**Extended Essay Notes (2015)**

* **Grade boundary sample**
	+ 29-36 = A; 23-28 = B; 16-22 = C; 8-15 = D; 0-7 = E
* **Variety of topics**
	+ microbiology ( effects of a wide range of commercial and natural antibacterial agents
	+ plant growth (effects of a range of chemicals and physical conditions on growth)
	+ factors affecting germination and growth of seedlings (although often accompanied by some confusion about what constitutes germination versus what constitutes growth)
	+ biochemical investigations (especially activity of enzymes)
	+ behavioural studies in invertebrates, fish and mammals, a variety of human biology topics (including behaviour, memory, exercise physiology, perception of stimuli, and nutrition)
	+ studies based on a particular disease and ecological studies based on particular local phenomena or environmental issues
* **Things to avoid**
	+ unsuitability of topics dealing with symptoms and treatment of particular human diseases
		- but still popular choice – no good
		- detailed account of symptoms and treatments instead of biological basis of disease
		- rarely leads to good essay
	+ topics that do not have a strong biological basis such as ethical issues related to particular kinds of research, different approaches to medicine, surveys of attitudes to biological issues or the treatment of biological issues in the media, **rarely lead to successful essays**.
	+ Things to avoid – music effect on organisms, health and fitness where sample size and time frame are inadequate
	+ Problematic - particular diet or of consumer products such as caffeine, coffee and energy drinks and, vitamin supplements on athletic performance and/or memory
		- Most submitted are **superficial**, **small sample sizes**
		- Often missing evidence of consideration of **possible negative health effects** and missing evidence of **informed consent** given
	+ Herbal treatments on memory and performance probably not large scale enough
	+ steer clear of topics such as creationism, intelligent design, personal injuries, alternative medicines or studies based on performance in a particular sport as most essays of this type turn out to be either strongly biased or even trivial.
* **must have a significant biological component**
	+ criteria C – appropriate sources and relevant data ***need to be biological***
	+ criteria D – biological **context**
	+ criteria F – appropriate analytical skills – biological - **deductive reasoning, graphical analysis and statistical approaches**
* **Essays based on research from outside institutions and labs**
	+ Fewer nowadays than before
	+ Needs cover letter from supervisor
	+ EE should be *planned by student-* needs to be clear in writing
	+ Terminology needs to be appropriately used by candidate
	+ Should be an independent project with minimal support from supervisors
* **Literature-based narratives are usually not done well**
	+ Compilation of data from popular sources on internet or literature
	+ Analysis is usually not in-depth enough to put **personal stamp** on the data
	+ Usually turns into simple **personal opinion**
	+ Ends up repeating the findings of the experts
	+ Difficult to award for criteria D, E, and F
* **Animal Experimentation Policy**
	+ Examples of bad usage
		- drawing and examining human blood sample,
		- working with human semen and vaginal mucus,
		- injecting rats with alcohol and then drawing blood to test for lipids
		- experiments that resulted in mortality of insects.
		- Incubating microorganisms at or near body temperature is inappropriate due to the dangers of exposure to pathogenic strains.
