

## **1. Mechanics**

1. The Physics of Roller Coasters
2. Investigating Projectile Motion with Different Angles
3. Analyzing the Forces on a Pendulum
4. Measuring Acceleration Due to Gravity with a Simple Pendulum
5. Exploring the Conservation of Momentum in Collisions
6. The Effect of Mass on the Acceleration of a Falling Object
7. Investigating Friction: Static vs. Kinetic
8. The Physics of Bouncing Balls: Energy Loss and Rebound Height
9. Modeling Air Resistance on a Falling Object
10. The Relationship Between Force, Mass, and Acceleration (Newton's Second Law)

## **2. Thermodynamics**

11. Measuring Heat Transfer in Different Materials
12. Investigating the Efficiency of Various Heat Insulators
13. The Physics of Phase Changes: Melting and Freezing Points
14. Analyzing the Carnot Cycle and Its Efficiency
15. The Effect of Temperature on the Rate of Chemical Reactions
16. Exploring the Greenhouse Effect and Its Impact on Climate Change
17. The Role of Specific Heat Capacity in Thermal Energy Transfer
18. Investigating Convection Currents in Fluids
19. Measuring the Thermal Conductivity of Different Materials
20. The Relationship Between Pressure and Temperature in Gases (Gay-Lussac's Law)

## **3. Electromagnetism**

21. Investigating Ohm's Law and Its Applications
22. The Effect of Wire Length and Thickness on Electrical Resistance
23. Exploring the Properties of Magnetic Fields Around a Current-Carrying Wire
24. Building and Analyzing Simple Electric Circuits
25. The Physics of Electromagnetic Induction
26. Investigating the Behavior of Electromagnetic Waves
27. Exploring Faraday's Law of Induction
28. The Effect of Magnetic Fields on Moving Charges
29. Analyzing Capacitors and Their Role in Electrical Circuits
30. The Physics of Transformers and Their Applications

## **4. Optics**

31. Investigating the Refraction of Light Through Different Mediums
32. The Physics of Lenses and Image Formation

33. Exploring the Behavior of Light Through Prisms
34. Measuring the Speed of Light Using a Rotating Mirror
35. The Role of Polarization in Light
36. Investigating Diffraction Patterns and Their Causes
37. Analyzing the Effects of Different Wavelengths on Light Dispersion
38. Exploring the Optical Properties of Various Materials
39. The Physics of Optical Fibers and Their Applications
40. Investigating the Color of Light and Its Interaction with Filters

## **5. Waves and Sound**

41. Analyzing the Frequency and Wavelength of Sound Waves
42. Investigating Resonance in Different Materials
43. The Physics of Sound Wave Propagation in Various Media
44. Measuring the Speed of Sound in Air
45. Exploring the Doppler Effect and Its Applications
46. The Effect of Temperature on Sound Velocity
47. Investigating Interference Patterns in Sound Waves
48. The Physics of Musical Instruments and Sound Production
49. Analyzing the Reflection and Absorption of Sound Waves
50. Exploring Ultrasonic Waves and Their Uses

## **6. Modern Physics**

51. Introduction to Quantum Mechanics: Basic Concepts
52. The Photoelectric Effect and Its Implications
53. Investigating Radioactive Decay and Half-Life
54. The Basics of Relativity and Time Dilation
55. Exploring the Concept of Quantum Entanglement
56. Analyzing the Heisenberg Uncertainty Principle
57. Investigating Atomic Models and Spectra
58. The Physics Behind Nuclear Reactions and Fission
59. Exploring the Behavior of Particles at High Energies
60. The Role of Particle Accelerators in Modern Physics

## **7. Astrophysics**

61. Investigating the Life Cycle of Stars
62. The Physics of Black Holes and Event Horizons
63. Exploring the Expanding Universe: Hubble's Law
64. Analyzing the Behavior of Light from Distant Galaxies
65. The Physics of Cosmic Rays and Their Detection
66. Investigating Gravitational Lensing and Its Applications
67. Exploring Exoplanets and Their Habitability

- 68. The Physics of Pulsars and Neutron Stars
- 69. Analyzing the Cosmic Microwave Background Radiation
- 70. The Role of Dark Matter and Dark Energy in the Universe

