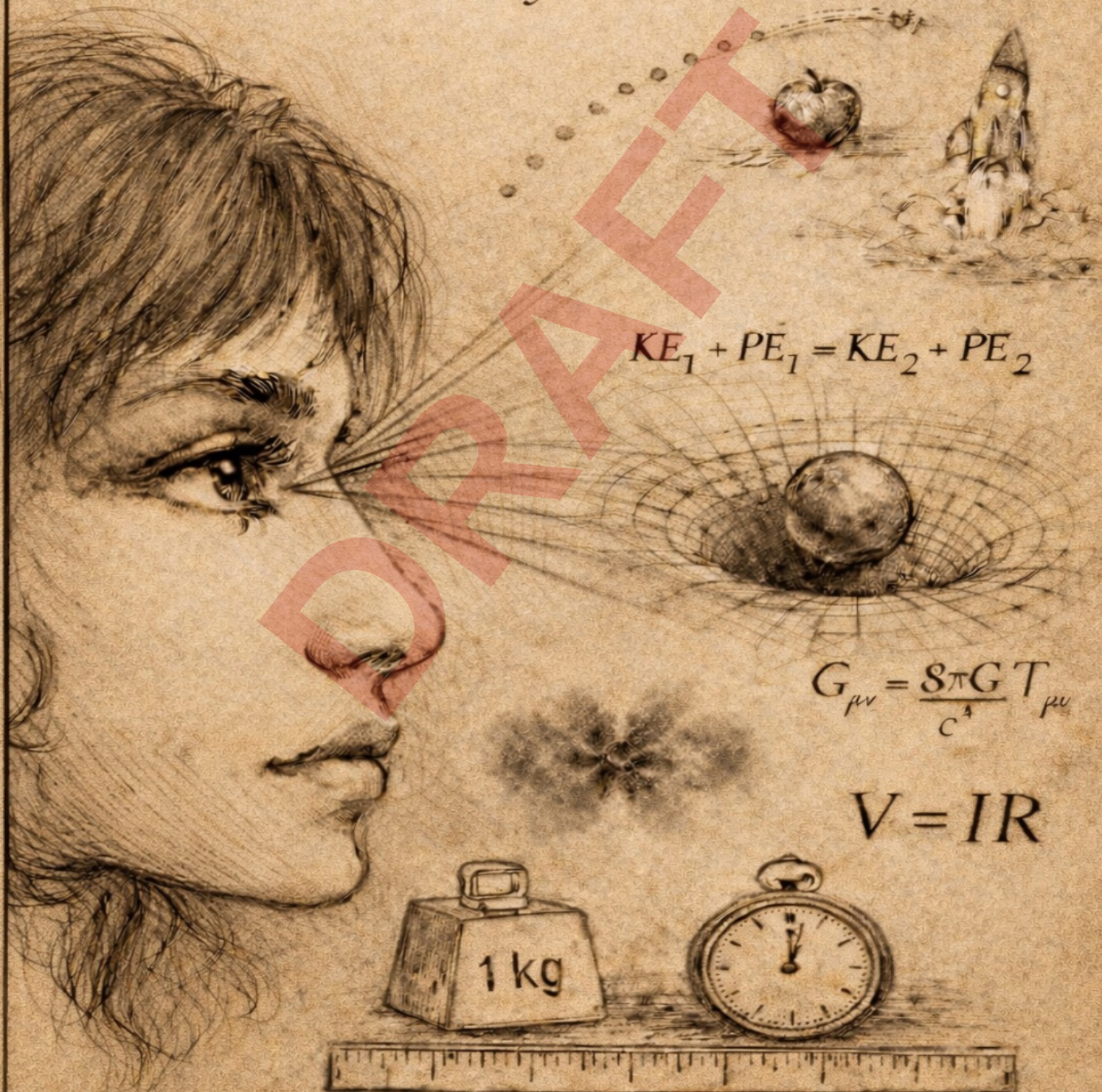


Conceptual Physics

*A Guide to Understanding
the Physical World*



$$KE_1 + PE_1 = KE_2 + PE_2$$

$$G_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$$

$$V = IR$$

Contents at a glance

Sample edition: Chapter 1 is included; Chapter 2 is under review.

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Part I

Getting Ready for Physics

Chapter 1

Getting Ready for Physics

A brief opening chapter that frames physics not as a wall of formulas, but as a disciplined way of noticing, describing, and testing the world.

Physics is often introduced as a collection of rules, formulas, and problem types. It is possible to come to physics with the impression that success depends mainly on recognizing the right procedure and using it correctly. That expectation is understandable, but it misses the deeper heart of the subject.

Physics begins earlier than calculation. It begins when a person notices a pattern, asks what is changing, asks what is staying the same, and tries to describe the situation carefully enough that another person could test the idea. In that sense, physics is not only a school subject. It leads to a way of thinking.

In this course, we will care about numbers, measurements, and quantitative thinking. But before those things become useful, we must develop something even more fundamental: the habit of reasoning well. We must learn how to slow down, describe what is happening, distinguish observation from interpretation, and build explanations that are clear enough to be challenged.

This book is written in that spirit. The main text aims to sound like thoughtful spoken language. The body of the chapter uses descriptive names rather than symbolic shorthand whenever possible. Formal symbols and equations are placed in the right-hand column, where they can support the ideas without interrupting the flow of reading. The goal is for the text to remain readable, speakable, and conceptually clear, while still giving students access to the formal language of physics.

In this physics course, I do not want you to abandon common sense. My goal is that you refine it. Sometimes your first intuition will be useful. Sometimes it will be incomplete. Sometimes it will be wrong in an interesting way. That is not failure. That is the beginning of understanding.

Equation Notes

Design Principle

Main text in the left column uses descriptive language. The right column holds symbolic shorthand, compact laws, and quick-reference relationships.

Average speed

$$v_{\text{avg}} = \frac{\Delta d}{\Delta t}$$

Average velocity

$$\vec{v}_{\text{avg}} = \frac{\Delta \vec{x}}{\Delta t}$$

Acceleration

$$\vec{a} = \frac{\Delta \vec{v}}{\Delta t}$$

Reading Tip

A student should be able to understand the sentence first, then glance right to see the symbolic version.

Chapter 2

Reasoning Before Formula

This chapter develops the habits of mind that make physics possible: careful description, clear assumptions, causal thinking, and the difference between noticing a pattern and explaining it.

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Chapter 2 is under review and will be added to a later sample.