Tuition and Proof

Professional Academic Services

# Mock Exams Report

**Student Name:** [redacted]

## Examinations covered:

- Biology - AQA - GCSE (*Higher*)
- Chemistry - AQA - GCSE (*Higher*)
- Physics - AQA - GCSE (*Higher*)
- Maths - EdExcel - GCSE (*Higher*)

**Report by:** [redacted] **Report date:** 23/02/16

**Email:** [redacted]

# Summary of exam scores

The following tables present [redacted]**'s** raw marks and percentage scores for the science and maths exams.

| **Biology - *Grade = A*** | | | |
|---|---|---|---|
| **Paper** | **Score** | **Marks available** | **Percentage** |
| Unit 1 | 33 | 45 | 73% |
| Unit 2 | 33 | 45 | 73% |
| Unit 3 | 33 | 45 | 73% |
| ***Overall*** | ***99*** | ***135*** | ***73%*** |

| **Chemistry - *Grade = B*** | | | |
|---|---|---|---|
| **Paper** | **Score** | **Marks available** | **Percentage** |
| Unit 1 | 32 | 40 | 80% |
| Unit 2 | 28 | 40 | 70% |
| Unit 3 | 17 | 38 | 45% |
| ***Overall*** | ***77*** | ***118*** | ***65%*** |

| **Physics - *Grade = B-C*** | | | |
|---|---|---|---|
| **Paper** | **Score** | **Marks available** | **Percentage** |
| Unit 1 | 17 | 44 | 39% |
| Unit 2 | 30 | 45 | 67% |
| Unit 3 | 25 | 45 | 56% |
| ***Overall*** | ***73*** | ***134*** | ***54%*** |

| **Mathematics - *Grade = B*** | | | |
|---|---|---|---|
| **Paper** | **Score** | **Marks available** | **Percentage** |
| Non-calculator | 39 | 60 | 65% |
| Calculator | 24 | 60 | 40% |
| ***Overall*** | ***62*** | ***120*** | ***52%*** |

# The Mock Exams Explained

## Grade boundaries

The idea that 80% is always the limit for an A* and that grade boundaries are set in gaps of 5% or 10% is incorrect; grade boundaries are based on the statistics of the number of students sitting the exam. As only 2 students have sat these exams, the estimated grade boundaries are speculative, and are based on the difficulty of the exams and calculated grade boundaries of previous AQA or EdExcel examinations.

*The estimated grade boundaries are shown below. The candidate's grades are highlighted.*

| Grade | Biology (%) | Chemistry (%) | Physics (%) | Maths (%) |
|---|---|---|---|---|
| A* | 80 | 75 | 75 | 70 |
| A | **72** | 68 | 65 | 60 |
| B | 63 | **61** | **56** | **50** |
| C | 55 | 52 | 46 | 40 |
| D | 45 | 39 | 35 | 32 |
| E | 36 | 31 | 30 | 25 |
| G | Below 36 | Below 31 | Below 30 | Below 25 |

## Redundant questions

A total of 3 marks were redundant (i.e., the question was "removed" from the exam during marking). This change is reflected in the scores.

## Difficulty of examinations

The level of questions was varied to ensure that students on all levels would be assessed, and was in line with current examinations. If the paper was difficult, the marking was more lenient, and the estimated grade boundaries were shifted down (i.e., a lower mark was needed for an A*). Where the paper was easy, the grade boundaries were shifted upwards, and the marking was stricter.

For example:
Biology was an "easy" paper, therefore the marks awarded for a longer written answer were only awarded when the candidate had used specific terminology. Physics was a more difficult paper, and therefore more stages of the calculation were able to gain method marks.

The maths paper was difficult. For context, an adult who had achieved an A grade in A level mathematics (5 years ago) achieved a total score of 68%. However, none of the questions were any more difficult than those in the EdExcel examinations, rather that there was a greater proportion of difficult questions.

**Duration of examinations**

The exams were designed to fit into a 2 hour window (give or take 15 minutes). The actual AQA science exams last for a total of three hours. The Edexcel maths papers are 1 hour and 40 minutes each.

