Student guide

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Introduction

Welcome to *FLAP*, the *Flexible Learning Approach to Physics*. *FLAP* is a new way of learning physics that puts *you* in control. It is based on a package of materials covering introductory physics and applicable mathematics which has been specifically designed for you to study at your own pace. The package consists of printed modules, audio tapes (including tutorials on some of the more difficult topics) video tapes, an extensive glossary, some computer software and an index. This guide explains the distinctive role of each of these components, starting with the printed modules.

FLAP modules

All *FLAP* modules are structured in a similar way. Subsection 1.1 of each module is an introduction that outlines the contents of the module. This is followed by a *Study comment* — a note in the text that offers you guidance on possible study routes through the rest of the module. Similar *Study comments* appear in several places throughout the modules so watch out for them!

Subsections 1.2 and 1.3 in each module are entitled *Fast track questions* and *Ready to study?*, respectively. Each of these subsections contains questions which you will need to work through. The *Fast track questions* should help you to find out whether or not you *need to study* the module. If your answers to all of the questions are correct (you can check your answers against those given at the back of the module), then you probably don't need to study the module in detail. You can take the *express route* and just glance through the text before looking carefully at the *Module summary* and the *Achievements*. If you are then able to answer all, or at least most, of the *Exit test* questions correctly, your task is complete!

On the other hand, if like most students you have a notion of how to answer the *Fast track questions*, but you're not 100% sure, then your best option is probably to work through the whole module in detail. If you do decide that you must work through the whole module, Subsection 1.3, *Ready to study?*, will enable you to check that you have the right background knowledge before you start to study the module. The *Study comment* in this subsection lists the terms you need to be familiar with and the questions that follow check that you know the right amount of detail. If you are a little unsure of some of the terms, the best thing would be to look them up in the *FLAP Glossary* and remind yourself of their meaning. Attempt all of the *Ready to study questions*. Check your answers against those printed at the back of the module, but don't waste time — it's precious. If you're sure you can answer a question, just write down the sort of answer you would expect and check that you had the right idea. If, having checked the solutions, you are entirely happy with these questions then you are ready to move on to the main text of the module, which follows immediately after the *Ready to study?* subsection. If you are unhappy with some parts of these questions, follow your tutor's advice on what topics you need to study first.

Once you embark on the main text of a *FLAP* module there are several features that are worth looking out for:

- All new terms introduced in a module are printed in a **bold** typeface when they are first met and they are also listed in bold type at the top of the page for easy reference. These terms are all defined in the *FLAP Glossary*.
- Some other important scientific terms used in the text are printed in an *italic* typeface. These are terms which are covered in greater detail elsewhere in *FLAP*, often in a later part of this same module. They are also entries in the *Glossary*, which you can use to locate the modules where they are introduced and discussed in detail. In many cases you may have already been alerted to the presence of these terms by the *Ready to study?* subsection.
- Throughout all *FLAP* modules, the most important statements and equations are printed in boxes to draw your attention to them.

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- 'Helping hands' (☞) will sometimes appear in the text to direct you to read a helpful marginal note or comment. Other marginal notes, not linked into the text at such a specific location, also appear in the right-hand margin — so keep your eye on these margins as you read through each section!
- Two further sorts of questions appear in the main text:

  Gem questions (marked by a diamond ◆) are short questions that are immediately followed by their answers (marked by ◇). They are intended to be treated as questions, but if you are finding things difficult you may prefer to treat some of them as examples.

  Text questions marked by a capital T and a number should always be treated as questions. You should make a serious effort to answer them before consulting the answers at the back of the module and certainly before moving on in the main text.
- Several modules also include worked *Examples*. A problem is posed and its solution follows. These *Examples* are designed to help you develop a systematic approach to problem solving, so it is worth paying attention to how each problem is tackled. (☞)
- The ends of *Text questions*, *Solutions* to *Examples* and solutions to *Gem questions* are marked by an open box symbol, so you can see where the normal text resumes. □

You will see, for example, that in *FLAP* we encourage you always to substitute in units as well as numbers once the stage comes to calculate quantities from an algebraic expression. This provides an excellent check on the calculation. By the same token we encourage you to make these substitutions together before a final calculation, rather than piecemeal during the calculation.

You might think that *FLAP* is very keen on putting you through your paces and testing your understanding every few pages. If so, you'd be right! One of the best ways of making sure that you have understood a scientific argument is to answer a question about it. Moreover, *FLAP* isn't merely concerned with what you know, but also with what you can *do* with that knowledge. By thinking carefully about questions and getting into the habit of providing good answers to them you will enhance your problem solving skills, and deepen your understanding.

