of sources with a focus on the twentieth century especially the period between the wars. Readers will see that contrary to what is often written, France's role has been significant. Important contributions were made through both the work of French scholars from within diverse disciplines: mathematicians, physicists, engineers, and through the geographical crossroads that France provided to scientific communication at the time. This study includes an examination of the period before the First World War which is vital to understanding the work of the later period. By examining literature sources such as periodicals on the topic of electricity from that era, the author has unearthed a very important text by Henri Poincaré dating from 1908. In this work, Poincaré applied the concept of limit cycle which he had introduced in 1882 through his own works to study the stability of the oscillations of a device for radio engineering. The discovery of this text means that the classical perspective of the historiography of this mathematical theory must be modified. Credit was hitherto attributed to the Russian mathematician Andronov from correspondence dating to 1929. In the newly discovered Poincaré text, there appears to be a strong interaction between science and technology or more precisely between mathematical analysis and radio engineering. This feature is one of the main components of the process of developing the theory of nonlinear oscillations. Indeed, it is a feature of many of the texts referred to in these chapters as they trace the significant developments to which France contributed. Scholars in the fields of the history of mathematics and the history of science and anyone with an interest in the philosophical underpinnings of science will find this a particularly engaging account of scientific discovery and scholarly communication from an era full of exciting developments.

*Theory of Transport Properties of Semiconductor Nanostructures* Eckehard Schöll, 1997-12-31 Recent advances in the fabrication of semiconductors have created almost unlimited possibilities to design structures on a nanometre scale with extraordinary electronic and optoelectronic properties. The theoretical understanding of electrical transport in such nanostructures is of utmost importance for future device applications. This represents a challenging issue of today's basic research since it requires advanced theoretical techniques to cope with the quantum limit of charge transport, ultrafast carrier dynamics and strongly nonlinear high field effects. This book, which appears in the electronic materials series, presents an overview of the theoretical background and recent developments in the theory of electrical transport in semiconductor nanostructures. It contains 11 chapters which are written by experts in their fields. Starting with a tutorial introduction to the subject in Chapter 1, it proceeds to present different approaches to transport theory. The semiclassical Boltzmann transport equation is in the centre of the next three chapters: Hydrodynamic moment equations (Chapter 2), Monte Carlo techniques (Chapter 3) and the cellular automaton approach (Chapter 4) are introduced and illustrated with applications to nanometre structures and

device simulation A full quantum transport theory covering the Kubo formalism and nonequilibrium Green's functions Chapter 5 as well as the density matrix theory Chapter 6 is then presented **Physics Teaching** International Group for the Advancement of Physics Teaching,1980 **Physics Briefs** ,1991 **Science Books & Films** ,1989 **Physics of Nanostructured Solid State Devices** Supriyo Bandyopadhyay,2012-02-17 Physics of Nanostructured Solid State Devices introduces readers to theories and concepts such as semi classical and quantum mechanical descriptions of electron transport methods for calculations of band structures in solids with applications in calculation of optical constants and other advanced concepts The information presented here will equip readers with the necessary tools to carry out cutting edge research in modern solid state nanodevices **Physics for Science and Engineering** Dudley Williams,John Spangler,1981

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