Both exam boards give a time limit based on 1 minute per mark.

The total number of marks available was therefore based on the reduced time limit.

**Syllabus coverage**

It is normal for the GCSE exams to cover every major topic on the curriculum/syllabus, Due to the reduced time limit per paper, some topics were not covered in as much detail as in the real exam. Every exam assumed that the candidate would have covered all topics, and so on occasions they would have encountered topics that they had not yet covered at the time of taking the exam.

# General Comments

Some brief comments based on the exams follow. Most of the comments are on what went wrong, and how to improve. Generally, [redacted] showed that when he knew a topic, and therefore how to answer a question, he would get a good score in it, suggesting that the only real thing letting him down is subject knowledge and not his ability or understanding.

**Overall**

[redacted] treated the exams as though they were the real thing - he had the necessary equipment, was well behaved and stayed focussed for the exam. He used his time to check his answers and add to his answers for other questions.

Sometimes, if he didn't understand a longer written question or detailed calculation fully, he would leave the question unanswered. You can quite often gain marks for stating the obvious in science (i.e., picking out the correct equation or simply by explaining what the question is asking).

He picked up quickly on the topics we covered (after looking at what questions on the exam he got wrong). The scores may seem quite low but I imagine if he puts a relatively small quantity of work in, we could be getting the scores up to the 70-80% mark quite easily. He is definitely capable of getting an A* in each of the subjects with enough work.

**Biology**

When he understands a question he's very capable of getting a good score for it. A lot of biology involves learning "model answers" for questions that come up frequently, and he would benefit from making model answers for 3-6 mark questions. Often it was clear that [redacted] knew exactly what the question was asking but he missed a couple of key points required to get all the marks.

His long written answers were very good and have definitely improved a lot since we started - he's usually getting top marks for the 6 mark questions when he understands the question (this was true in all the science mock exams).

**Chemistry**

In terms of understanding there are few real problems that can't be sorted with a bit of revision - [redacted] seems to have a good grasp of most of the subject matter. A couple of topics (hard water, titrations - Unit 3) and some of the calculations let him down.

Where [redacted] knows the topic that the question is based on, he's able to answer correctly and concisely. His knowledge just seems a little sparse at the moment. Chemistry is quite tedious to learn for exams - there are lots of equations, colours of products and chemicals/compounds etc, that need to be learned rather than understood.

**Physics**

Most of what is letting [redacted] down is applying what he knows to the mathematical questions. He is good at answering equation based questions when he knows what he's doing, but I think the main thing to practise would be equation based questions for topics he's not so sure about.

He should make sure that before he starts writing numbers for the maths problems, that he writes it down in symbols first, then rearranges the equation in symbol form (where necessary) before putting in the numbers. He should also check the units of the values given in the questions before he attempts the question, and make sure he's working in standard units every time.

**Maths**

Where he knows what he's doing, [redacted] shows that he is very competent at maths. He needs to watch out for silly mistakes, and practice the different types of questions that come up.

I must stress that the papers were difficult, but most of the questions didn't require much actual knowledge. I think because he can't remember a few rules/topics (probability, histograms etc), he wasn't confident attempting the more tricky questions.

# Scores By Topic

The next section presents the candidate's scores for specific topics for each subject. A description of each of the topics is explained to give a brief indication of what subject matter is covered. Some brief comments are also made for each subject based on the scores.

Like the real GCSEs, the mock examinations are not able to assess every part of the syllabus. Instead, they are designed to cover the main topics that come up, and more marks were available for the topics that come up most frequently.

