You sneak in to try EPFL's top-secret teletransportation device and inadvertently have your genome spliced with a stray Drosophila melanogaster that entered the machine with you (you should have known the risks, this was the plot device for both the 1958 and 1986 movies 'The Fly').

Unlike in the films, it fortunately appears only some of your epidermal stem cells have had their genomes infused with Drosophila DNA sequences. You are able to culture some of these epidermal cells and first need to find out how much Drosophila DNA has been introduced into your genome.

1. What genome sequencing technology will you use? Explain why you chose this technology.

2. You discover that you have been relatively lucky, only a single short stretch of Drosophila DNA has been introduced into one of your chromosomes but not into the other homologous chromosome. Nonetheless, a single copy of this sequence is causing your skin to appear more insect like. In genetic terms, how would you describe this phenomena?

3. You identify the inserted Drosophila sequence (attached file, coding sequences in pink, non-coding sequences in blue). What is the identity of this gene? You decide to inactivate the gene product (or products) of this sequence. You think one strategy could be genome editing. Can you think of an alternative strategy? What would the advantages and disadvantages of this alternate strategy be compared to genome editing?

4. You decide to investigate the genome editing solution further. You must first design a guide RNA (or gRNAs) to target this sequence using software such as Benchling [https://www.benchling.com]. Describe how you did this, the sequence (or sequences) you would choose [only the target sequence(s) is required, not the full gRNA sequence] and why you chose this sequence (or sequences) in particular. Describe a common risk with genome editing technology and the steps you took to avoid this with your design. If your strategy works as expected what would be the ideal edit achieve and how would this affect gene expression?

4. With your strategy designed, you are now ready to genome edit yourself. In addition to the guide RNA(s) you designed what other factor(s) will you have to introduce into your cells for the gene editing to work? What gene delivery technology could be suitable to introduce these factors into your cells?

Answers 1000 words maximum, 1 pdf file or submit online text.