BVGS A-level Physics

KS4 → KS5 Summer Bridging Work

Tasks for you to complete:

1. Read through the summary of A-level Physics at BVGS on page 3 & 4 of this document

2. Research what **SI units** are.
   What is the difference between *SI fundamental base units* and *SI derived units*?
   Make a table of SI unit prefixes/symbols from 10^{-15} up to 10^{12}. You will be assessed on this in your baseline assessments at the beginning of Y12!

3. Main project: complete the experiment and report at home on the *stacking of particles* (page 2 of this document)

Do your best and have a good summer,

Mr D Bradley (Head of Physics)

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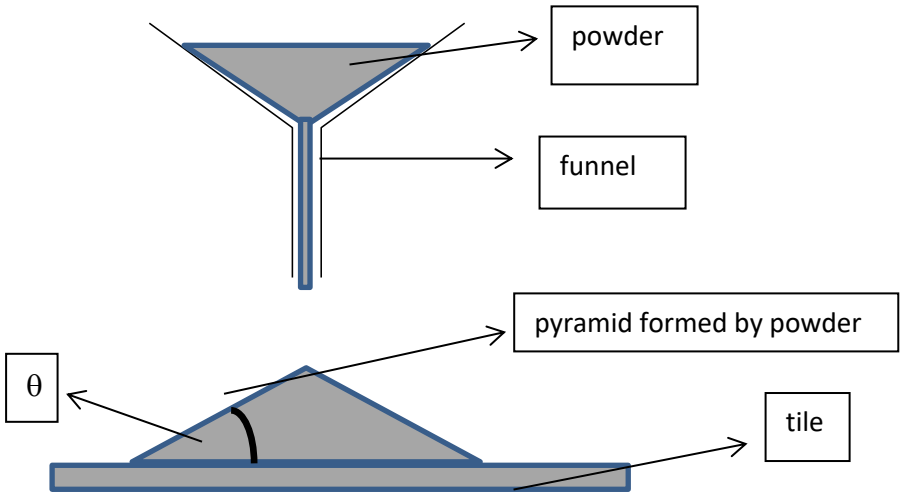
Physics Experimental Project (at home): The Stacking of Particles

Please record your work neatly as we can assess it against the five practical competencies and it can count as further evidence towards your practical certificate in future.

You will *probably* need the following:

- a tile or small tray
- a funnel (or make your own from paper/card and plastic containers)
- powder(s); e.g. sand, salt, flour, icing sugar, caster sugar
- protractor
- baking scales

Design an experiment which allows a powder to fall from the funnel to form a pyramid – see diagram below.



Now investigate factors that might affect the angle of the slope (i.e. θ in diagram); e.g. drop height, type of powder, amount and dampness of powder (it's best to do one in detail rather than several in less depth).

Then:

- Decide on a single independent variable (the factor you change),
- Design a good method to measure θ accurately.
- Ensure it's a fair test – what are the control variables (all other factors that might affect angle θ that you are ensuring to keep the same).

The report should be no more than two sides of A4; quality not quantity matters.

You could include the following:

- Diagram – photograph allowed
- Short method including comment on repeatability (i.e. why take several values of θ and work out the mean).
- Results (in a table if possible) and if appropriate a chart or graph.
- Conclusion – i.e. any patterns in the results and what you have found out. Try to explain the pattern (access to a microscope or magnifying glass would be useful to look at the shape of a powder's crystals).
- A link to existing research (including Harvard referencing) – find some similar research and say how it is similar or different to yours. Hint: search the **angle of repose.**
- A suggestion for how this research may be applied to a context in everyday life? Why is it important? Good luck!
- Any questions please email/message Mr D Bradley, Head of Physics. (d.bradley@bishopveseys.bham.sch.uk)

Physics A-level

BVGS Curriculum Summary

Physics involves the study of matter, its motion and behaviour through space and time, and studies the related entities of Force and Energy. **The main goal of Physics is to understand how the universe behaves.** The study of physical concepts over time has led, sometimes inadvertently, to the development of many technologies that have transformed modern-day society.

