**Design & Technology (Product Design)**

**A-Level**

**Materials required for questions**

* Pencil
* Rubber
* Calculator

**Instructions**

* Use black ink or ball-point pen
* Try answer all questions
* Use the space provided to answer questions
* Calculators can be used if necessary

**Advice**

* Marks for each question are in brackets
* Read each question fully
* Try to answer every question
* Don’t spend too much time on one question

**Time: 2 hours 30 minutes**

**Mark /120**

**Q12)** The production of a car currently takes 15 people 80 hours to make a car. Each person is paid £9.21 per hour.

**Q12a)** Work out the total cost of making a car using people. **(2 marks)**

**Q12b)** The company hire an additional 15 people. What is the effect on the time to manufacture the car and the cost to manufacture the car? **(4 marks)**

**Q12c)** The company then decide to replace all the workers with dedicated automated machinery. Evaluate the decision to do this discussing the effect on the workforce and manufacturer. **(6 marks)**

**Q13)** Explain two ways new and emerging technologies have impacted people **(4 marks)**

**Q14)** The figure below shows a bench being used in a garden.



**Q14a)** Explain two working properties of Oak that make it a suitable material to be used for the outdoor bench. **(6 marks)**

**Q15)** The figure below shows a section of track to be used in a new railway line.



**Q15c)** At the end of the sleepers usable lifespan, they are to be upcycled.

Explain 2 disadvantages of Upcycling **(4 marks)**

**Q16a)** What are the three forces being exhibited in this image below? **(3 marks)**



**Q16b)** A similar bridge is to be built abroad, the client wants a virtual model of the design. Explain two advantages of virtual modelling **(4 marks)**

**Q18)** The figure below shows a laminated arch-bridge



**Q18a)** Describe the process of creating the laminated arches **(6 marks)**

**Q18b)** The arch can be treated simply as a sector of a circle.

A picture containing chart

Description automatically generated

7m

Calculate the arch length in metres **(4 marks)**

**Q19a)** Explain one advantage of using knock-down fittings **(2 marks)**