	+ IB more stringent that local area practices
	+ Also more stringent than university labs – *research done in EE is less-likely to be groundbreaking*
	+ Planned and actual experimentation must be subject to discussion
	+ **3Rs principle: replacement, refinement, reduction**
		- Replacement of animals with cells or tissues, plants or computer simulation
		- If animal is essential – refinements to investigation to alleviate any distress to animal necessary
		- Reduction in numbers of animals involved should be made
	+ Observing and measuring aspects of natural animal behavior
	+ should not result in cruelty; vertebrates or invertebrate
	+ experiments that administer drugs or medicines or manipulate the environment or diet beyond that which can be regarded as humane is unacceptable
	+ Human subjects: consent forms needed, not under 16 without parental consent; results must be anonymous, subjects must participate of own free will, subjects have right to withdraw at any time
	+ No bodily fluids (except investigator using their own saliva or sweat)
	+ Secondary data *may not have to follow guidelines* but must be from Academic journals qualifying is groundbreaking; considered ethical and time research was conducted; unethical Data using within the cultural and historical context is not acceptable
* **Performance against each criterion**
	+ A – research question (RQ)
		- RQ does not have to be title of essay
		- Forms foundation of successful essay
		- Should be part of abstract and introduction
		- Wording should be kept consistent throughout to avoid confusion
	+ B – introduction
		- 3 main aspects: context, significance, worthiness of investigation
		- context and significance addressed through summary of relevant literature
		- weak candidates tend to only deal with the “worthiness of investigation” and focus solely on personal motivation
		- need to address what the results of the study might reveal about the question being investigated
	+ C – investigation
		- Practical-based data or data collected from other sources
		- Range and appropriateness of data
		- Methods used to gather data also important
		- Must be **planned by candidate**
		- Explain how information obtained from the sources helps to guide decisions about which approach to follow
		- Approach needs to be justified; Not simply reporting a method
		- well-planned investigation we’ll not have a predetermined outcome; Free from bias
		- Basic concepts in chemistry: pH, dilution, concentration, and solubility need to be covered accurately including related calculations 🡪 something often overlooked by weak candidates
	+ D – knowledge and understanding of topic studied
		- Can be demonstrated in various ways
		- Presenting relevant background information and explaining the relationship with the research question
		- reference to relevant variables and significance of the outcomes
		- provide explanations and justifications for decisions about research directions
			* why things are included why other things are automated
		- avoid segments and text taken directly from sources
		- avoid anything that shows you’re using highly technical texts with no terminology explanation
		- needs to be clear that candidate has an appropriate level of understanding
	+ E – reasoned argument
		- Usually okay an experiment to be based message
		- Be explicit about reasoning
		- regular reference to research questions throughout yesterday
		- findings and discussion points are always presented in context of overall aims of the research
	+ F – application of analytical and evaluative skills
		- Appropriateness of analysis depends on type of data collected
		- “investigations” vs. “reports” - investigations do better
		- Carry out analysis in such away so as to obviously addressed the research question
		- statistical analysis is appropriate but be selective about techniques and explain and justify the approach
		- *no requirement* to include statistics and top level can still be reached without using
	+ G – use of language
		- Clear; appropriate terminology to the topic
		- clear and precise style
		- show understanding of and fluency in main technical terms
		- no requirement to write in passive voice - the first person singular, active voice, may be clearer and may in fact be easier to sustain (especially for non-native speakers of the target language)
		- write in formal style
		- problems arise when essay consists largely of descriptions of protocols with little or no attempt to explain the technical language; difficult to sustain consistently linguistic style throughout
	+ H – conclusion
		- Restate the research question and the extent to which it has been answered
		- Deal with unresolved issues
		- Many candidate struggle to write effective conclusion
		- Express conclusion concisely and overstate the findings
	+ I - formal presentation
		- All sources accessed must be included in the bibliography
		- bibliography items should have some in-text reference
		- provide appropriate and complete bibliographic entries for online sources – URL only NOT sufficient
		- essay needs clear structure
		- heading used should appear in the text
		- Page numbers need to be matching
		- do not use titles of internal assessment criteria as chapter headings; essay should still be clear without reference to the appendix
		- results of statistical analyses should be in body of essay ( calculations and raw data can also be an appendix but should be referred to In the text of the essay)
		- appendix is not part of essay
	+ J – abstract
		- Technical part of essay that is difficult to do
		- avoid careless omissions like missing research question and the conclusion
		- most common problem is failure to deal adequately with the scope of the essay
		- should outline how research was conducted including methods used, type and quantity of data and how test and control groups were selected
	+ K – holistic judgment
		- Comments from supervisor on coversheet can be of considerable assistance to examiners
		- Circumstances surrounding research, level of personal involvement
		- Note: does not have to show all qualities mentioned in descriptor to attain highest level