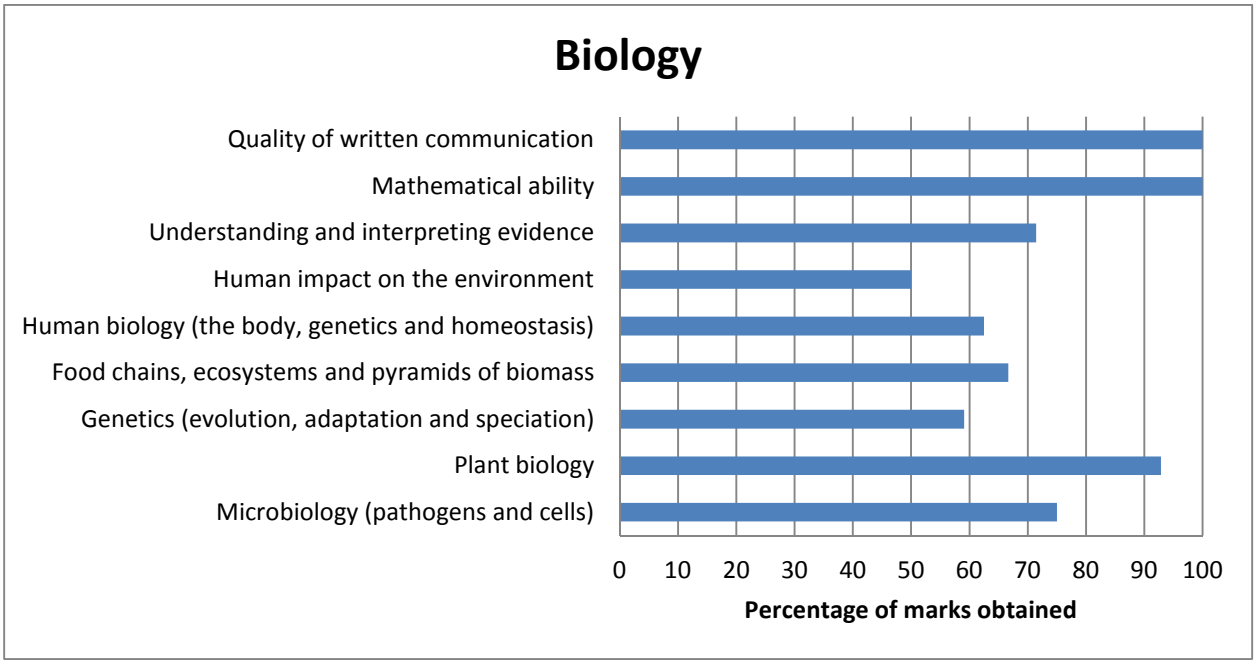
The marks are presented as tables and graphs. The tables show the raw number of marks that the candidate achieved, and the total number of available marks for each topic. The percentages are calculated out of the total marks available. This means that where a candidate left questions unanswered, this would impact their percentage.

Therefore a word of caution with the scores that follow - a low percentage score does not necessarily indicate a poor understanding on a particular topic. For example, many physics questions require maths. If the candidate is unclear on the science behind the question, they would be penalised marks in the "mathematical ability" category by not attempting the question.

Nonetheless, the scores that follow should give a good indication of which topics need work.

# Biology - Scores by topic

| Topic | Score | Marks available | Percentage |
|---|---|---|---|
| Quality of written communication | 6 | 6 | 100 |
| Mathematical ability | 4 | 4 | 100 |
| Understanding and interpreting evidence | 10 | 14 | 71 |
| Human impact on the environment | 4 | 8 | 50 |
| Human biology (the body, genetics and homeostasis) | 20 | 32 | 63 |
| Food chains, ecosystems and pyramids of biomass | 4 | 6 | 67 |
| Genetics (evolution, adaptation and speciation) | 13 | 22 | 59 |
| Plant biology | 26 | 28 | 93 |
| Microbiology (pathogens and cells) | 12 | 16 | 75 |




These scores suggest that [redacted] has a good understanding of most topics, and the main way to improve would be to revise and practise exam papers.

His exam technique is good, i.e., his written answers and calculations were very good and he answered most questions in the correct way.

I suggest he revises human biology in a bit more detail, and works on making "stock" answers for questions that come up frequently.

# Biology topics explained

**Quality of written communication**
Longer (usually 6 mark) questions allow 2 marks for written communication.

**Mathematical ability**
Biology usually has a small number of maths based questions, that are normally quite straightforward (such as working out magnification).

