You are working as a process engineer for a company who manufacture polymeric products for the building industry. The company has decided that it would like to start to manufacture a promotional ball point pen emblazoned with the company logo and contact details. For marketing purposes the company wish to produce the pen from a bio-based polymer, of which it has no previous experience with using. PLA has been suggested as a potential polymer. You have been tasked with writing a feasibility report to the company’s technical director about the project. This should include an overview of PLA, in particular, its structure, properties and applications. You should also research alternative bio-based materials, and suggest whether PLA could be modified, either with additives or as a co-polymer to improve properties. The report should also cover the feasibility of injection moulding the body of the pen – the company are willing to invest in a small injection moulding machine for this purpose but have little experience the size of machine required or the type of mould tool needed. In addition you are tasked with evaluating the mechanics of the proposed pen design to ensure that it is fit for purpose. Your report should also cover any characterisation techniques the company may wish to consider investing in to ensure the quality of the product; either to characterise the polymer or the moulded product. As sustainability is important, the company also wish you to think about end of life of the product so your report should examine whether the moulded pens could be recycled or if they could be made to be sufficiently biodegradable to be composted.