Final Exam Study Guide

Chapter 1 Units, Physical Quantities, and Vectors

1) You are responsible for all sections except 1.5

Chapter 2 Motion Along a Straight Line

1) You are responsible for all sections except 2.6

Chapter 3 Motion in Two or Three Dimensions

1) You are responsible for all sections
2) There will not be any three-dimensional motion problems

Chapter 4 Newton's Laws of Motion

1) You are responsible for all sections

Chapter 5 Applying Newton's Laws

1) You are responsible for all sections except section 5.5, and except the subsection "Fluid Resistance and Terminal Speed" (pages 155–157)

Chapter 6 Work and Kinetic Energy

1) You are responsible for all sections

Chapter 7 Potential Energy and Energy Conservation

1) You are responsible for all sections, except that you can omit the subsection "Force and Potential Energy in Three Dimensions" (pages 233–234).

Chapter 8 Momentum, Impulse, and Collisions

1) You are responsible for all sections, except section 8.6

Chapter 9 Kinematics for the Rotation of Rigid Bodies

1) Kinematic definitions for rotational variables θ, ω, and α; three kinematic equations relating rotational variables for constant acceleration
2) Constrained, no-slip linear motion and rotational motion
3) Computation of moment of inertia for discrete masses, and kinetic energy
4) Don't need to know sections 9.5 and 9.6 (parallel axis, calculus for I)

Chapter 10 Dynamics Laws for Rotational Motion

1) Computation and use of torques to compute rotational acceleration
2) Rolling motion and coupled particle-rigid body motion
3) Angular momentum-energy changes for angular momentum conservation
4) Don't need to know section 10.6 (gyroscopes)

Chapter 11 Mechanical Equilibrium and Elasticity

1) Solving translational and rotational equilibrium situations, with friction
2) Center-of-gravity calculations and movement/non-movements of cg
3) Use of stress and strain for linear and volume objects, and liquids
4) Don't need to know section 11.5 (elasticity and plasticity)

Chapter 12 Universal Gravitation

1) Use of Newton's Law of Gravity and Kepler's Three Laws
2) Calculations of kinetic and potential energies with Universal gravity
3) Satellite motion and motion of the planets
4) Definition of black-hole and Schwarzchild radius
5) Don't need to know *proof* of spherical mass result for gravity
6) Don't need to know section 12.7 (effect of Earth's rotation)

Chapter 13 Simple Harmonic (Periodic) Motion and Oscillations

1) Definitions and use of T, f, and ω for oscillatory motion
2) Concept of a restoring force and SHM solution to restoring force equation
3) Use of initial conditions to derive parameters in SHM solutions
4) Energy relations in SHM
5) Simple and compound pendulum solutions
6) You don't have to know about molecular vibrations nor sections 13.7–13.8

Chapter 14 Principles of Fluid Mechanics

1) Pascal's Law and Archimedes Principle of Buoyancy
2) Applications of continuity equation and Bernoulli's equations
3) You don't have to know surface tension nor section 14.6

Chapter 15 Mechanical Waves

1) Definition and use of f, ω, T, v, k, and λ for waves
2) Distinction between transverse and longitudinal waves
3) Use of the wave function $A\cos(kx \mp \omega t)$
4) Calculations of wave speed, superposition, standing waves, and energy in waves
5) There are no sections which can be omitted from Chapter 15

Chapter 16 Sound Waves

1) Speed of sound waves in solids, liquids, and gases
2) Use of the Doppler Effect equation
3) Normal modes of open and closed organ pipes
4) You can omit the other topics in Chapter 16.

Chapter 17 Temperature and Heat

1) Changing between Kelvin, Celsius, and Fahrenheit temperature scales
2) Thermal expansion effects and thermal stress
3) Use of specific and molar heat capacities, calorimetry examples
4) Thermal conductivity equation
5) You don't have to study convection or radiation calculations

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Chapter 18 Behavior of Ideal Gases (Thermal Properties)

1) Simple uses of the ideal gas law
2) Postulates of the kinetic theory and consequences of kinetic theory of gases
3) Relation between absolute temperature and average kinetic energy
4) Molar heat capacities of ideal gases, the mean free path equation
5) You don't have to study other topics in Chapter 18 such as the van der Waals equation, heat capacities of solids, and sections 18.5–18.6

Chapter 19 Work and the First Law of Thermodynamics

1) Calculations of work in various system changes using $\int_{V_1}^{V_2} p\, dV$
2) Understanding of isothermal, isobaric, isochoric, and adiabatic gas changes.
3) Internal energy of an ideal gas, molar heat capacities of an ideal gas
4) There are no sections in Chapter 19 which you can omit

Chapter 20 Heat Engines and the Second Law of Thermodynamics

1) Basic model of a heat engine, and calculations of the efficiency for the amount of work done

2) Upper limit on heat engine efficiencies prescribed by the Second Law of Thermodynamics

3) Model of refrigerators and heat pumps

4) Calculations with the Carnot cycle, and of entropy changes

5) You can omit section 20.8