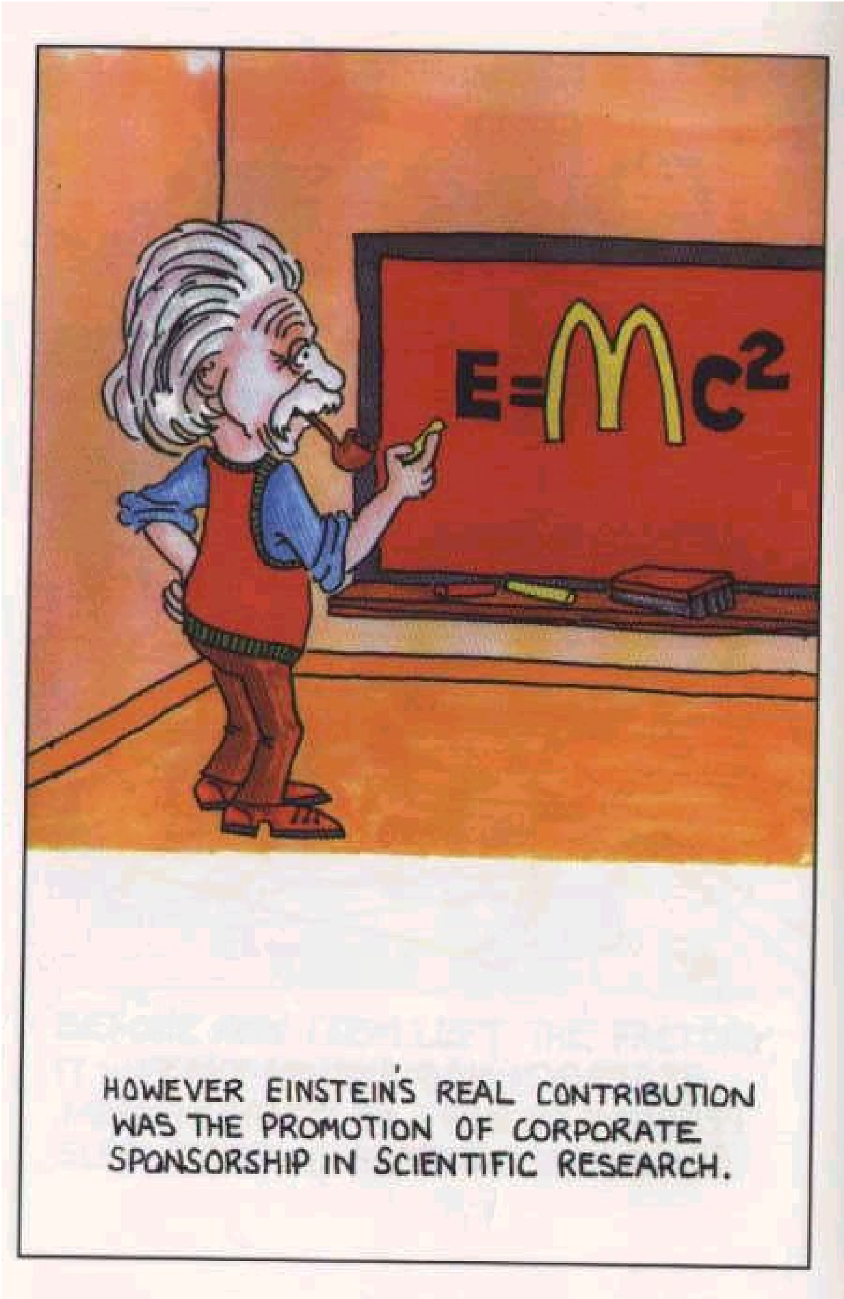
Physics Revision

2020



Presented by Colin Hopkins

colinhop@bigpond.net.au

The Exam

70% should be familiar if you have completed enough past papers.

25% for high performance students

5% to sort out the top students

OR

25% easy

50% in the middle

25% hard

2017 Exam structure	**2018 Exam structure**	**2019 Exam structure**
48% Calculations	**60%** Calculations	**50%** Calculations
31% Explanation	**28%** Explanation	**39%** Explanation
21% Annotation	**12%** Annotation	**11%** Annotation

Know when the exam is.

Tuesday 9th November 9:00 am – 11:45 am

Chief Assessors report on past exams

Students still struggle to convert g to kg, and cm and mm to m.

Students are responding to explanation questions with text copied directly from commercially available reference sheets. These pre-prepared statements will never be able to adequately respond to the specifics of the questions and students are advised not to waste their time copying them onto the paper.

