**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**

**Q1)** State what following acronyms stand for. **(4 marks)**

**PAR –**

**BSI –**

**HSE –**

**PPP –**

**Q2)** The production of a car currently takes 15 people 80 hours to make a car. Each person is paid £9.21 per hour.

**Q2a)** Work out the total cost of making a car using people. **(2 marks)**

**Q2b)** The company hire an additional 15 people. State the effect on the time to manufacture the car and the cost to manufacture the car. **(4 marks)**

**Q2c)** 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)**

**Q3a)** A plastic water bottle is made from PET. Explain one property of PET that makes it suitable for a plastic water bottle. **(2 marks)**

**Q3b)** Describe using annotated sketches the process of blow moulding. **(4 marks)**

**Q3c)** Explain two reasons why blow moulding has been chosen for the manufacture of the plastic water bottle. **(6 marks)**

**Q4)** The figure below shows a bench being used in a garden.



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

**Q5)** The figure below shows a section of track to be used in a new railway line.



At the end of the sleeper’s usable lifespan, they are to be upcycled.

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

**Q6a)** State the three forces being exhibited in this image below. **(3 marks)**



**Q6b)** 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)**

**Q6c)** The figure below shows a different bridge, this one is a laminated arch-bridge.



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

**Q6d)** 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)**

**Q7)** Explain one advantage of using knock-down fittings. **(2 marks)**

**Q8)** A DT student makes a critical path analysis to track the progression of his DT coursework. Give three features of critical path analysis. **(3 marks)**

**Q9)** Discuss the style and design philosophy of the Arts and Crafts movement. **(6 marks)**

**Q10)** Explain how rapid prototyping has affected on traditional manufacture. **(9 marks)**

**Q11a)** A car door is being produced with an automated press. Outline the process used to form the car door starting from sheet metal. **(6 marks)**

**Q11b)** Explain two reasons why CNC machines are safer than the use of manually operated machines. **(4 marks)**

**Q11c)** State five benefits of using CNC machines for batch production. **(5 marks)**

**Q11d)** State what is meant by the term ‘quality control’. **(4 marks)**

**Q11e)** Quality control is a feature of TQM. Explain two further features of TQM. **(4 marks)**

**Q12)** QTCs change from being electrical insulators to electrical conductors with an applied pressure. State three advantages of using QTCs for this purpose. **(3 marks)**

**Q13)** Probability question. **(3 marks)**

**Q14)** Explain two ways new and emerging technologies have impacted people. **(4 marks)**

**Q15)**

**A diagram of tin opener and tin opener

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