

Design & Technology
AQA A-Level

Paper 1 – Technical
Principles
2 hours 30 minutes

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
- For the multiple choice questions, circle your answer

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

Good luck!

120 marks

Q1) Identify the specific material classification of titanium **(1 mark)**

Q2) Define the following metal properties **(2 marks)**

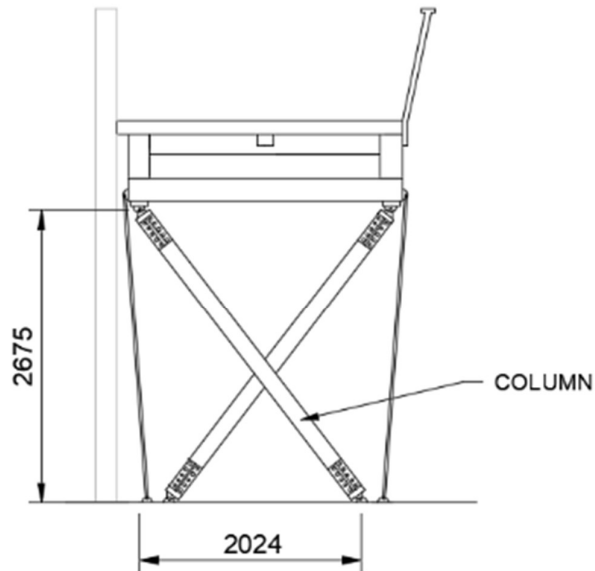
Electrical conductivity

Plasticity

Q3) PSE is a stock form of timber. What does PSE stand for? **(1 mark)**

Q4) Describe the process of forming a timber product using steam bending **(6 marks)**

Q5) The image shows a design for a footbridge. Calculate the length of the column. All measurements are in mm **(3 marks)**



Q6. Explain why glulam is a suitable material for the manufacture of the outdoor structure shown **(6 marks)**



Q7) Explain why a manufacturer may choose to use a unit production system for the manufacture of clothes **(6 marks)**

Q8) A new car has four quality control checks. The probability of failure for each check is shown below

- Fail in check A: 0.02
- Fail in check B: 0.043
- Fail in check C: 0.005
- Fail in check D: 0.012

A product will fail the quality control check if A, B and C fail together or if D fails. If 20,000 products are made, estimate how many will fail **(4 marks)**

Q9) Identify the smart material that changes colour with temperature **(1 mark)**

Q10) The design below has been cut using the laser cutter. Describe the process of creating the model using the laser cutter **(6 marks)**



Q11) Evaluate the use of a flexible manufacturing system, compared to dedicated automated machinery, in production **(9 marks)**

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

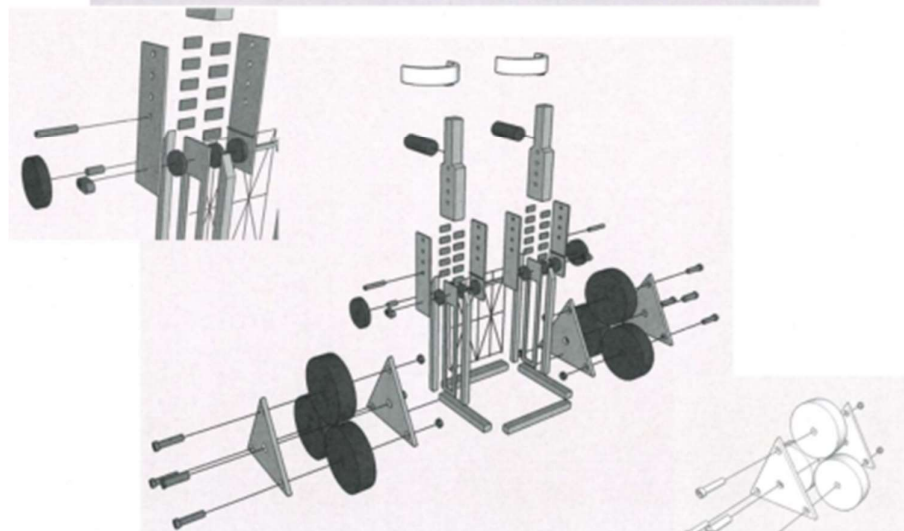
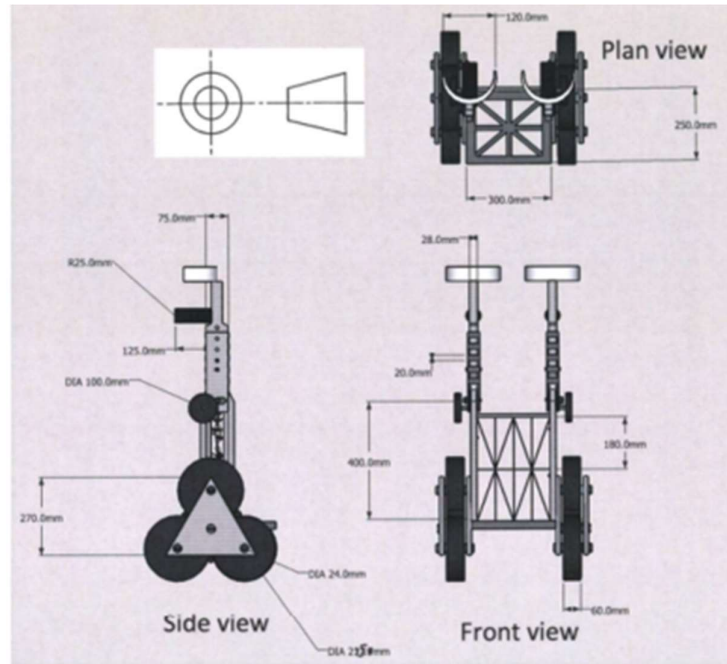
Q12) Outline the key features of AGV guidance systems. (4 marks)

