IB Extended Essay Advisor Comment and Assessment Rubric - PHYSICS

Supervisor's Name: _____ Candidate's Name: _____

A. Research Question

This criterion assesses the extent to which the purpose of the essay is specified. In many subjects, the aim of the essay will normally be expressed as a question and, therefore, this criterion is called the "research question." However, certain disciplines may permit or encourage different ways of formulating the research task.

Although the aim of the essay can best be defined in the form of a question, it may also be presented as a statement or proposition for discussion. Whichever way it is formulated, the research question must be: appropriate to physics as a science; centred on physics and not on peripheral issues such as the history of physics or social implications of discoveries in physics; and identified clearly and set out prominently in the introduction. An effective treatment within the word limit requires a narrow and well-focused topic.

Below Standard **0**	**Adequate** **1**	**Excellent** **2**
❑ Not stated in the introduction ❑ Does not lend itself to a systematic investigation in an extended essay in the subject in which it is registered	❑ Stated in the introduction ❑ Not clearly expressed ❑ Too broad in scope to be treated effectively within the word limit	❑ Clearly stated in the introduction ❑ Sharply focused ❑ Makes effective treatment possible within word limit

First Draft Comments:

B. Introduction

This criterion assesses the extent to which the introduction makes clear how the research question relates to existing knowledge on the topic and explains how the topic chosen is significant and worthy of investigation.

The introduction should relate the research question to existing subject knowledge: the student's personal experience or particular opinion is rarely relevant here. The relevant principles of physics should be situated in the context of the topic. The introduction should not be seen as an opportunity for padding out an essay with a lengthy account of the context of the physics involved.

Below Standard **0**	**Adequate** **1**	**Excellent** **2**
❑ Little or no attempt is made to set the research question into context ❑ Little or no attempt to explain the significance of the topic	❑ Some attempt is made to establish the research question in context ❑ Some attempt to explain the significance of the topic and why it is worthy of investigation	❑ Context of the research question is clearly demonstrated ❑ Introduction clearly explains the significance of the topic and why it is worthy of investigation

First Draft Comments:

C. Investigation

This criterion assesses the extent to which the investigation is planned and an appropriate range of sources has been consulted, or data has been gathered, that is relevant to the research question.

The way in which the investigation is planned will depend on the approach chosen by the student. However, the plan should include the relevant theory as well as an appreciation of the uncertainties or limitations inherent to techniques and apparatus.

	Below Standard **0**	**Marginal** **1**	**Adequate** **2**	**Good** **3**	**Excellent** **4**
*Where the research question does not lend itself to a systematic investigation in the subject in which the essay is registered, the maximum level that can be awarded for this criterion is 2.	❑ Little to no evidence that sources have been consulted or data gathered ❑ Little to no evidence of planning in the investigation	❑ A range of inappropriate sources has been consulted or inappropriate data has been gathered ❑ There is little evidence that the investigation has been planned	❑ A limited range of appropriate sources has been consulted or data has been gathered ❑ Some relevant material has been selected ❑ There is evidence of some planning in the investigation	❑ A sufficient range of appropriate sources has been consulted or data has been gathered ❑ Relevant material has been selected ❑ The investigation has been satisfactorily planned	❑ An imaginative range of appropriate sources has been consulted or data has been gathered ❑ Relevant material has been carefully chosen ❑ The investigation has been well planned

First Draft Comments:

D: Knowledge and Understanding of Topic

"Academic context", as used in this guide, can be defined as the current state of the field of study under investigation. However, this is to be understood in relation to what can reasonably be expected of a pre-university student. For example, to obtain a level 4, it would be sufficient to relate the investigation to the principal lines of inquiry in the relevant field; detailed, comprehensive knowledge is not required.

The knowledge and understanding demonstrated in a physics essay should extend from the Diploma Programme physics course or laboratory. The fundamental knowledge acquired in the classroom could be applied to a new physical situation that requires an interpretation of this knowledge. A purely empirical approach seriously limits the level of knowledge and understanding of the physics related to a topic, and consequently should be avoided.

	Below Standard 0	Marginal 1	Adequate 2	Good 3	Excellent 4
*Where the research question does not lend itself to a systematic investigation in the subject in which the essay is registered, the maximum level that can be awarded for this criterion is 2.	❑ Essay demonstrates no real knowledge or understanding of the topic	❑ Essay demonstrates some knowledge but little understanding of the topic ❑ Essay shows little awareness of an **academic context** for the investigation	❑ Essay demonstrates an adequate knowledge and some understanding of the topic ❑ Essay shows some awareness of an **academic context** for the investigation	❑ Essay demonstrates good knowledge and understanding of the topic ❑ Where appropriate, the essay successfully outlines an **academic context** for the investigation	❑ Essay demonstrates a very good knowledge and understanding of the topic ❑ Where appropriate, the essay clearly and precisely locates the investigation in an **academic context**

First Draft Comments:

E. Reasoned Argument

This criterion assesses the extent to which the essay uses the material collected to present ideas in a logical and coherent manner, and develops a reasoned argument in relation to the research question.