Students are rounding excessively during their working.

Students are finding graphing data difficult and interpreting graphical data even more difficult.

Make sure students read the question and check that they have responded specifically.

Use the number of marks as a guide to the level of detail required

Significant figures

"Non-zero digits in data are always considered significant. Leading zeros are never significant whereas **following zeros and zeros between non-zero digits are always significant.** For example, 075.0210 contains six significant figures with the zero at the beginning not considered significant. A whole number may be a counting number, or a measurement and determination of significant figures varies in the literature.

Whole numbers

For the purpose of the *VCE Physics Study Design*, whole numbers will have the same significant figures as number of digits, for example 400 has three significant figures while 400.0 has four."

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

Victorian Certificate of Education
2019

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER | | | | | | | | | Letter

PHYSICS
Written examination

Wednesday 13 November 2019

Reading time: 9.00 am to 9.15 am (15 minutes)
Writing time: 9.15 am to 11.45 am (2 hours 30 minutes)

QUESTION AND ANSWER BOOK

Structure of book

Section	*Number of questions*	*Number of questions to be answered*	*Number of marks*
A	20	20	20
B	19	19	110
			Total 130

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, pre-written notes (one folded A3 sheet or two A4 sheets bound together by tape) and one scientific calculator.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.

Materials supplied
- Question and answer book of 41 pages
- Formula sheet
- Answer sheet for multiple-choice questions

Instructions
- Write your student number in the space provided above on this page.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.
- All written responses must be in English.

At the end of the examination
- Place the answer sheet for multiple-choice questions inside the front cover of this book.
- You may keep the formula sheet.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

Reading time

In 2019 there were 41 pages to be read in 15 minutes, i.e. 22 seconds per page.

This was virtually impossible.

You need a plan and you need to practice it.

One suggestion is:

Go to Section B, and read the questions that you haven't seen before.

Skip the questions you are familiar with.

Don't get bogged down reading data, you are going to need to read it again when you do the question, so you are wasting time reading it during reading time.

When you have finished reading section B, go back to Section A, multiple choice, and start doing the questions in your head.

This time you are reading with the intent to complete the question. You will need to remember the answer until you can start writing.

The examination consists of two sections.

Section A will consist of 20 multiple choice questions worth 1 mark.

A total of 20 marks.

Instructions for Section A

Answer **all** questions in **pencil** on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 1; an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Take the value of g to be 9.8 m s^{-2}.

Instructions for Section B

Section B consists of short-answer and extended answer questions, including questions with multiple parts. The number of questions varies from year to year, worth a total of 110 marks.

All questions must be completed.

A formula sheet will be provided with the examination.

Answers to Section A are to be recorded on the answer sheet provided for multiple choice questions.

Answers to Section B are to be recorded in the spaces provided in the question and answer book.

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- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.
- All written responses must be in English.

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Physics Approved materials and equipment

one scientific calculator

one folded A3 sheet or two A4 sheets bound together by tape, single or double-sided. Notes may be typed or handwritten and from any source (including commercially available notes).

Examiner's report

Many students lose marks due to contradictions in their answer.

Answers MUST relate to question, need a specific link to question, not just transposed from cheat sheet.

It is important to show numbers substituted into formulas/equations

If using $F = \frac{GMm}{r^2}$ then make sure that you substitute in order for M and m.

Answers should be in simplified standard form, with the correct number of significant figures.

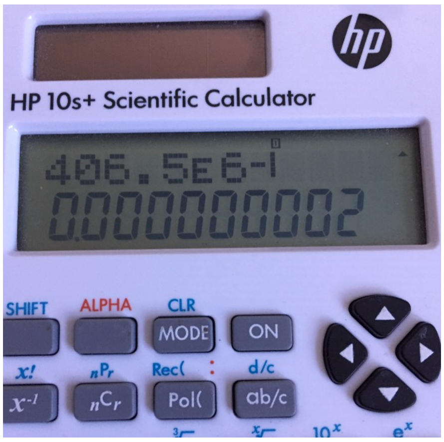
Data dumping.