Q13) A manufacturer is producing a concrete mix for a new building. The building requires 4 concrete beams, each 1.2m x 2m x 5m. The cement is mixed with water in a 2:4 water to cement ratio. How much water is needed for the building? **(4 marks)**

Q14) Describe the process of investment casting to produce the car part shown below **(6 marks)**



Q15) The images below show two different design communication techniques. Discuss why a designer may use each technique to communicate information **(6 marks)**



Q16) The table shows the geometry of a shape. Using the coordinates draw the shape and calculate the area bound by the external and internal paths **(4 marks)**

Internal Path	External Path
Circle with a radius of 2.5 with centre (0,1)	(5, 4)
	(5, -3)
	(-6, -3)
	(-6, 4)

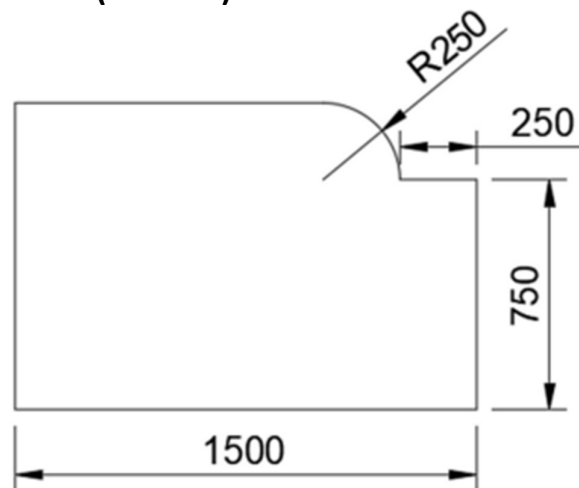
Q17) The mild steel tube for a gym rack is to be metal inert gas (MIG) welded. Outline, using notes, the features of the MIG welding process **(6 marks)**

Q18) Describe how the critical assessment of existing products can influence the work of designers and manufacturers **(6 marks)**

Q19) Evaluate the impact of Kevlar fibres on the development of sporting products **(6 marks)**

Q20) Discuss how the design and manufacture of consumer products can minimise the impact of the products on the natural environment **(9 marks)**

Q21) Some sheet metal is being cut for a car door. If the density of the metal is 2.8g/cm^3 and the metal is 6mm thick. What is the mass of the sheet metal? All measurements are in mm **(6 marks)**



Q22) Justify the requirement for risk assessments to be formally recorded and stored **(4 marks)**

Q23) The role of the British Standards Institute (BSI) is to promote safety and quality throughout product manufacture and usage.

Evaluate the advantages and disadvantages to a business of ensuring their practices and products comply with BSI standards **(8 marks)**

Q24) Evaluate the use of a patent to protect a design idea **(6 marks)**

END OF PAPER