Students should be aware of the need to give their essays the backbone of a developing argument. Personal views should not simply be stated but need to be supported by reasoned argument to persuade the reader of their validity. For example, it is not sufficient to write "From the graph we can see that…". Straightforward descriptive or narrative accounts that lack analysis do not usually advance an argument and should be avoided. A well-organized and well-presented essay will enhance the clarity of an argument.

	Below Standard 0	Marginal 1	Adequate 2	Good 3	Excellent 4
*Where the research question does not lend itself to a systematic investigation in the subject in which the essay is registered, the maximum level that can be awarded for this criterion is 2.	❑ No attempt to develop a reasoned argument in relation to the research question	❑ Limited or superficial attempt to present ideas in a logical and coherent manner ❑ Limited or superficial attempt to develop a reasoned argument in relation to the research question	❑ Some attempt to present ideas in a logical and coherent manner ❑ Some attempt to develop a reasoned argument in relation to the research question, but this is only partially successful	❑ Ideas are presented in a logical and coherent manner ❑ A reasoned argument is developed in relation to the research question, but with some weaknesses	❑ Ideas are presented clearly and in a logical and coherent manner ❑ Essay succeeds in developing a reasoned and convincing argument in relation to the research question

First Draft Comments:

F. Application of Analytical and Evaluative Skills Appropriate to the Subject

Physicists use mathematics as a tool. This tool should not replace the relevant physics, nor become the goal itself rather than the instrument used to reach the goal. The student should show an understanding of the statistics and mathematical relationships produced automatically by software programs. A complete and solid understanding of the intrinsic limitations of an investigation, and their implications for the conclusions reached, is essential. It should be shown in some way that a given proposed limitation, possibly procedural, does have the expected impact on the final results and conclusion, for example, in the case where experimental results are compared to standard values. A proper manipulation of significant digits and uncertainties, including uncertainty in the mean and in graphs, is expected, as well as an understanding of propagation of errors.

Below Standard 0	**Marginal 1**	**Adequate 2**	**Good 3**	**Excellent 4**
❑ Essay shows no application of appropriate analytical and evaluative skills	❑ Essays shows little application of appropriate analytical and evaluative skills	❑ Essay shows some application of appropriate analytical and evaluative skills	❑ Essay shows sound application of appropriate analytical and evaluative skills	❑ Essay shows effective and sophisticated application of appropriate analytical and evaluative skills

First Draft Comments:

G: Use of Language Appropriate to the Subject

Scientific language must be used throughout the essay. Students should be encouraged to read articles from recognized scientific journals or magazines to learn about the proper style, organization and presentation of a scientific paper. The essential quality of the language relates to exactness and precision, and typical expressions, such as “function of” or “proportional to”, carry specific meanings. A curve on a graph cannot be qualified as “exponential” or “quadratic” without proper analysis. Any symbols used must be clearly and fully identified in the context of the situation; for example, writing “t for time” would not be sufficient but writing “t for time during which the magnetic force is applied” would be precise and helpful.

Below Standard 0	**Marginal 1**	**Adequate 2**	**Good 3**	**Excellent 4**
❑ Language used is inaccurate and unclear ❑ No effective use of terminology appropriate to the subject	❑ Language used sometimes communicates clearly but does not do so consistently ❑ Use of terminology appropriate to the subject is only partially accurate	❑ Language used for the most part communicates clearly ❑ Use of terminology appropriate to the subject is usually accurate	❑ Language used communicates clearly ❑ Use of terminology appropriate to the subject is accurate, although there may be occasional lapses	❑ Language used communicates clearly and precisely ❑ Terminology appropriate to the subject is used accurately, with skill and understanding

First Draft Comments:

H: Conclusion

This criterion assesses the extent to which the essay incorporates a conclusion that is relevant to the research question and is consistent with the evidence presented in the essay.

"Consistent" is the key word here: the conclusion should develop out of the argument and not introduce new or extraneous matter. It should not repeat the material of the introduction; rather, it should present a new synthesis in light of the discussion. The conclusion should reveal the impact on the final results of the investigation of uncertainties in experimental data, the limitations of a model or of an experimental design, or the validity of sources.

