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EE/RPPF

For first assessment in 2018

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Candidate personal code

Extended essay - Reflections on planning and progress form

Candidate: This form is to be completed by the candidate during the course and completion of their EE. This document records reflections on your planning and progress, and the nature of your discussions with your supervisor. You must undertake three formal reflection sessions with your supervisor: The first formal reflection session should focus on your initial ideas and how you plan to undertake your research; the interim reflection session is once a significant amount of your research has been completed, and the final session will be in the form of a viva voce once you have completed and handed in your EE. This document acts as a record in supporting the authenticity of your work. The three reflections combined must amount to no more than 500 words.

The completion of this form is a mandatory requirement of the EE for first assessment May 2018. It must be submitted together with the completed EE for assessment under Criterion E.

Supervisor: You must have three reflection sessions with each candidate, one early on in the process, an interim meeting and then the final viva voce. Other check-in sessions are permitted but do not need to be recorded on this sheet. After each reflection session candidates must record their reflections and as the supervisor you must sign and date this form.

First reflection session

Candidate comments:

I came to look at the antimicrobial properties of metals after reading news articles about the growth of resistant bacteria such as MRSA the methods being used to tackle these bugs. I read into the impact of pH and UV light on bacterial growth in online scientific studies when I found the Oligodynamic effect which suggests metal ions have a toxic effect on bacteria. I originally planned to test the antimicrobial effects of solid metal discs on two nonpathogenic bacteria. However, I found two potential issues with using elemental metals 1. The cost of sourcing different metal discs of the same dimensions and 2. Whether the metal ions would dissociate to inhibit bacterial growth. To tackle this issue of availability and cost of elemental metals and as advised, I modified my research question to test the antimicrobial properties of various salt solutions containing the desired metal ions, as they are cheaper and easily sourced.

Date:

Supervisor initials:



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**Interim reflection**

Candidate comments:

My preliminary investigation suggested that sodium and potassium didn't show any antimicrobial properties whereas copper, silver and barium were worth testing further. Initially, I focused on the issue of biofilms that harbour resistant strains of bacteria and the issues this posed in hospitals. However, I found that focusing on the mechanisms of action for my chosen metal ions was more relevant to my research question. In formulating my final method, I found that 3 soaked filter discs per bacterial plate was sufficient and measuring the area of inhibition could be achieved using graph paper. Using this resourceful method, I could collect sufficient data for my essay. However, due to cost, my experiment was limited to a low concentration of salt solutions containing silver. This challenged the accurate comparison of the antimicrobial properties of the metals and highlighted a key flaw in my experiment. This limit of cost also led me to consider the importance of cost effectiveness if these salt solutions were to be used in a healthcare system.

Date:

Supervisor initials:

Final reflection - Viva voce

Candidate comments:

Once my essay was completed I could reflect on some of its strengths. I had sufficient data to conduct statistical tests and I could come to a conclusion that copper was the best metal at inhibiting the growth of two nonpathogenic bacteria. In my essay, I acquired information from an appropriate range of current scientific papers to strengthen my argument and I could evaluate their reliability. I learnt about the importance of consistency in scientific method to reduce the likelihood of anomalies and the possibility for contamination when working with living organisms. To expand on my essay, I was advised to look into the impact of the tested metals on biofilms that harbour pathogenic bacteria and the possible impact that metal ions have on human cells. After discussion with my supervisor, I understood the large extent to which a limited concentration of silver ions restricted the reliability of my conclusions. I thoroughly enjoyed redrafting and completing this essay as it allowed me to reflect on and discuss the possible improvements and implications of my research.

Date:

Supervisor initials:

Supervisor comments:

Keen to enter medical research as a future career, she wanted to investigate an aspect of this within a school laboratory. Bacterial resistance is often mentioned in the press as well as in the IB syllabus in relation to the use of antibiotics and she wanted to see if she could look at another method of destruction of bacteria that could benefit a hospital environment and be simple and effective in its use.

She researched use of some metals such as copper and silver in limiting bacterial growth and this was the starting point of her essay. Although she used lower concentrations of silver nitrate compared to the other salt solutions, she did prove that even at lower concentrations, they still had an inhibiting effect on growth of bacteria and were therefore worthy of consideration. Very highly motivated, with a clear idea of eliminating the anion effect from her investigation, she carried out initial investigations to prove it was the cations that needed to be the focus for her investigations.

During her viva voce she discussed various ideas and clarified aspects of her essay, explaining how she decided on the number of discs of filter paper to use per petri dish. She ensured from preliminary planning that the zones of bacterial inhibition of growth were such that using three discs per dish would mean that there would be no overlap in the zones and they would still be discrete. She used all data collected when calculating her means and standard deviation as she appreciated that living organisms can be variable in nature and so give variable data. By introducing an element of selectivity to her results, she may well have biased her findings to enable them to fit her hypothesis and so needed to prevent the issue of human bias. Intellectually curious, well organised and analytical in her approach, she was able to produce a good comparative study but also be suitable critical in her evaluation.