**Understanding and interpreting evidence**
Candidates will be given a table or graph, and will be asked to explain what the data shows, and also to suggest why the data shows these trends using their biological knowledge.

**Human impact on the environment**
This includes sub-topics such as deforestation, farming, pollution and climate change. Questions are normally then related to discussing the impact on ecosystems and biodiversity.

**Human biology**
This includes topics such as the circulatory system, the nervous system, hormones (the menstrual cycle), the effects of exercise and blood sugar (diabetes, insulin etc). These topics are also frequently used in homeostasis questions where the candidate must discuss the systems the body uses to regulate itself.

**Food chains, ecosystems and pyramids of biomass**
This topic is frequently linked to the "human impact" element. Candidates need to be aware of the transfer of biomass (hence energy) and how the length of a food chain can impact on the amount of biomass. They also need to be aware of how ecosystems are delicate, and one small change can impact large numbers of organisms.

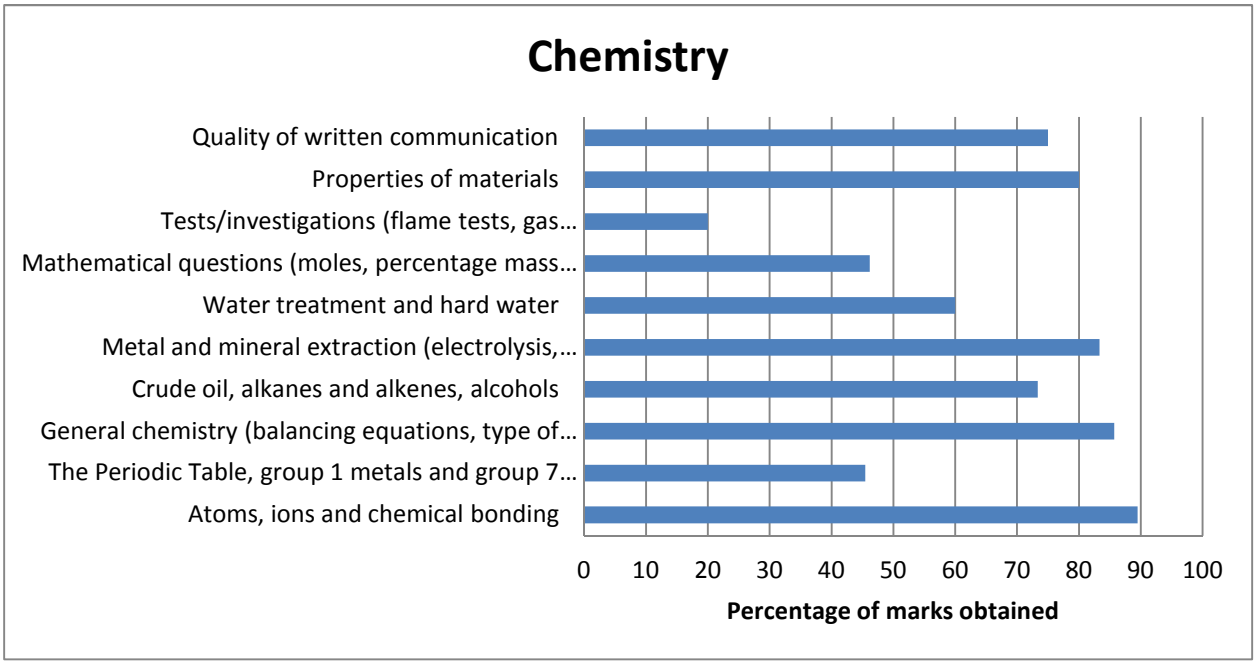
**Genetics**
The topics included are inheritance and Natural Selection, speciation and adaptation. Genetic diagrams, and examples of genetic illnesses should be known (cystic fibrosis), as well as the role and structure of DNA. Cell division should be known (mitosis and meiosis).

**Plant biology**
This topic is broad, and included photosynthesis, specific adaptations in plants (root hairs), factors that affect growth, the transpiration stream and the role of plants as producers.