Below Standard 0	Adequate 1	Excellent 2
❑ Little or no attempt is made to provide a conclusion that is relevant to the research question	❑ A conclusion is attempted that is relevant to the research question but may not be consistent with the evidence presented in the essay	❑ An effective conclusion is clearly stated ❑ Conclusion is relevant to the research question and consistent with the evidence presented in the essay ❑ Where appropriate to the subject concerned, the conclusion includes unresolved questions

First Draft Comments:

I: Formal Presentation

This criterion assesses the extent to which the layout, organization, appearance and formal elements of the essay consistently follow a standard format. The formal elements are: title page, table of contents, page numbers, illustrative material, quotations, documentation (including references, citations and bibliography) and appendices (if used).

This criterion relates to the extent to which the essay conforms to academic standards about the way in which research papers should be presented. The presentation of essays that omit a bibliography or that do not give references for quotations is deemed unacceptable (level 0). Essays that omit one of the required elements—title page, table of contents, page numbers—are deemed no better than satisfactory (maximum level 2), while essays that omit two of them are deemed poor at best (maximum level 1).

Below Standard 0	Marginal 1	Adequate 2	Good 3	Excellent 4
❑ Formal presentation is unacceptable ❑ Essay exceeds 4000 words	❑ Formal presentation is poor ❑ Is within the word limit	❑ Formal presentation is satisfactory ❑ Is within the word limit	❑ Formal presentation is good ❑ Is within the word limit	❑ Formal presentation is excellent ❑ Is within the word limit

First Draft Comments:

J: Abstract

The requirements for the abstract are for it to state clearly the research question that was investigated, how the investigation was undertaken and the conclusion(s) of the essay.

The abstract is judged on the clarity with which it presents an overview of the research and the essay, not on the quality of the research question itself, nor on the quality of the argument or the conclusions.

Below Standard **0**	**Adequate** **1**	**Excellent** **2**
❑ Does not state the research question	❑ States the research question that was investigated	❑ Clearly states the research question that was investigated
❑ Does not state how the investigation was undertaken	❑ States how the investigation was undertaken	❑ Clearly states how the investigation was undertaken
❑ Does not state the conclusions of the essay	❑ States the conclusions of the essay	❑ Clearly states the conclusions of the essay
❑ Exceeds 300 words	❑ Is within the word limit	❑ Is within the word limit

First Draft Comments:

K: Holistic Judgment

The purpose of this criterion is to assess the qualities that distinguish an essay from the average, such as intellectual initiative, depth of understanding and insight. While these qualities will be clearly present in the best work, less successful essays may also show some evidence of them and should be rewarded under this criterion.

Qualities that are rewarded under this criterion include the following.
* Intellectual initiative: Ways of demonstrating this in physics essays include the choice of topic and research question, and locating and using a wide range of sources, including some that may have been little used previously or generated for the study.
* Insight and depth of understanding: These are most likely to be demonstrated as a consequence of detailed research, reflection that is thorough and well informed, and reasoned argument that consistently and effectively addresses the research question.
* Originality and creativity: In physics, these include looking inquisitively at the surrounding world, innovation in experimental procedures and equipment to measure variable parameters, an inventive approach to physical analysis or to classical topics, as well as the construction of imaginative theoretical models.

Below Standard 0	Marginal 1	Adequate 2	Good 3	Excellent 4
❑ Essay shows no evidence of intellectual initiative, depth of understanding and insight	❑ Essay shows little evidence of intellectual initiative, depth of understanding and insight	❑ Essay shows some evidence of intellectual initiative, depth of understanding and insight	❑ Essay shows clear evidence of intellectual initiative, depth of understanding and insight	❑ Essay shows considerable intellectual initiative, depth of understanding and insight

First Draft Comments:

Submitted to turnitin.com □ yes □ no

Works Cited/Works Consulted Page is free of errors □ yes □ no

Disclaimer: The draft score is assigned at the school level by the candidate's supervisor. It is a formative evaluation intended to help the student revise the essay. The finished essay is rescored by the supervisor and submitted as the student's predicted grade on the extended essay. **The actual/official extended essay score is determined by the mark received from external IBO examiners.**

A. Research Question _____
B. Introduction _____
C. Investigation _____
D. Knowledge/Understanding of Subject _____
E. Reasoned Argument _____
F. Analytical and Evaluative Skills _____
G. Use of Language _____
H. Conclusion _____
I. Formal Presentation _____
J. Abstract _____
K. Holistic Judgment _____

Total: _____/36

ESTIMATED GRADE BOUNDARIES

Excellent	**36-30**
Good	**29-25**
Satisfactory	**24-17**
Mediocre	**16-9**
Elementary	**8-0**

OVERALL ASSESSMENT:

☐ A Work of an excellent standard

☐ B Work of a good standard

☐ C Work of a satisfactory standard

☐ D Work of a mediocre standard