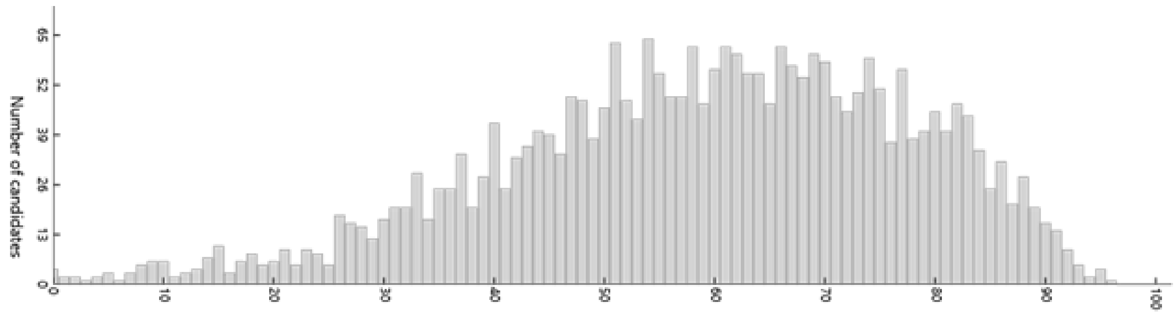
Summary report of the 2019 ATAR course examination:
Physics

Year	Number who sat	Number of absentees
2019	2770	58
2018	3165	35
2017	3304	33
2016	3493	53

Examination score distribution–Written



Summary
Attempted by 2770 candidates Mean 58.85% Max 95.97% Min 0.00%

The 2019 Physics ATAR Examination gave candidates of all abilities the opportunity to demonstrate their understanding of concepts covered in the syllabus. The contexts used should have been familiar to most candidates. The paper was fair and the questions familiar. The examination appeared to be accessible for the average student while sufficiently challenging for the more capable ones.

The multi-part questions were scaffolded. The initial parts were straightforward with subsequent parts becoming progressively more difficult. This is reflected in the correlation between marks achieved for each question compared to the marks achieved for each section. Essentially, the harder the question, the higher the correlation and vice-versa.

It was observed that some candidates could not explain a concept after they had completed its calculation. One conclusion could be that candidates rehearse answering specific questions rather than being taught the principles first.

Section means were:
Section One: Short response Mean 66.28%
Attempted by 2764 candidates Mean 19.88(/30) Max 29.73 Min 0.55
Section Two: Problem-solving Mean 57.18%
Attempted by 2763 candidates Mean 28.59(/50) Max 48.92 Min 0.00
Section Three: Comprehension Mean 53.01%
Attempted by 2742 candidates Mean 10.60(/20) Max 19.47 Min 0.00

General comments
There were many excellent performances by candidates who understood the concepts and expressed themselves clearly and concisely.

Advice for candidates

- Read the question carefully. Make sure you answer the question that is being asked.
- Set out your answers clearly. Do not to skip steps just because they are on your calculator. An incorrect numerical answer can score four out of five marks if adequate workings are shown.
- Answer every part of the question. If the question asks you to supply an appropriate equation, write one down.
- Explain concepts rather than simply applying them in calculations.

Advice for teachers

- Teach the difference between vector diagrams and free body diagrams. This is not a skill learnt in isolation. It teaches students to approach questions from first principles and helps them answer the harder, less familiar questions.
- Emphasise the concept of net force.
- Teach the conversion of electrical potential energy to kinetic energy. This will require revisiting the concept of potential difference.
- Taking moments around a point does not mean the forces acting at that point are no longer there.
- There is no such thing as length dilation.
- Spend more time showing how the Bohr model enables line spectra to be correlated with atomic energy-level diagrams.
- Discourage students from using Plank’s constant in eV. It is not contained within the Formulae and data booklet and most students who used it made mistakes.
- Encourage students to take greater care in drawing diagrams of fields or forces. Labelling is important.
- Teach students how the shape of graphs correlates to specific mathematical relationships between variables.
- Emphasise that induced emf is a function of rate of change of flux.

Comments on specific sections and questions

A system in equilibrium has no net force acting on it. This is easily understood with co-linear forces but poorly understood with co-planar forces. Very few candidates could draw a vector diagram of a body in equilibrium. This lack of understanding extended into circular motion where the centripetal force is the net force and the vector addition of all real forces acting on an object. It appears that many candidates simply remembered algebraic expressions for vector resolution from previous questions without being capable of analysing a system and resolving it themselves. Conservation of energy was confidently applied mathematically in a gravitational field, but very poorly applied in an electrical field. It was obvious that many candidates went through the motions of linearisation of data, but did not understand why it was important. Tolerances, error bars and significant figures were crucial in producing reliable results. These are not mutually exclusive ideas to be assessed in isolation.

Section One: Short response (55 Marks)

Candidates performed well in Section One. Questions 1, 5, 6 and 8 appeared to be the easiest for candidates. Question 7 proved to be difficult as candidates confused a vector diagram with a free body diagram and Question 11 (c) discriminated amongst candidates who could or could not explain the concept of simultaneity.

Section Two: Problem-solving (93 Marks)

Questions 12 and 15 were generally easier questions for candidates. Candidates tended to struggle with labelling vectors in Questions 13 (a) and 13 (b) proved to be a very discriminating question. Drawing energy transitions lines on an energy level diagram in Question 14 was done poorly. Questions 16, 17 and 18 served as good questions with discriminating parts.

Section Three: Comprehension (38 Marks)
Initial parts of both comprehension questions were accessible and answered well by candidates. Question parts became progressively more difficult providing the top performing candidates' opportunities to demonstrate their Physics knowledge. Question 19 (f) and 20 (d) proved to be the most discriminatory.