**Microbiology**
Candidates should have known some details about cells and the differences between plant and animal cells. This topic also included pathogens (bacteria and viruses), vaccination and the formation of disease resistant bacteria.

# Chemistry - Scores by Topic

| Topic | Score | Marks available | Percentage |
|---|---|---|---|
| Quality of written communication | 3 | 4 | 75 |
| Properties of materials | 4 | 5 | 80 |
| Tests/investigations (flame tests, gas chromatography etc) | 3 | 15 | 20 |
| Mathematical questions (moles, percentage mass etc) | 6 | 13 | 46 |
| Water treatment and hard water | 6 | 10 | 60 |
| Metal and mineral extraction (electrolysis, limestone etc) | 10 | 12 | 83 |
| Crude oil, alkanes and alkenes, alcohols | 11 | 15 | 73 |
| General chemistry (balancing equations, type of reaction etc) | 12 | 14 | 86 |
| The Periodic Table, group 1 metals and group 7 halogens | 5 | 11 | 45 |
| Atoms, ions and chemical bonding | 17 | 19 | 89 |




[redacted] has a good grasp on the basics and has a good understanding of the topics he knows. These scores suggest to me that he needs to revise topics that he's not as familiar with until he understands them fully. I'd also recommend he makes some concise notes on "facts" that need to be remembered (flame test colours etc). It would also be worth practising some of the different types of calculation that come up as he seemed a bit rusty of these.

# Chemistry topics explained

**Quality of written communication**
Longer (usually 6 mark) questions allow 2 marks for written communication.

**Properties of materials**
Properties of materials such as metals, ionic compounds and diamond/graphite need to be known and explained in terms of the chemical bonding/structure.

**Tests/investigations**
The candidate needs to know and be able to describe tests for the presence of a chemical, such as gasses ($CO_2$, hydrogen or oxygen), alkenes, metal ions (flame tests). Testing procedures such as gas chromatography and mass spectrometry should be known. Finally, different types of investigations should be learned in detail (such as titrations).

**Mathematical question**
The most common maths questions involve "formula triangles" (A = B/C). Often the questions require the atomic mass, number of moles, percentage by mass or concentration of a solution to be calculated. These types of questions can easily be practised.

**Water treatment and hard water**
Candidates need to know the stages of the water treatment process, and be aware of other processes (such as distillation). They need to know why fluoride is added, and be able to discuss the advantages/disadvantages. Hard water is a topic that is almost guaranteed to come up - the causes (type of rock, ions), different types (hard/soft) and consequences of hard water should be learned in detail.

**Metal and mineral extraction**
Candidates need to know how commonly used materials are sourced. They need to know the definition of an ore, and be familiar with how limestone and metals such as aluminium, copper and iron are extracted - two of these metals are by electrolysis so this process also needs to be covered in detail. They should be able to discuss the impact of resource extraction on the environment.

**Crude oil, hydrocarbons and ethanol**
Candidates should be familiar with where crude oil comes from, how it is extracted and how the different "fractions" are distilled. They should be aware of simple hydrocarbons such as ethane (an alkane), ethene (an alkene) and alcohols that contain an OH group - namely ethanol. They should be able to discuss different alkanes in terms of their chemical structure and how this affects their physical properties (such as length of the alkane's carbon chain and boiling point).

