

Exam questions

1. Coordinates. Velocity. Acceleration.
2. Newton's Laws
3. Forces. Force Balance – Static Equilibrium
4. Simple Motion in One Dimension. A Mass Falling from Height H
5. A Constant Force in One Dimension
6. Motion in Two Dimensions. Trajectory of a Cannonball
7. The Inclined Plane
8. Circular Motion. Ball on a String. Tether Ball/Conic Pendulum. Tangential Acceleration
9. Friction. Inclined Plane of Length L with Friction. Block Hanging off of a Table
10. Drag Forces. Stokes, or Laminar Drag. Rayleigh, or Turbulent Drag
11. Work and Kinetic Energy. Power
12. Conservative Forces: Potential Energy. Conservation of Mechanical Energy.
13. Conservation of Mechanical Energy. Falling Ball Reprise. Block Sliding Down Frictionless Incline Reprise.
14. Conservation of Mechanical Energy. Looping the Loop
15. Heat and Conservation of Energy
16. Equilibrium
17. Newton's Laws for a System of Particles – Center of Mass
18. Momentum. The Law of Conservation of Momentum
19. Impulse, Fluids, and Pressure
20. Collisions. Elastic, Fully Inelastic, Partially Inelastic. Ballistic Pendulum
21. Torque and Rotation
22. Conditions for Static Equilibrium. Balancing a See-Saw
23. Tipping Versus Slipping
24. General Fluid Properties. Pressure. Density. Compressibility
25. Viscosity and fluid flow

26. Static Fluids. Pressure and Confinement of Static Fluids
27. Pressure and Confinement of Static Fluids in Gravity.
28. Variation of Pressure in Incompressible Fluids.
29. Barometers
30. Variation of Oceanic Pressure with Depth. Variation of Atmospheric Pressure with Height
31. Pascal's Principle and Hydraulics. A Hydraulic Lift
32. Archimedes' Principle
33. Fluid Flow. Conservation of Flow
34. Work-Mechanical Energy in Fluids: Bernoulli's Equation
35. Fluid Viscosity and Resistance
36. 0th Law of Thermodynamics. Temperature Scales
37. The First Law of Thermodynamics
38. Second Law of Thermodynamics. Kelvin-Planck and Clausius Statements of the Second Law of Thermodynamics. Refrigerators (and Heat Pumps)
39. Carnot Engine
40. Entropy
41. Phases and Phase Transitions
42. Surface Tension and Bubbles
43. Capillary Action
44. Ptolemy's Solar System. Copernicus' Solar System
45. Kepler's Laws
46. Universal Gravitation. The Gravitational Field
47. Discrete Charge and the Electrostatic Field. Coulomb's Law
48. Electrostatic Field. Field of Two Point Charges
49. The Field of Continuous Charge Distributions
50. Gauss's Law for the Electrostatic Field. Using Gauss's Law to Evaluate the Electric Field

51. Electric Potential Energy. Potential Reference at Infinity
52. Work and Voltage: Constant Electric Field; Voltage Difference and Electric Field;
Voltage from Electric Field
53. Circuit Elements. Capacitors. Resistors. Inductors.
54. Capacitors. Parallel Plate Capacitor. Spherical Capacitor. Cylindrical Capacitor.
55. Energy Stored on a Capacitor
56. Resistance. Resistivity and Conductivity. Resistor Combinations
57. Ohm's Law. Voltage Law. Current Law
58. Voltmeter. Ammeter. Ohmmeter.
59. Kirchhoff's circuit laws.
60. DC Electric Power
61. Magnetic Field
62. Lorentz Force Law. Magnetic Interactions with Moving Charge
63. Magnetic Fields from Currents. Ampere's Law. Magnetic Force Between Wires
64. Biot-Savart Law
65. Magnetic Field Strength
66. Faraday's Law
67. Lenz's Law
68. Solenoid Field from Ampere's Law. Inductance of a Coil
69. Periodic Motion
70. Simple Harmonic Motion. Energy of an Oscillator
71. Damped Harmonic Oscillator. Damping Coefficient
72. Underdamped Oscillator
73. Driven Oscillator
74. Wave Graphs. Traveling Waves.
75. Resonance. Nodes and Antinodes. Overtones and Harmonics
76. Air Column Resonance

77. Sound. Inverse Square Law. Sound Speed in an Ideal Gas. Speed of Sound in Air. Sound in Liquids and Metals.
78. Sound Intensity. Sound Pressure.
79. Threshold of Hearing. Threshold of Pain
80. Reflection of Sound. Plane Wave Reflection. Phase Change Upon Reflection
81. Refraction and Diffraction of Sound
82. Doppler Effect
83. Ultrasonic sound. Arterial Ultrasound Scan
84. Propagation of Light. Spectral Colors
85. Refraction of Light
86. Focal Length and Lens Strength. Thin Lens Equation
87. Magnification: Transverse & Angular
88. Vergence of light
89. Ray Diagrams for Convex Lenses. Ray Diagram for Two Lenses
90. Refraction and the Eye. Accommodation. Crystalline Lens. Cataracts.
91. Aberrations and Astigmatism
92. Reflection of Light. Total Internal Reflection. Fiber Optics
93. Mirrors in Imaging. Concave Mirror Image
94. Interference. Double Slit Interference. Thin Films
95. Michelson Interferometer. Fabry-Perot Interferometer
96. Diffraction. Fraunhofer Diffraction. Single Slit Diffraction
97. Double Slit Diffraction, Diffraction Grating.
98. Diffraction. Fresnel Diffraction
99. Quantum Properties of Light. Lasers