## **8. Fluid Dynamics**

- 71. Investigating Bernoulli's Principle and Its Applications
- 72. The Physics of Fluid Flow Through Pipes
- 73. Exploring the Effect of Viscosity on Fluid Movement
- 74. Analyzing the Behavior of Gases Under Different Pressures
- 75. The Role of Surface Tension in Fluid Dynamics
- 76. Investigating Laminar vs. Turbulent Flow
- 77. The Physics of Buoyancy and Floating Objects
- 78. Exploring the Principles of Hydrodynamics
- 79. Analyzing the Flow Rate of Fluids Through Different Nozzles
- 80. The Role of Capillary Action in Liquids

## **9. Nuclear Physics**

- 81. Investigating Nuclear Fission and Fusion Reactions
- 82. The Physics of Nuclear Power Generation
- 83. Exploring Radiation Types: Alpha, Beta, and Gamma
- 84. Analyzing Nuclear Decay and Its Applications
- 85. The Role of Nuclear Medicine in Diagnosing Diseases
- 86. Investigating the Structure of the Atomic Nucleus
- 87. The Physics Behind Nuclear Weapons and Their Impact
- 88. Exploring Nuclear Reactions in Stars
- 89. The Use of Particle Accelerators in Nuclear Research
- 90. Analyzing the Safety Measures in Nuclear Power Plants

## **10. Thermodynamics and Statistical Mechanics**

- 91. Exploring the Laws of Thermodynamics
- 92. Investigating Entropy and Its Implications
- 93. The Physics of Heat Engines and Refrigerators
- 94. Analyzing the Carnot Efficiency of Heat Engines
- 95. The Role of Boltzmann Statistics in Particle Systems
- 96. Investigating the Microscopic Basis of Temperature
- 97. The Physics of Phase Transitions: Solid, Liquid, and Gas
- 98. Exploring the Maxwell-Boltzmann Distribution
- 99. Analyzing Heat Transfer in Different Materials
- 100. The Role of Thermodynamic Cycles in Engine Efficiency

## **11. Classical Mechanics**

101. The Physics of Rotational Motion and Angular Momentum
102. Investigating Simple Harmonic Motion in Springs and Pendulums
103. The Role of Energy Conservation in Mechanical Systems
104. Analyzing the Motion of Projectiles and Its Applications
105. Exploring the Work-Energy Theorem
106. Investigating the Dynamics of a Rigid Body
107. The Physics of Mechanical Waves in Solids
108. Analyzing the Motion of a Block on an Inclined Plane
109. Exploring the Concepts of Work, Power, and Energy
110. The Role of Gravitational Forces in Planetary Motion

## **12. Relativity**

111. Investigating Special Relativity and Its Implications
112. The Role of Time Dilation in High-Speed Travel
113. Exploring the Concept of Spacetime Curvature
114. Analyzing the Equivalence Principle in General Relativity
115. The Physics of Gravitational Waves
116. Investigating the Twin Paradox and Its Resolution
117. Exploring the Impact of Relativity on GPS Technology
118. Analyzing Black Holes and Event Horizons in Relativistic Context
119. The Role of Relativity in Modern Particle Physics
120. Investigating the Concept of Gravitational Time Dilation

## **13. Optics and Light**

121. Investigating the Polarization of Light
122. The Physics of Optical Illusions
123. Exploring the Role of Diffraction in Optical Systems
124. Analyzing the Behavior of Light in Different Media
125. The Physics Behind Holography and 3D Imaging
126. Investigating the Role of Lenses in Correcting Vision
127. The Effect of Different Wavelengths on Light Dispersion
128. Analyzing the Spectrum of White Light Through a Prism
129. The Physics of Laser Technology and Its Applications
130. Exploring the Role of Light in Photosynthesis

## **14. Plasma Physics**

131. Investigating the Properties of Plasma
132. The Role of Plasmas in Space and Astrophysics
133. Analyzing Plasma Behavior in Magnetic Fields
134. The Physics of Fusion Reactors and Plasma Confinement
135. Exploring the Applications of Plasmas in Industry