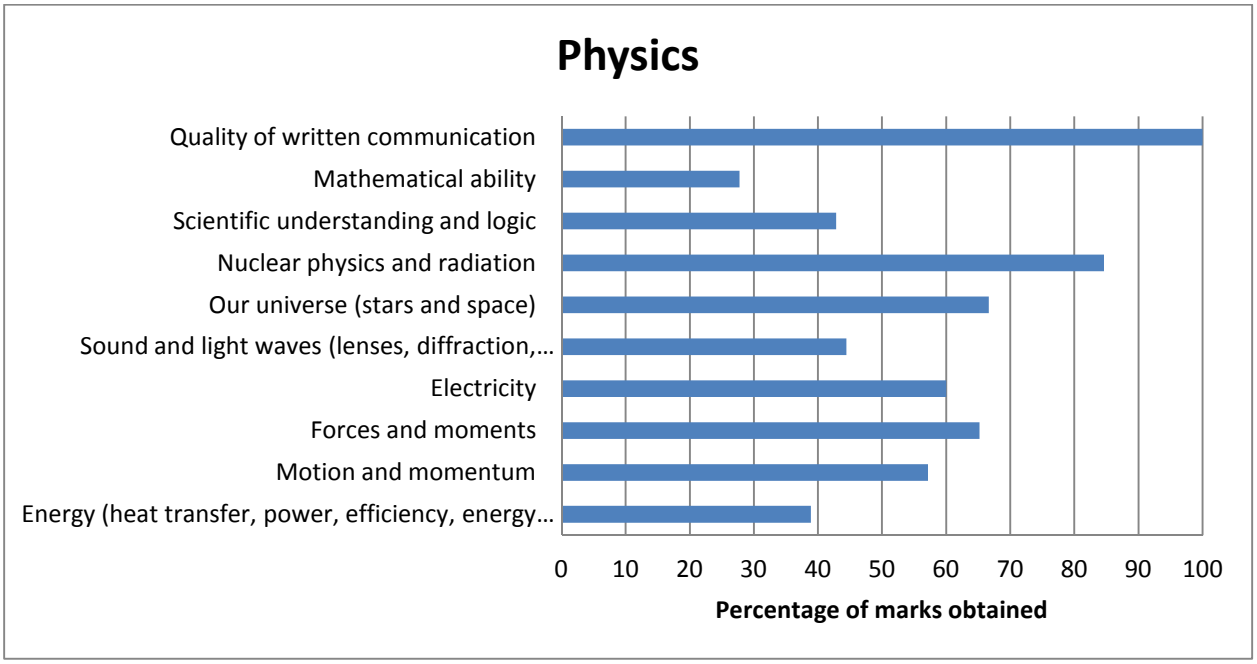
**General chemistry**
This topic is covered throughout the exams and is effectively a judge of how well they understand the subject. They need to know about balancing equations, exothermic and endothermic reactions, factors that affect rates of reaction and the definitions of key terms such as catalyst, element and compound.

**The Periodic Table**
This topic includes understanding the periodic table and the origins of it. The candidate needs to be able to discuss Mendeleev's version, and describe trends as you look at a single period or group. Group 1 metals and group 7 halogens need to be studied in detail as these are guaranteed to feature in the exam.

**Atoms, ions and chemical bonding**
This topic is fundamental to understanding most other topics. The different types of chemical bonds (ionic, covalent, metallic and weak intermolecular forces) need to be known in detail as questions often ask students to discuss how the bonding affects a chemical's properties. Candidates should also understand the melting/boiling process.

# Physics - Scores by Topic

| Topic | Score | Marks available | Percentage |
|---|---|---|---|
| Quality of written communication | 3 | 3 | 100 |
| Mathematical ability | 5 | 18 | 28 |
| Scientific understanding and logic | 6 | 14 | 43 |
| Nuclear physics and radiation | 11 | 13 | 85 |
| Our universe (stars and space) | 4 | 6 | 67 |
| Sound and light waves (lenses, diffraction, frequency etc) | 8 | 18 | 44 |
| Electricity | 9 | 15 | 60 |
| Forces and moments | 15 | 23 | 65 |
| Motion and momentum | 4 | 7 | 57 |
| Energy (heat transfer, power, efficiency, energy changes etc) | 7 | 18 | 39 |




[redacted] main downfall was the equations/maths questions (hence the low score for mathematical ability) - in particular he struggled with the energy and power questions. I suggest he practise exam style questions so that he's familiar with using the correct equations and converting units.

Generally his subject knowledge is good, but he needs to work on applying what he knows to unfamiliar situations where they are given a graph or some data to analyse and explain. It would also be worth writing and learning model answers for common questions (such as describing convection).

