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Guide to Cambridge International AS Level
Physics (9702)

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1st edition, for examination until 2024

Version 1 - last revised 29 June 2022

Preface

Guide to Cambridge International AS Level Physics (9702) provides a comprehensive guide to approaching the AS Level Physics syllabus. This guide provides information on how to approach the paper, as well as additional resources and study strategies provided by alumni of the subject. A list of definitions for the AS Level syllabus is also provided at the back of the booklet.

Chapters in AS Level Physics

General Physics

- Chapter 1: Physical Quantities and Uncertainties
- Chapter 2: Kinematics
- Chapter 3: Dynamics
- Chapter 4: Forces, Density and Pressure
- Chapter 5: Work, Energy and Power
- Chapter 6: Deformation of Solids

Waves Physics

- Chapter 7: Waves
- Chapter 8: Superposition

Electricity

- Chapter 9: Current of Electricity
- Chapter 10: D.C Circuits

Nuclear Physics

- Chapter 11: Particle Physics

Introduction to AS Level Physics

How to Approach the Subject

Visualize

The first and most obvious thing to keep in mind is the need to be open minded when it comes to visualization. It may seem comfortable to treat a given problem as an event taking place in front of you if it is a scenario-based question (Cambridge also makes it easier by giving diagrams in specific questions). This is achieved from constant exposure to past paper questions of the specific topic one is dealing with.

Ask Questions and Research

Asking questions about possible alternate scenarios to your respective teacher or browsing the internet may also help widen your understanding of the topic. Most answers for this subject may have several mathematical solutions so knowing your way around the mathematics behind the result is also beneficial.

Know your specific values

You are also tested for your knowledge of certain values you are expected to know off the top of your head such as the speed of light or the charge of an electron. Flash cards or quick read notes are highly recommended.

Study With Correlation

Cambridge AS and A level Mathematics Mechanics concepts may also come in handy from time to time. So if one has taken it for AS, it is highly recommended to study the two subjects while trying to correlate the respective subjects to one another.

Past Paper Completion

Having a grasp of the completion of each separate paper can also yield a great deal of advantage as it gives one the chance to review their work for minor errors after roughly completing the entire paper (checking if one has knowledge of all the success criteria for the topics from the syllabus is also highly recommended).

What you need to know

The Papers and Additional Resources from Cambridge

While doing your IGCSEs, you may have known that the best way to access the syllabus and the past papers is from the official Cambridge website. However, you may also not have known that Cambridge also offers more than that.

Below is a list provided that contains all the essential resources and their respective links from Cambridge for Physics:

Syllabus

The syllabus explains what candidates are required to know and how they're going to be assessed. Here is the link provided below:

Syllabus Cambridge International AS & A Level Physics 9702

Specimen Papers, Past Papers and Examiner Reports

The specimen papers are used by candidates to familiarize with the latest format of the paper, as the way it is designed can change from time to time.

Past Papers are used by candidates for constant exam practice, understanding the concepts they've learnt by making mistakes and many more

Examiner reports provide an insight into what kind of answers examiners are looking for, and where most of the common mistakes are made in a question paper that has been answered by candidates previously

Here is the link provided below to access all three of them:

Cambridge International AS and A Level Physics (9702)

Scheme of Work

The scheme of work is a resource used by teachers to help plan their lessons out. This can also be used by candidates who are interested in self-learning and want to create their own study strategy. Here is the link provided below:

Physics Scheme of Work (for examination from 2022) [9702]

Learner Guides

The learner guides are used to provide an overview of the course and what candidates will learn. It also shows candidates how to revise and provides revision planners and many more. Here is the link provided below:

Learner Guide Cambridge International AS & A Level Physics 9702

Example Candidate Responses

These are booklets that contain candidates' responses in exam papers in examination conditions. These responses are categorized according to performance, such as high, middle and low. Here is the link provided below:

Cambridge International AS and A Level Physics

Understanding the Thresholds

Grade Thresholds are crucial to check one's progress in achieving their desired grade alongside predicting how low or high the threshold might be in the respective candidate's exam season.

The marks required to achieve grades may vary significantly depending on how easy or hard the paper of the respective year was to the majority of the candidates (increasing with more frequent high scores from candidates and decreasing with less)

		minimum raw mark required for grade:				
	maximum raw mark available	A	B	C	D	E
Component 11	40	30	25	22	19	16
Component 21	60	41	36	30	24	17

As shown above different papers will have different amounts of maximum raw marks obtainable and minimum marks for specific grades. This may also be an indicator for the difficulty of the year's paper since a low minimum raw mark would mean now many candidates were capable of obtaining high marks.

The grade threshold may also be used to gauge one's papers of strength and weaknesses.

Guide to Paper 1

Paper 1 is considered one of the harder papers to score a high mark on due to the paper's difficulty as made obvious by some of the previous year grade thresholds.

