

READING GUIDE FOR PHYS 107 – Classical Mechanics and Waves

FALL 03 Term

READING GUIDE TO THE TEXT

The purpose of this Reading Guide is to help Physics 107 students in using their textbook (*Physics* by Resnick, Halliday and Krane, 5th edition, extended version) in learning the material of the course. The Guide pertains to all of the chapters and sections relevant for Physics 107, including the descriptive chapters at the end of the textbook which are intended for extra reading.

Each Section is graded according to the following code:

- A** a very important section which should be studied carefully
- B** an important section
- C** a section which can be read quickly
- D** a section which can be omitted and will not be covered in class
- R** a section which is largely a review of Physics 12 and which will not necessarily be covered in class, but with which the student should be familiar

CHAPTER 1 – MEASUREMENT

- R** 1.1-1.6 the first 6 sections are review
- B** 1.7 Dimensional Analysis

CHAPTER 2 – MOTION IN ONE DIMENSION

This whole chapter is a review of high school physics and should be read carefully. It develops the important tools associated with the use of vectors, and most students will find they need more practice with the use of components of vectors and with multiplication laws for vectors. Part of the first assignment will be devoted to developing more skill with vectors.

- R** 2.1 Kinematics with Vectors
- R** 2.2 Properties of Vectors
- B** 2.3 Position, Velocity and Acceleration Vectors
- B** 2.4 One-Dimensional Kinematics
- B** 2.5 Motion with Constant Acceleration
- R** 2.6 Freely Falling Bodies

CHAPTER 3 – FORCE AND NEWTON'S LAWS

- R** 3.1 Classical Mechanics
- R** 3.2 Newton's First Law
- R** 3.3 Force
- R** 3.4 Mass
- A** 3.5 Newton's Second Law
- R** 3.6 Newton's Third Law
- R** 3.7 Weight and Mass
- B** 3.8 Applications of Newton's Laws in One Dimension