# Physics topics explained

**Quality of written communication**
Longer (usually 6 mark) questions allow 2 marks for written communication.

**Mathematical ability**
Many physics questions require maths, however the equations are usually not difficult and candidates are allowed to use a calculator. The most common way to lose marks in this topic is to not attempt a question or to make a minor mistake such as when converting units.

**Scientific understanding and logic**
There are often questions in the physics exam that do not require a candidate to explicitly recall a learned fact; rather that the candidate is presented with a new scenario and asked to either look at and explain some data or to apply their knowledge to a novel context.

**Nuclear physics and radiation**
Topics include the structure of the atom, isotopes, generating nuclear power and also the different types of nuclear radiation (alpha beta and gamma). Candidates may be asked to describe the different types of radiation, calculate the half-life of a material or to explain the process or benefits/risks of nuclear power.

**Our universe**
The processes that take place during the lifecycle of stars should be known, and also the different types of stars. The Big Bang theory should be known, including evidence that supports the theory (such as the Doppler effect and cosmic background radiation).

**Sound and light waves**
Candidates should be able to draw ray diagrams and describe the image formed from convex and concave lenses. They need to understand how to use the formulae to calculate refractive index and critical angle of a material, and understand terms such as total internal reflection. Terms such as frequency, wavelength and amplitude need to be understood and calculated from given data.

**Electricity**
Calculations are based topics including Ohms Law (V = IR), charge, power/energy and efficiency. The properties and symbols of common electrical components need to be known, such as resistors, thermistors, bulbs, batteries, ammeters/voltmeters etc.

**Forces and moments**
Topics include Newton's Law (F = ma), the concept of work done and moments (turning forces). Students may be asked to calculate forces or moments, or explain where certain forces arise.

**Motion and momentum**

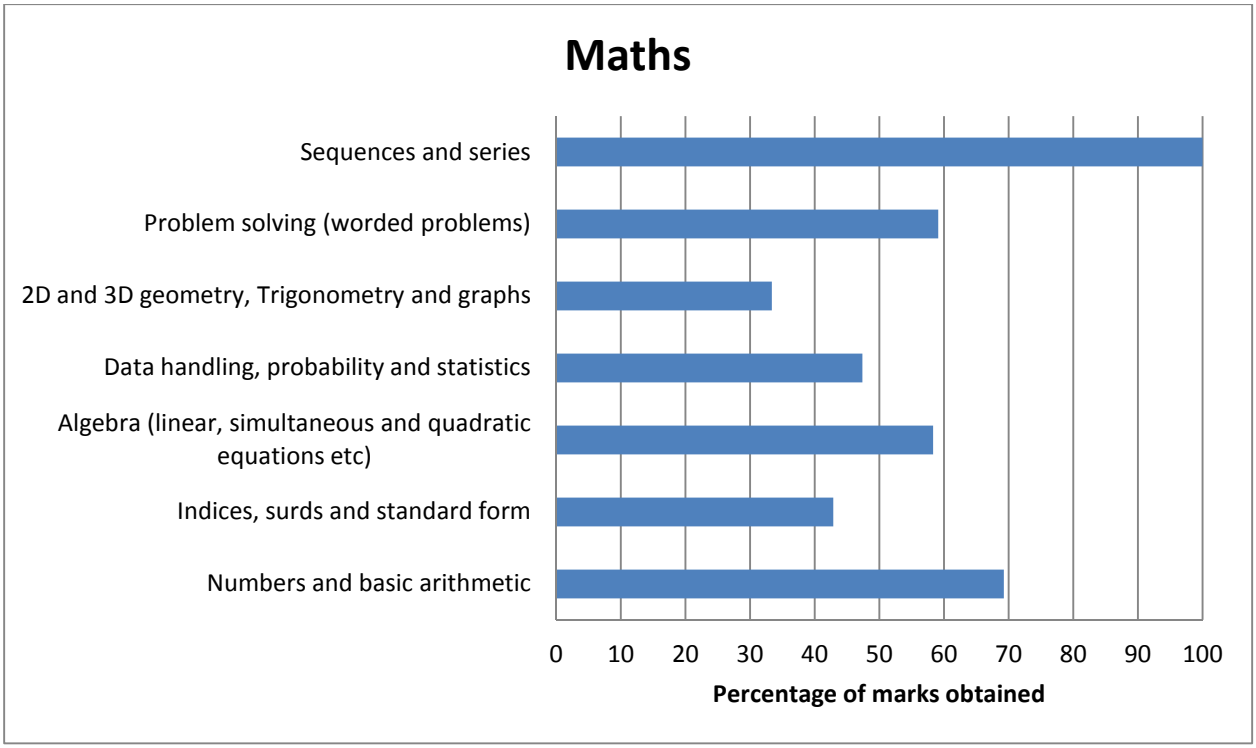
Calculations may ask that the velocity or momentum be calculated from some given information. The concept of conservation of momentum is important.