All the important points developed in each module, including the boxed equations and statements, are listed in the *Module summary*, which appears as the first of the *Closing items* in each module. These summaries are quite detailed and specific, they are designed to act as a reference list for the module and may also be useful for examination revision. The *Module summary* is followed by two other subsections that deserve close attention; the *Achievements*, which lists all the things you should be able to do as a result of studying the module, and the *Exit test* which tests that you really *can* do them. The *Exit test* questions are directly linked to the *Achievements*, with each question testing one or more of the *Achievements*. Answers to the *Exit test* questions appear at the back of the module and contain references back to the text in case you had difficulty with the questions. When you have successfully completed the *Exit test*, your last remaining task is to go back and answer the *Fast track questions* in Subsection 1.2, if you have not already done so. With those questions complete your work on the module is over and you should feel reassured that you have the new material under control. If not, consult your tutor!

CAT FLAP

If you are unsure about which *FLAP* modules you need to study, it may be worth spending half an hour working through part of *CAT FLAP*. This is Computer-Aided Testing for *FLAP*, and it contains a host of multiple-choice questions (with answers and worked solutions) covering all the modules. *CAT FLAP* contains two sorts of quizzes; *access quizzes* and *modular quizzes*. The *access quizzes* cover maths and physics, and are designed to give you an overview of your abilities together with some idea of which parts of *FLAP* you need to study. The *modular quizzes* each contain five or six questions on a specific module, and should provide more detailed information. *CAT FLAP* is a *diagnostic* quiz and it is designed to be used for self-assessment. It will provide you with a printout of your performance but it does not retain a copy of this, or any other information about you as an individual, after you finish your session.

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FLAP audio and video

The *FLAP* audio tapes cover various topics (☞) and give general problem solving advice. If you have difficulty studying any of these topics in the modules, ask your tutor if you can listen to the corresponding audio tape. These tapes are designed to take you through some of the more difficult points. They usually discuss one or two specific problems, sometimes with examination advice. A version of this *Student guide* is also available on tape.

The *FLAP* videos contain a selection of clips, each of five or six minutes duration, covering different aspects of physics and applicable mathematics. Your tutor can advise you which clips are relevant to the modules you are studying, and how best to use them.

Topics covered on the audio tapes:

differentiation
integration
Taylor series
binomial expansions
vectors and scalars
vectors in mechanics
rigid bodies
Lorentz forces
electromagnetic induction
interference
kinetic theory

FLAP Glossary

FLAP modules deliberately contain no explicit references to other *FLAP* modules. All links between modules are made through the *Glossary*, which is the main routing and linking document in *FLAP*. Every scientific term introduced in the *FLAP* modules is defined and listed in the *FLAP Glossary*. Within each definition, any scientific term printed in *italics* is also defined elsewhere in the *Glossary*. The *Glossary* exists in both printed form and as a hypertext document (called the *Hyperglossary*) supplied on a computer disk. The *Hyperglossary* also contains a version of the *Maths handbook*, a collection of scientific biographries and a full index. Your tutor will tell you how to access the *Hyperglossary* on a computer.

FLAP Maths handbook

The *FLAP Maths handbook* is an extensive collection of useful formulae and mathematical results. This handy reference document also includes tables of common mathematical symbols, SI units (and some of the common non-SI ones too!) and the Greek alphabet. The *Maths handbook* has been incorporated into the *Hyperglossary*, but you may also be supplied with a printed version by your tutor.

FLAP CAL disk

Some simple simulations of physical systems have been provided for use on a personal computer. Examples include the motion of molecules in a gas, orbital motion, force fields and a bubble chamber. If you'd like to explore these simulations ask your tutor for the accompanying notes and for further information.

FLAP and you

The responsibility for learning with *FLAP* is in *your* hands. *You* must decide how well *you* understand each topic and *you* must be honest with *yourself* about *your* strengths and weaknesses. Don't deceive yourself, but also, don't underestimate your achievements. The *FLAP* modules you will be given are designed for *you* to use in the way that suits *you* best. There are no right ways or wrong ways of using the modules —just ways that work for *you* and ways that don't.

Remember, in self-study the only person you can cheat is yourself! Set yourself a high standard, study conscientiously and aim to build a solid foundation for your future. Student users of *FLAP* have reported that hard work *will* be rewarded with a thorough understanding of the material. Above all they say: 'Don't panic — you will improve with practice!'

We hope that you enjoy studying physics and mathematics with *FLAP* and that you find it an effective way of learning. The subjects are not always easy, but they are of enduring value and of great practical utility. Physics provides unique and profound insights into the nature of the Universe, and mathematics provides the language for describing them.

By using *FLAP* effectively you too will be able to share in some of those insights and to use that language with growing confidence. Study hard —and have fun.

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