Through studying A-level Physics, students will learn to understand how the complex and diverse phenomena of the natural world can be described in terms of a small number of key ideas which are of universal application and which can be illustrated in the topics further below.

These core ideas include:

- the use of **models**, as in the particle model of matter of the wave models of light and sound
- the concept of **cause and effect** in explaining such links as those between force and acceleration, or between changed in atomic nuclei and radioactive emissions
- the phenomena of **"action at a distance"** and the related concept of the field as they key to analysing electrical, magnetic and gravitational effects
- that **differences,** for example between pressures, temperatures or electrical potentials are the drier of change
- that **proportionality**, for example between weight and mass of an object or between force and extension in a spring, is an important aspect of many models in science
- that physical laws and models of nature are expressed in **mathematical form** and that strong similarities exist between apparently disconnected areas of Physics (e.g. radioactive decay of isotopes and discharge of capacitors or the electrostatic force between charges and gravitational forces between planets)
- that **experimental investigation** can be used to discover physical laws and to consider the **uncertainties** in measurements and how to minimise these
- that new evidence leads to changes in our descriptions of the universe

The topics covered in A-level Physics include:

Mechanics

Forces in Equilibrium, Projectile Motion, Materials, Newton's Laws, Momentum and Energy.

Particle Physics

Constituents of Matter, Particle Interactions and Quantum Phenomena.

Waves and Optics

Wave Properties, Progressive & Standing Waves, Refraction, Diffraction & Interference.

Electricity

Simple Electrical Quantities, EMF, Resistivity, Internal Resistance, and Series/Parallel Circuits

Periodic Motion

Circular Motion and Simple Harmonic Motion

Thermal Physics & Gases

Particle Motion, Changes of State, Kinetic Theory of Gases and Gas Laws

Fields

Gravitational fields – Newton's laws, Potential and Satellite Motion.
Electric fields – Coulomb's laws, Potential and Similarities to Gravitational Fields.
Magnetic fields – Forces on Charges and Currents in Magnetic Fields
Capacitors – Charging/Discharging, Energy and Dielectrics.
Electromagnetic Induction – Faraday's/Lenz's Laws and Alternating Current

Nuclear Physics

Radioactivity – Radioactive decay, Radiation, and Nuclear Radius
Nuclear Energy – Energy-mass equivalence, Binding Energy, Fusion and Fission

Turning Points – *(Option Module)*

Discovery of the Electron
Wave-Particle Duality
Special Relativity

Practical Work and Data Analysis

12 required practicals incorporating experimental skills and data analysis spread across the topics above. Assesses ability to:

1. Follow written procedures
2. Applies investigative approaches & techniques
3. Safely uses equipment
4. Makes and records observations
5. Research reference and reports

Students will study these through:

- Planning, conducting and analysing experimental investigations (including the 12 assessed required experiments as minimum)
- Class and group discussion
- Research
- Theoretical activities – i.e. "thought experiments"
- Computer simulations and animations
- Exam technique practice questions
- Formative and summative assessments

The format of the final exams are:

Paper 1	Paper 2	Paper 3
Mechanics, Waves, Particle Physics, Electricity, and Periodic Motion	**Fields, Thermal Physics and Gases, and Nuclear Physics** May draw on content from paper 1.	**Section A: Practical Skills and Data Analysis** **Section B: Turning Points**
Written exam – 2hrs **85 marks** ***60 marks long and short answer questions, 25 multiple choice questions*** **34% of A-level**	Written exam – 2hrs 85 marks *60 marks long and short answer questions, 25 multiple choice questions)* 34% of A-level	Written exam – 2hrs 80 marks *45 marks of short and long answer questions on practical experiments and data analysis.* *35 marks of short and long answer questions on Turning Points.* 32% of A-level

A separate practical certificate is awarded for meeting practical work competencies.