**Energy**

This topic covers energy changes (potential to kinetic), energy loss (as heat) and hence calculating "efficiency" and also heat transfer ($Q = mcT$). The ideas of conservation of energy, and that power measures the energy per second is important (i.e., that kWh are a unit of energy usage, $1\text{kWh} = 3.6 \times 10^6$ MJ). Candidates should also understand the different methods by which electricity is generated.

# Maths

| Topic | Score | Marks available | Percentage |
|---|---|---|---|
| Sequences and series | 5 | 5 | 100 |
| Problem solving (worded problems) | 13 | 22 | 59 |
| 2D and 3D geometry, Trigonometry and graphs | 10 | 30 | 33 |
| Data handling, probability and statistics | 9 | 19 | 47 |
| Algebra (linear, simultaneous and quadratic equations etc) | 14 | 24 | 58 |
| Indices, surds and standard form | 3 | 7 | 43 |
| Numbers and basic arithmetic | 9 | 13 | 69 |




The scores indicate that [redacted] needs to keep practising different types of maths questions so that he's confident in attempting the exam style questions. In particular, he should look at shapes/geometry/trigonometry and also probability. He lost quite a few marks for silly mistakes, and missed out on lots of marks simply by not attempting the question - quite often there are marks awarded for the first few stages of working out.

Where he knew how to do a question he usually got it right and set out his working clearly, so I'm not concerned about his ability or exam technique. But with maths it's important to keep on top of things by practicing the different types of question on a regular basis.

# Maths topics explained

**Sequences and series**
Understanding of linear sequences - calculating the sum of a linear sequence and defining the $n^{th}$ term.

**Problem solving**
Questions are often given that require the candidate to read a worded question carefully and then solve it in a logical way - the ability to turn a worded question into an equation or calculation is an important skill.

**Geometry, trigonometry and graphs**
Calculating areas and volumes of regular shapes is required, as well as understanding the relationship between length, volume and area. Candidates must be comfortable using trigonometry (SOH CAH TOA, sin rule etc) and Pythagoras's theorem to look at triangles and vectors. Angles on intersected parallel lines and circle theorems need to be known. Candidates need to understand linear graphs in the form of $y = mx + c$, and also the transformation of graphs and shapes.

**Data handling, probability and statistics**
Topics include the acquisition of data, different types of data (discreet/continuous) and how to present and analyse this data (correlation, mode/median/mean, histograms, cumulative frequency and interquartile range, box plots etc). The rules of probability need to be understood (tree diagrams, probability of OR or AND events).

**Algebra**
Algebra is a very large part of GCSE maths - candidates should be able to derive and solve linear equations, and be able to solve quadratic equations by either factorising or using the quadratic formula.

**Indices, surds and standard form**
Topics include the laws of indices, rearranging surds (irrational square roots) by rationalising the denominator, and converting to and from standard form (usually without a calculator).

**Numbers and basic arithmetic**
This topic covers simple questions that involve long multiplication/division, and fractions, percentages and decimals. Candidates should be able to convert from one number form into another (such as a recurring decimal into a mixed fraction in its lowest terms). Percentage questions (such as compound interest or discounts), conversions (such as £ to $) and ratios are also covered in this topic.