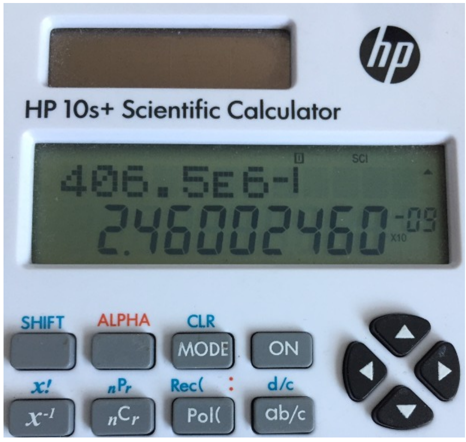
Use of scientific calculators

Be familiar with the operation of the scientific calculator you plan to use in the exam. Ensure that it is in scientific mode, and that it does not truncate answers after one or two decimal places.

Example Personal Location Beacons use EM radiations to transmit information.

What is the period of the EM wave when it is operating at 406.5 MHz?





Marking guide

In general:

1 mark questions:

Mark for correct answer.

2 mark questions:

1 mark for correct answer.

1 mark for correct formula and substitution.

3 mark questions:

1 mark for correct answer.

1 mark for final formula and substitution.

1 mark for initial derivation or conversion of information.

Hints

Avoid algebraic rearrangement. Make it easier for markers to award the "formula & substitution" mark(s)

Selected questions

2017 Question 19, 4 marks (10% were awarded 4 marks)

Roger and Mary are discussing diffraction.

Mary says electrons produce a diffraction pattern.

Roger says this is impossible as diffraction is a wave phenomenon and electrons are particles; diffraction can only be observed with waves, as with electromagnetic waves, such as light and X-rays.

Evaluate Mary's and Roger's statements in light of the current understanding of light and matter. Describe **two** experiments that show the difference between Mary's and Roger's views.

Chief examiner's comment (this was a typical answer)

Diffraction is a wave phenomenon.
The amount a wave diffracts depends on its wavelength.
Electrons demonstrate a wave behaviour based on their de Broglie wavelength.
When electrons are passed through a slit, they show a diffraction pattern.
Electrons produce similar diffraction patterns to X-rays if the de Broglie wavelength of the electron is similar to the wavelength of the X-ray.
If electrons are passed through a pair of slits an interference pattern may be observed.
This is a data dump. It is clear the student does not understand the question.

Examiner's comment

Once again there seemed to be a reliance on prepared responses copied from the student's sheet of notes. Responses such as this did not receive any marks as they did not refer to the question.

2017 Question 4c, 3 marks (23% were awarded the 3 marks)

Scientists wish to place a spacecraft, of mass 1000 kg, in an orbit of the same radius as Charon. Three students, Rick, Melissa and Nam, are discussing the situation and have different opinions.

Rick says as the spacecraft is lighter, it will have to move at a greater speed than Charon to achieve the same orbit.

Melissa says the spacecraft would need to move at the same speed as Charon.

Nam says the spacecraft would need only to move at a lower speed as it is lighter than Charon.

Evaluate these three opinions. Detailed calculations are **not** necessary.

Examiner's comment

Many students suggested that all three students were correct to some extent. Marks cannot be awarded where it is unclear whether the student has recognised an incorrect argument.

2018 Question 14, 2 marks, 13%

Jani is stationary in a spaceship travelling at constant speed.

Does this mean that the spaceship must be in an inertial frame of reference? Justify your answer.

Examiner's comment

Students were required to identify that constant speed is not the same as constant velocity, and that the ship in question could be travelling in a circular path or it could be in orbit and still be traveling at a constant speed. Therefore, the spaceship may not be in an inertial frame of reference.

2017 Question 11c , (8% of students gained 3 marks)

Examiner's comment

It was clear that the majority of students had no understanding of these phenomena. Many responses simply stated that 'due to time dilation and length contraction the particles last

c. Explain why the scientists would observe more particles at the end of the laboratory measuring range than classical physics would expect.

longer and travel a shorter distance'. Many students explained the results by applying both time dilation and length contraction at the same time, which generally resulted in a confused response that indicated the students were not aware of which frame of reference they were referring to.

What does a 'good' answer look like?

Elegance in the answer
- linkages between points
- references to actual question
- appropriate data

Questions require more in-depth understanding.
Holistic answers forming a coherent argument are essential, facts, by themselves, will not earn marks.

> ***Examiner's comments***
>
> *Factual statements can only be rewarded if they form part of a coherent argument. Factual statements (copied from the A3 sheet) that are not part of a coherent argument do not indicate an understanding of the question.*

The student's response must demonstrate:
- an understanding of the question being asked.
- an understanding of appropriate and relevant physics in response.

therefore
- identify the relevant theory or concept
- describe relevant theory or concept
- apply by relating back to question

Make the pathway through your thinking very clear, consider using small statements to show this.