CHAPTER 4 – MOTION IN TWO AND THREE DIMENSIONS

B 4.1 Motion in Three Dimensions with Constant Acceleration

B 4.2 Newton's Laws in Three-Dimensional Vector Form

A 4.3 Projectile Motion

A 4.4 Drag Forces and the Motion of Projectiles

B 4.5 Uniform Circular Motion

C 4.6 Relative Motion

CHAPTER 5 – APPLICATIONS OF NEWTON'S LAWS

R 5.1 Force Laws

B 5.2 Tension and Normal Force

B 5.3 Frictional Forces

B 5.4 Dynamics of Uniform Circular Motion

B 5.5 Time-Dependent Forces

B 5.6 Noninertial Frames and Pseudoforces

C 5.7 Limitation of Newton's Laws

CHAPTER 6 – MOMENTUM

C 6.1 Collisions

B 6.2 Linear Momentum

B 6.3 Impulse and Momentum

B 6.4 Conservation of Momentum

A 6.5 Two-Body Collisions

CHAPTER 7 – SYSTEMS OF PARTICLES

C 7.1 Motion of a Complex Object

C 7.2 Two-Particle Systems

B 7.3 Many-Particle Systems

B 7.4 Center of Mass of Solid Objects

A 7.5 Conservation of Momentum in a System of Particles

B 7.6 Systems of Variable Mass

CHAPTER 8 – ROTATIONAL KINEMATICS

C 8.1 Rotational Motion

B 8.2 Rotational Variables

A 8.3 Rotational Quantities as Vectors

A 8.4 Rotation with Constant Angular Acceleration

B 8.5 Relationships between Linear and Angular Variables

D 8.6 Vector Relationships between Linear and Angular Variables

CHAPTER 9 – ROTATIONAL DYNAMICS

A 9.1 Torque

A 9.2 Rotational Inertia and Newton's Second Law

A 9.3 Rotational Inertia of Solid Bodies

A 9.4 Torque due to Gravity

A 9.5 Equilibrium Applications of Newton's Laws for Rotation

A 9.6 Non-equilibrium Applications of Newton's Laws for Rotation

A 9.7 Combined Rotational and Translational Motion

CHAPTER 10 – ANGULAR MOMENTUM

A 10.1 Angular Momentum of a Particle

A 10.2 Systems of Particles

B 10.3 Angular Momentum and Angular Velocity

A 10.4 Conservation of Angular Momentum

A 10.5 The Spinning Top

A 10.6 Review of Rotational Dynamics

CHAPTER 11 – ENERGY 1: WORK AND KINETIC ENERGY

B 11.1 Work and Energy

B 11.2 Work Done by a Constant Force

B 11.3 Power

B 11.4 Work Done by a Variable Force

C 11.5 Work Done by a Variable Force: Two-Dimensional Case

B 11.6 Kinetic Energy and the Work-Energy Theorem

B 11.7 Work and Kinetic Energy in Rotational Motion

B 11.8 Kinetic Energy in Collisions

CHAPTER 12 – ENERGY 2: POTENTIAL ENERGY

A 12.1 Conservative Forces

A 12.2 Potential Energy

A 12.3 Conservation of Mechanical Energy

A 12.4 Energy Conservation in Rotational Motion

A 12.5 One-Dimensional Conservative Systems: The Complete Solution

C 12.6 Three-Dimensional Conservative Systems

CHAPTER 13 – ENERGY 3: CONSERVATION OF ENERGY

- B** 13.1 Work Done on System by External Forces
- B** 13.2 Internal Energy in a System of Particles
- B** 13.3 Frictional Work
- B** 13.4 Conservation of Energy in a System of Particles
- B** 13.5 Center-of-Mass Energy
- B** 13.6 Reactions and Decays
- C** 13.7 Energy Transfer by Heat

CHAPTER 14 – GRAVITATION

- C** 14.1 Origin of the Law of Gravitation
- B** 14.2 Newton's Law of Universal Gravitation
- C** 14.3 The Gravitational Constant G
- C** 14.4 Gravitation Near the Earth's Surface
- B** 14.5 Two Shell Theorems
- C** 14.6 Gravitational Potential Energy
- A** 14.7 Motions of Planets and Satellites
- C** 14.8 The Gravitational Field
- C** 14.9 Modern Developments in Gravitation

CHAPTER 17 – OSCILLATIONS

- B** 17.1 Oscillating Systems
- B** 17.2 Simple Harmonic Oscillator
- A** 17.3 Simple Harmonic Motion
- A** 17.4 Energy in Simple Harmonic Motion
- B** 17.5 Applications of Simple Harmonic Motion
- A** 17.6 Simple Harmonic Motion and Uniform Circular Motion
- B** 17.7 Damped Harmonic Motion
- B** 17.8 Forced Oscillations and Resonance
- D** 17.9 Two-Body Oscillations

CHAPTER 18 – WAVE MOTION

- C** 18.1 Mechanical Waves
- C** 18.2 Types of Waves
- A** 18.3 Traveling Waves
- B** 18.4 Wave Speed on a Stretched String

- D 18.5 Wave Equation
- C 18.6 Energy in Wave Motion
- A 18.7 Principle of Superposition
- A 18.8 Interference of Waves
- A 18.9 Standing Waves
- B 18.10 Standing Waves and Resonance

CHAPTER 19 – SOUND WAVES

- C 19.1 Properties of Sound Waves
- B 19.2 Traveling Sound Waves
- C 19.3 Speed of Sound
- B 19.4 Power and Intensity of Sound Waves
- B 19.5 Interference of Sound Waves
- A 19.6 Standing Longitudinal Waves
- A 19.7 Vibrating Systems and Sources of Sound

CHAPTER 22 – MOLECULAR PROPERTIES OF GASES

- D 22.1 Atomic Nature of Matter
- D 22.2 Molecular View of Pressure
- C 22.3 Mean Free Path
- A 22.4 Distribution of Molecular Speeds
- A 22.5 Distribution of Molecular Energies
- D 22.6 Equations of State for Real Gases
- D 22.7 Intermolecular Forces

CHAPTER 50 – NUCLEAR PHYSICS

- C 50.1 Discovering the Nucleus
- B 50.2 Some Nuclear Properties
- A 50.3 Radioactive Decay
- B 50.4 Alpha Decay
- C 50.5 Beta Decay
- C 50.6 Measuring Ionizing Radiation
- C 50.7 Natural Radioactivity
- C 50.8 Nuclear Reactions
- D 50.9 Nuclear Models

CHAPTER 51 – ENERGY FROM THE NUCLEUS

- D 51.1 The Atom and the Nucleus
- B 51.2 Nuclear Fission: The Basic Process
- D 51.3 Theory of Nuclear Fission
- D 51.4 Nuclear Reactors: The Basic Principles
- C 51.5 A Natural Reactor
- B 51.6 Thermonuclear Fusion: The Basic Process
- B 51.7 Thermonuclear Fusion in Stars
- C 51.8 Controlled Thermonuclear Fusion

CHAPTER 52 – PARTICLE PHYSICS AND COSMOLOGY

- B 52.1 Particle Interactions
- B 52.2 Families of Particles
- B 52.3 Conservation Laws
- B 52.4 Quark Model
- B 52.5 Big Bang Cosmology
- B 52.6 Nucleosynthesis
- B 52.7 The Age of the Universe