It is recommended that the following information on how the marking scheme is applied should be photocopied and distributed to the students.

Notes on Marking of Investigation

No **half marks** were awarded throughout.

Introduction

Summary: purpose / findings. Must be at the beginning of the report. Findings were often omitted. Findings should be consistent with purpose e.g. comparison of different methods of measurement or numerical values. **(1,0)**

Underlying Physics: **Not good enough to just give equations.** Physics behind the equations should be explained. Opportunity for markers to reward commensurate / good investigations. **(3,2,1,0)**

Procedures

Diagrams / descriptions: Generally well done. Digital photographs should be labelled. Most were excellent although there were some that were too small, making clarity a problem. Apparatus / circuit diagrams should also accompany these where appropriate. **(2,1,0)**

Apparatus use: Should include **how** readings were taken. Description should be clear enough to allow replication of experimental work. **(2,1,0)**

Level of demand: Centres should ensure that the investigation is at an appropriate level.

Basic Outcome 3 experiments alone are unacceptable. They can possibly be used as an initial experiment. **(2,1,0)**

Results

Data sufficient/relevant: Most candidates awarded a mark here. (Must show all readings taken – no short cuts to average). **(1,0)**

Uncertainties: Still a problem area. Types, combinations, inappropriate use of random uncertainty (e.g. applying to different methods of finding the refractive index), not finding the uncertainty in the gradient a straight line graph where appropriate, number of significant figures. (It is sufficient to show one example of each type of calculation involving data and the combination of uncertainties). **(3, 2,1,0)**

Analysis of data: Improvement in use of spreadsheet packages. Still some problems - lack of grid lines for graphs, size of graphs, origin omitted, error bars missing where appropriate. Spreadsheets packages may be used to establish the equation of a straight line plus the uncertainty in the gradient and intercept. **(2,1,0)**

Discussion

Conclusion: **Must** relate to the purpose of the investigation. **(1,0)**

Evaluation of Procedures: Not specific / detailed enough. Sometimes better to break down into [1]assessment criteria where applicable. Sources of uncertainties ignored, no mention of limitations of equipment. Compare percentage uncertainties **(3,2,1,0)**

Evaluation of Investigation: Poorly attempted. Candidates had difficulty with this section. Very little mention of modifications and further improvements in sufficient detail. Describe difficulties, frustrations with problems encountered. **(2,1,0)**

Presentation	Title, contents, page numbers - any one omitted - (0)	**(1,0)**
	Readability	**(1,0)**
	References - must be cited in text - e.g. ref 1, ref 2, etc. Reference at back should not only list the book or website, but also the appropriate page number so the marker can easily check on these.	**(1,0)**

[1] See assessment criteria in **Guidance on Course Assessment for Candidates.**

Incorrect Application of Random Uncertainty

e.g. Finding **g** using a Pendulum

Varying the length l and measuring the period T of the pendulum.

Different values of g were calculated for each l and T.

A mean value of g was calculated with associated random uncertainty. **This is incorrect.**

Allowance for random uncertainty in the measurement of time is made when measurements are repeated for one value of length.

A better way of finding g is to plot a graph of T^2 against l and then calculate the gradient of the line.

Investigations frequently classed as non-commensurate with AH.

Output of a Solar Cell

Golf Ball - basic bouncing experiments, Standard Grade angle of launch.

Specific Heat Capacity - simple Standard Grade experiments with uncertainties included.

Efficiency of Electric Motor

Efficiency of a Transformer.

Investigations where no measurements were taken e.g. making a hologram, construction of an electronic device.

Impulse experiments.

Those listed were Higher or Standard Grade level with no real attempt at extension work.

Popular Investigations

Comparisons of different methods of measuring g.

Comparisons of different methods of measuring refractive index.

LCR circuits. Factors affecting Capacitance. Factors affecting Inductance.

Measurement of Magnetic Field Strength using a Hall probe.

Stretched Strings.

e/m for an Electron.

Speed of Sound – comparison of different methods.

Determination of Planck's Constant - Find λ of light emitted and forward biased voltage just lighting LED.

Interference of Light.

Young's Modulus, Surface Tension, Viscosity, Focal Length of Lenses.