VIVID BOOKS

Physics general notes

How the book is structured

Physics is divided into the following books:

Fundamentals, Forces, Liquids and gases, Optics, Acoustics, Energy, Electricity and magnetism, Nuclear physics, Space

Each book is divided into chapters where you'll find specific lessons.

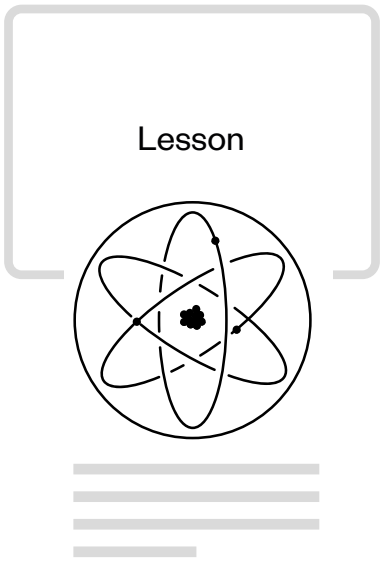
The order of chapters and lessons in the textbook does not have to be strictly followed. It's possible and sometimes even appropriate to give lessons from different chapters as needed.

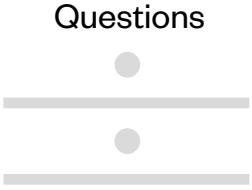
Lessons

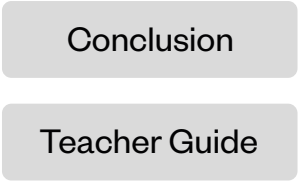
Each lesson includes:

- Short text
- Animation
- Questions
- Summary text for independent study
- Teacher's guide

Worksheets containing a short text with simple graphics (which serve as the basis to launch the animations in the application) can be printed for students.







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Working with worksheets

We consider the worksheet to be a place where students can take notes, draw and answer questions. The notes they take down in their school notebook after each lesson serve as the study text. We believe students' participation in creating the notes can be supported with questions such as: What was important in this chapter? What would you write down? What do you think we should remember? It can also be motivating for students to write down their specific thoughts or interesting questions.

They work with the worksheet individually or in small groups. The amount of time to read the text, watch the animation and think through the questions is roughly 10-15 minutes. In most cases, including these at the beginning of the lesson is a good idea.

Students start by reading the text and then view the animation.

Part of the work should be the ability to work with information from the internet.

The worksheets are intended primarily for work in class. The goal of the text and animation is not to explain the material in detail, but rather to lead to questions that result in reflection and discussion. The goal is for understanding of the curriculum to take place through appropriately posed questions and discussions among students and teachers, or among students themselves.

Questions

Questions occur in roughly three gradation levels

❶
The answer is found directly in the text or animation – we assume that students generally have a problem with reading and understanding the text

❷
Answers can be devised using information from the text or animation

❸
Aonsiderations that go beyond the chapter being discussed

Questions are intended ideally for pairs or smaller groups.

Some may have more than one correct answer, and some may not even have a completely correct answer – their goal is to support debate.

An incorrect answer may not be a wrong answer. It is very important for students to come up with their own ideas and to try to defend them. Even incorrect thinking can be very helpful in finding the right answer to a question.

Questions that verify understanding of the text or animation are used, among other things, to practice the formulation of ideas and the use of the language of physics.

In questions leading to the derivation of a relation for the calculation of certain physical quantities, it is primarily a matter of students being aware of the interdependence or independence of physical quantities. Students can come up with the method of calculation based on intuition rather than in a more exact way, which is why we definitely do not require an answer to this part of the questions from most students.

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Teacher guide

Learning objectives and sub-objectives of the text, animation and individual questions are presented for every lesson.

Answers to the questions are not the only ones possible and are not formulated in a way that students are likely to answer.

We consider these tasks to be part of the exposition of the curriculum. The number of tasks is insufficient to establish this in students' minds.

The notes presented in the teacher's guide are only examples and may not (and should not) be used exactly in this form.

Physics notes

In all books, we use the somewhat simplified designation of force of gravity in given cases in relation to the unit of mass for gravitation. However, its values differ for other cases of the gravitational fields of the Earth, Moon, other planets, etc.

For the whole of planet Earth, we assume the same gravitational acceleration of 10 N per kg.

For simplicity's sake, in all books we consider the not entirely correct designation of the magnitude of an angle, for which Greek letters are used by default, to be the name of the angle.

Forces

Correctly, in lessons devoted to friction, we should first define frictional force as a force required for the uniform movement of an object on the surface of another object, one whose magnitude can be determined by measurement, for example, and then by the physical quantity of coefficient of shear friction as the proportion of frictional and compressive force. Based on these definitions, students should then be able to derive a method of calculating frictional force. In this book, however, we decided to directly define for students the equation for the calculation of frictional force at the cost of only an intuitive definition of the coefficient of shear friction.

For simplicity, here, we do not consider the difference between static and dynamic friction.

In the chapter "Turning effect of forces" we assume for simplicity's sake that the force causing the rotation of an object is always perpendicular to its lever arm.

Liquids & gases

Unless otherwise stated, we assume that word problems take place on Earth and in water with a density of 1,000 kg per m3.

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Optics

In this book we will deal only with geometric (ray) optics. We understand the propagation of light as a beam of infinitely thin rays. However, there are a few exceptions:

In the introductory lesson Radiation, we understand light to be part of the electromagnetic spectrum, but we do not mention its wave character any more.

In the section Propagation of light, a dot appears on the mirror, which in a purely geometrical approach is not well-founded. We do not discuss its presence if it remains unnoticed by the students. Otherwise it is worth mentioning that real situations are somewhat more complicated than how we discuss them in elementary school.

Author
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