The total marks for Paper 1 is 40 marks, and the total time to complete the paper is 1 hr & 15 mins

The questions have been seen to be in the order according to how the topics are arranged in our syllabus. Questions vary in difficulty but a pattern may be observed in the range of question numbers where most difficult questions may arrive similar to what is stated below:

Questions 1 - 5

These questions tend to be on the easier part of the spectrum (Seen to be from topics 1 to 2) with some with the graph based questions, formula formations and estimations being some questions to look out for on the way.

Questions 6 - 25

Questions 6 to 25 tend to be from chapters 3 to 7. It may be wise to pay attention to wording in work energy power and waves questions (especially if the waves question is about malus law or phase difference).

Questions 26 - 40

Questions 26 to 40 tend to be from chapter 8 to 11. The questions in this range that are from chapter 8 may require comparatively more visualization as it concerns superposition so appropriate time investment for it is recommended.

Questions from chapters 9 and 10 may concern I-V graphs, total resistance, potential dividers, Kirchoff's Laws etc. The very last questions have been seen to be from chapter 11 and arguably the easier questions to do.

Reminder

At the end of the day it all comes down to how adjusted the respective candidate has gotten through past paper solving. Time management may be observed to fix itself as well with continued practice but still wise to pay attention to time needed for paper completion.

Guide to Paper 2

Compared to paper 1, chances are that you will find paper 2 more easier. Hence, it is important that you score as many marks as possible in paper 2 to help increase your chances for getting an A.

The total marks for Paper 2 is 60 marks, and the total time to complete the paper is 1 hr & 15 mins

Questions in Paper 2 usually follow a pattern of questioning. The questions come in the order given below, and contains details on how the questions are structured:

Topic Structure

The topics for questions in the question paper is usually structured in the following order:

General Physics → Waves Physics → Electricity → Nuclear Physics

Types of Questions

When coming across questions from any topic, you may encounter upon these type of questions:

1. Definitions: this includes questions such as "define force" or "define acceleration". For questions like these, we HIGHLY recommend to memorize the exact definition given from the markscheme in order to not lose marks

2. Explanations: these type of questions usually ask you to state a low or principle, such as "state newton's second law" or "state the principle of superposition" and etc

3. Math-Related: these types of questions require you to calculate a certain value, such as finding the overall resistance, or finding the phase difference, and also finding ratios

4. Concept-Based: these types of questions test how well you understand your concepts. For example, "explain why two balls of varying masses reach the ground at the same time in a vacuum"

Study Strategies for AS Physics

Apart from using the Scheme of Work and Learner Guides, it may be more useful to use more efficient and time-saving strategies that have been used by the authors of this booklet and have been proven to be useful to them.

You'll find two different approaches, both of which have been crafted from the advice given to the teachers of the authors. You may be free to take a part from any of these strategies and implement them in your own.

Rahib Kibria's Strategy

Know Your Enemy

Knowing what you're up against is a simple yet important starting point for pretty much any topic from any subject. Spending valuable time on a topic where understanding concepts is supposed to be easy to understand is far from ideal.

Depending on the individual of the topics compared to one another may vary. Some primary difficulties candidates might face may be from the final few chapters such as (7) Waves, (8) Superposition and (10) D.C. circuits. Hence it is recommended to understand how time needs to be rationed properly so any topic question on the paper seems doable.

The Two Phase Method

The first phase consists of reading through the chapter while simultaneously checking whether you can recall the concept you are expected to know by the success criteria (Bullet points after "Candidates should be able to: ") like definitions.

The second phase is just completing past paper questions of that topic and trying to get a feel for the manner in which they ask the questions until satisfied with the completion rate and accuracy of answers.

Depending on the individual's attention span it is recommended to use this method in conjunction with the pomodoro method with the time interval of comfort.

Past paper Practice & Self Assessment

A crucial part of exam preparation is going to be learning to manage time in each respective paper. As you do more and more paper there is going to be a point where the investable time on the question will become obvious close to instantly. Doing approximately four years of papers has been seen to work pretty well but it may vary from person to person.

After a satisfactory amount of past papers it is important to test yourself by mentally simulating an exam environment and sitting a paper without any distractions and unusable support like blogs. Doing this every so often like on weekends may help with more practice alongside boosting the candidate's confidence which may help out immensely.

Jawadul Islam's Strategy

Extraction of Information from Textbooks

When starting with a chapter, it is recommended to simply just read the entire chapter once or twice. Reading the chapter will help provide a complete overview of the content and will help identify the important pieces of information you need to know.

After the reading has been completed, notes can be made for the chapter, where you jot down all the formulas, values you need to memorize, or concepts that you've identified important to understand

Doing Topical Past Papers

Once note-making has been completed, practicing topical past papers is an extremely good way to understand whether you know the chapter well.

As a person practices for the first time, he/she is obviously very likely to make some mistakes upon the first attempt, which is expected and completely fine. It is very important to analyze these mistakes. Ask yourself important questions like:

- Did I make a mistake here because I didn't learn the concept properly?
- How can I prevent a similar mistake like this from happening again?
- Was this mistake due to a silly mistake?