You need to work smarter, not harder.

You need to know what you know, and know what you don't know. Then work on your areas of weakness.

Quality, not quantity, is the secret.

You need to practise the way you intend to perform on the exam.

Exam preparation

Theory suggests something along the following lines.

In general you remember

~ 10% of what you hear

~ 25% of what you read

~ 40% of what you write

~ 70% of what you do

~ 85% of what you teach

Do past papers.

Questions often repeat

2018 Question 2

Question 2 (6 marks)

A square loop of wire of 10 turns with a cross-sectional area of 1.6×10^{-3} m^2 passes at a constant speed into, through and out of a magnetic field of magnitude 2.0×10^{-2} T, as shown in Figure 2.

The loop takes 0.50 s to go from position X to position Y.

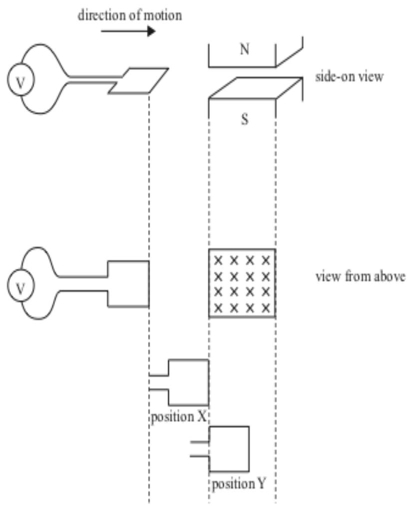


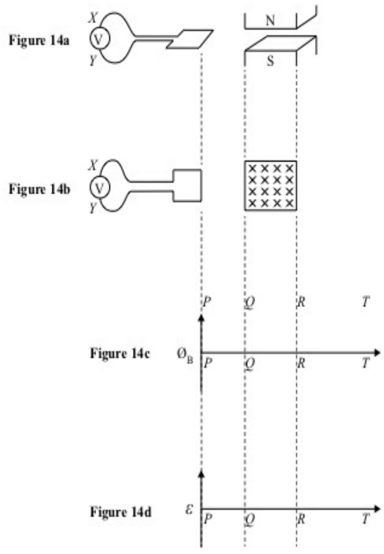
Figure 2

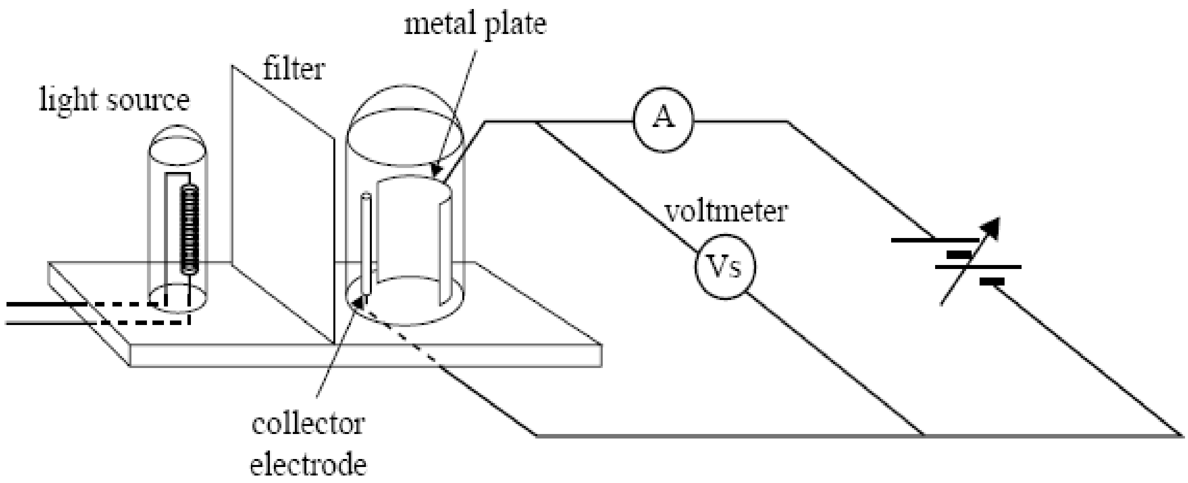
2015 Question 13

Question 13 (8 marks)

To study electromagnetic induction, students pass a square loop at constant speed through the pole pieces of a magnet, as shown in Figure 14a. Figure 14b shows the experimental set-up as viewed from above. The axes below indicate the same distances as shown in Figure 14b.

In answering Question 14, you do not have to include any calculations or values on the axes.





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