136. Investigating the Formation of Plasma Balls
137. The Role of Plasma in Neon Lights
138. Analyzing the Interactions Between Plasmas and Electric Fields
139. Exploring Plasma Waves and Their Applications
140. The Physics of Plasma Diagnostics

## **15. Quantum Mechanics**

141. Investigating the Wave-Particle Duality of Light
142. The Role of Quantum Tunneling in Electronics
143. Exploring Quantum Superposition and Entanglement
144. Analyzing the Double-Slit Experiment and Interference Patterns
145. The Physics of Quantum Computing and Its Future
146. Investigating the Schrödinger Equation and Its Solutions
147. The Role of Quantum Mechanics in Atomic and Molecular Physics
148. Exploring the Heisenberg Uncertainty Principle
149. Analyzing Quantum Teleportation and Its Implications
150. The Physics of Quantum Dots and Nanotechnology

## **16. Experimental Physics**

151. Designing and Conducting Experiments on Newton's Laws
152. Measuring the Speed of Light Using a Simple Apparatus
153. Investigating the Properties of Magnetic Materials
154. Analyzing the Behavior of Gases in a Laboratory Experiment
155. The Physics of Simple Machines and Their Efficiency
156. Conducting Experiments on Fluid Dynamics and Flow
157. Investigating the Thermal Conductivity of Various Materials
158. Measuring the Gravitational Constant Using Simple Pendulums
159. The Physics of Electric Circuits: Building and Testing
160. Exploring the Properties of Optical Lenses in Laboratory Settings

## **17. Biophysics**

161. Investigating the Physics of Blood Flow in Arteries
162. The Role of Biophysics in Understanding Cellular Processes
163. Analyzing the Mechanics of Human Joints and Movement
164. The Physics of Vision and Light Sensitivity in Eyes
165. Exploring the Role of Biophysics in Medical Imaging
166. Investigating the Effects of Physical Forces on Cellular Structures
167. The Role of Electromagnetic Fields in Biological Systems
168. Analyzing the Mechanics of Breathing and Respiratory Systems
169. The Physics Behind Muscle Contraction and Movement
170. Investigating the Effects of Temperature on Enzyme Activity

## **18. Environmental Physics**

171. Exploring the Physics of Climate Change and Global Warming
172. Investigating the Impact of Greenhouse Gases on Earth's Atmosphere
173. Analyzing the Role of Solar Energy in Renewable Power Generation
174. The Physics of Ocean Currents and Their Effects on Climate
175. Investigating the Impact of Pollution on Air Quality
176. The Role of Physics in Understanding Natural Disasters
177. Analyzing the Effect of Human Activities on Environmental Systems
178. The Physics of Water Resources and Conservation
179. Investigating the Efficiency of Renewable Energy Sources
180. Exploring the Impact of Deforestation on the Climate

## **19. Space Physics**

181. Investigating the Physics of Cosmic Microwave Background Radiation
182. The Role of Solar Flares and Their Impact on Earth
183. Analyzing the Behavior of Asteroids and Comets
184. The Physics of Interstellar Travel and Space Exploration
185. Exploring the Role of Magnetospheres in Planetary Protection
186. Investigating the Impact of Space Weather on Satellites
187. The Physics of Space Telescopes and Observatories
188. Analyzing the Formation and Evolution of Galaxies
189. The Role of Dark Matter in Galactic Formation
190. Exploring the Physics of Exoplanets and Their Atmospheres

## **20. Medical Physics**

191. Investigating the Physics of X-Ray Imaging and CT Scans
192. The Role of Magnetic Resonance Imaging (MRI) in Medicine
193. Analyzing the Physics of Radiation Therapy for Cancer Treatment
194. The Physics of Ultrasound Imaging and Its Applications
195. Exploring the Role of Physics in Developing Medical Devices
196. Investigating the Use of Lasers in Medical Procedures
197. The Role of Biomechanics in Prosthetics and Orthotics
198. Analyzing the Physics of Thermography and Its Uses
199. The Impact of Radiation Exposure on Human Health
200. Exploring the Role of Physics in Diagnostic and Therapeutic Techniques