Asking these questions can help identify the root of your problems. And the best way to clear out these problems is often with the help of a teacher, who can act as a helping hand to help clear out the gaps in your learning that you may have not noticed earlier.

Creating Past Paper Notes

While solving the topical past papers, it is highly recommended to create two pieces of documents, which make up the past paper notes.

- Formula Booklet: this is a document where you write down all the formulas.
- Definition Booklet: this is where you jot down all the definitions you learn from solving past papers.
- Mistakes Booklet: this is a document where you jot down all the common mis takes you've made while solving questions.

Practice, Practice, Practice!

After finishing the topical past papers, you may now have to start practicing past papers entirely. It is recommended to practice every past paper from 2016 to the latest year, as past papers beyond 2016 may contain questions that aren't a part of the syllabus, hence it would be a waste of your time solving them.

However, before starting with complete past papers, it is recommended to take a week's break after finishing the topicals before starting with them. This is to help clear the mind and start fresh once you start doing the past papers.

List of Definitions in AS Physics

General Physics

- principle of conservation of momentum: total momentum before = total momentum after in any closed system
- velocity: change in displacement over time taken
- law of conservation of momentum: total momentum before collision is equal to total momentum after collision in an isolated system
- force: it is the rate of change of momentum
- newton's first law: object will continue in its state of rest or motion unless acted upon by a resultant force
- newton's second law: if there is a resultant force, the object will accelerate in the direction of the resultant force
- newton's third law:
  - force on body A is equal to force on body B
  - force is in opposite directions
  - force are the same kind
- mass: the property of a body that resists change in motion
- weight: is the gravitational force acting on the mass
- 2 conditions for equilibrium:
  - there is zero resultant force in any direction
  - there is zero resultant moment about any point
- displacement: distant in a specified direction
- acceleration: change of velocity / time taken
- kinetic energy: energy due to motion
- gravitational potential energy: energy of a mass due to its position in the gravitational field
- principle of moments:
- for a body in equilibrium the sum of clockwise moment = sum of anticlockwise moment
- elastic potential energy: energy stored in a body due to its extension / compression

Waves Physics

- displacement: it is distance from the equilibrium position
- amplitude: it is the maximum displacement from the equilibrium position
- frequency: it is the number of oscillations per unit time
- time period: it is the time taken for one oscillation
- period: the time for one oscillation
- wavelength: distance between two adjacent wave fronts
- transverse: the vibration is perpendicular to direction of energy transfer
- longitudinal: the vibration is parallel to direction of energy transfer
- progressive wave: energy is transferred by waves
- doppler effect: change in observed frequency when a source is moving
- period: the time for one oscillation
- wavelength: distance between two adjacent wave fronts
- diffracted waves: waves that spread out at a slit
- coherent waves: waves that have a constant phase difference
- interference: sum of displacement of overlapping waves
- principle of superposition:
  - it is when two waves overlap at a point
  - resultant displacement is sum of individual displacements
- node: zero amplitude
- interference:
  - when two or more waves superpose
  - resultant displacement is the sum of displacement of each wave

Electricity

- electric current: it is the flow of charge carrier
- coulomb: it is an ampere second
- resistance: potential difference / current
- terminal potential difference : it is the sum of potential difference outside the battery
- lost volts: voltage lost to internal resistance
- electromotive force: energy converted from chemical to electrical per unit charge
- quantized: charge exists only in discrete amounts
- potential difference: energy converted from electrical to other forms per unit charge
- Kirchhoff's first law: the sum of currents in is equal to the sum of current out of a junction
- Kirchhoff's second law: the sum of emf equals to the sum of pd around a ` closed circuit
- ohm: it is the volt per ampere
- volt: it is the joule per coulomb
- potential difference: it is the work done over charge

Nuclear Physics

- spontaneous decay: it is the decay of nucleus not affected by external factors
- random decay: it is the decay of the nucleus that can't the predicted and can occur at any given time
- alpha-particle: contains 2 protons and 2 neutrons
- radioactive decay: it is the decay of a unstable nucleus by emitting a particle until it reaches stability again
- two properties of alpha particle:
  - highly ionizing
  - deflected in electric/magnetic fields

Additional Resources

Links To YouTube Videos

Playlist: AS Reference Resources - YouTube

Recommended YouTube Channels

- ET Physics
- Physics Online
- Science Shorts

Recommended Websites

- For MCQ's – Physics 9702 Notes | Worked Solutions for Past Papers

r/IGCSE Resources

r/IGCSE Resources repository | r/IGCSE subreddit | Official Discord Server

Subreddit: igcse.reddit.com

Official Discord Server: discord.gg/IGCSE

Acknowledgements and Information:

The information on this booklet were generously prepared by alumni who have taken the subject, and the author(s) have been acknowledged where possible. The website links which may be in this document should not be understood to be an endorsement of that website or the site/folder's owners (or their products/services).

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