A Level (9DT0_01) 2nd SAM

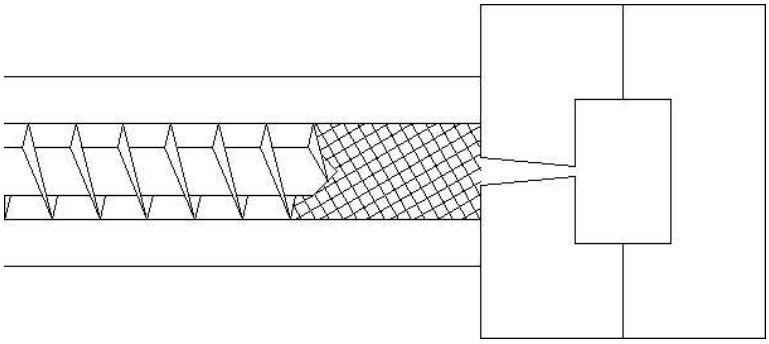
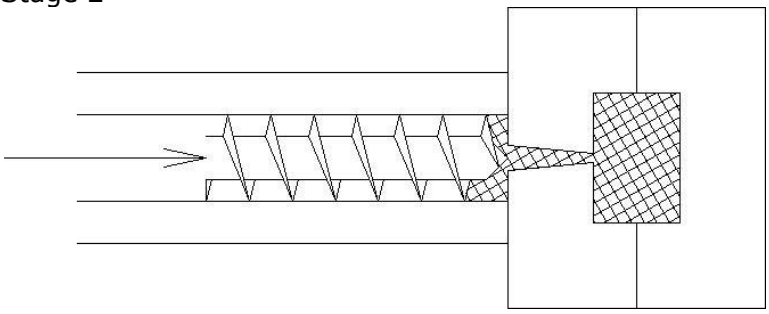
Question number	Answer	Mark
1(a)	Two valid settings: 1. Depth of groove/depth per pass/cut (1) 2. Size of cutter (1) 3. Material type (1) 4. Offset/height of material (1)	**(2)**

Question number	Answer	Additional guidance	Mark
1(b)	Any **two** valid benefits: 1. MDF is a dimensionally stable material/will not twist/warp/the cover will stay flat (1). 2. MDF is knot free/there is no chance of any bits falling out/which would result in a good quality product visually/ aesthetically/functionally (1). 3. MDF has no short grain/has uniform strength / small details will be less likely to break off. (1) 4. MDF has a smooth surface finish from the manufacturing process/no grain pattern (1)	Allow answers written in the negative referring to the disadvantages of solid wood over MDF	**(2)**

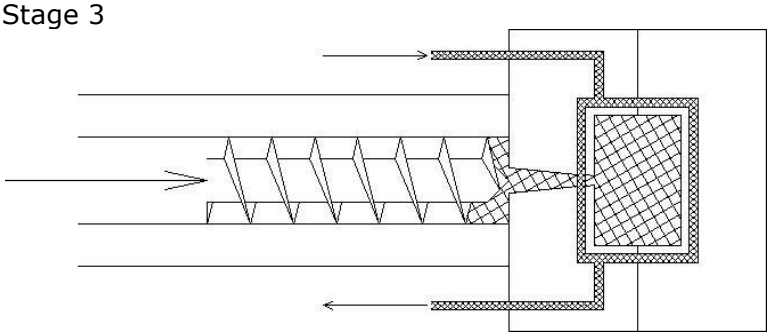
Question number	Answer	Additional guidance	Mark
1(c)	An explanation that includes identification of an advantage (1) and linked justifications of that advantage (1) + (1). 1. Paint gives a protective finish (1) which means the surface does not get damaged/absorb moisture (1) so the product remains in good condition longer (1) 2. Paint seals the surfaces/edges (1) so it does not collect dirt/get dirty (1) so is easier to clean (1) 3. Paint can come in a range of colours (1) so the look of the cover can be changed (1) potentially making the product more appealing (1)		**(3)**

Question number	Answer	Additional Guidance	Mark
1(d)	In order for the candidates to solve the problem, they will need to recognise that each of the following stages are required. Stage 1: Area of the square groove 40 x 40 – 32 x 32 =576mm^2 (1) Stage 2: Area of square groove with curved corners 4 x 4 = 16mm^2 (1) π x 2^2 = 12.57mm^2 (1) 16 – 12.57 = 3.43mm^2 (1) 576 - 3.43 = 572.57mm^2 (1) Stage 3: Volume of square groove 572.57 x 0.5 = 286.29mm^3 (1) Stage 4: Correct to 4 significant figures 286.3 (1)	Accept alternative methods of correct working out. Error carried forward should be applied. Award full marks for correct answer only.	**(7)**

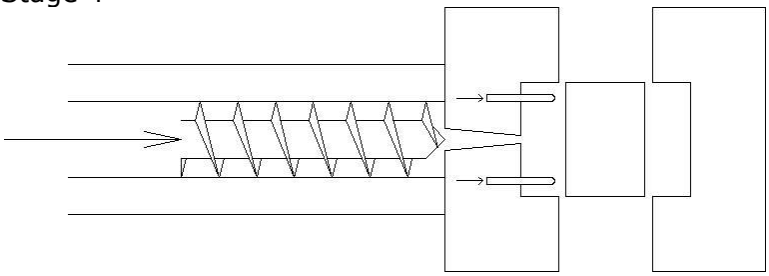
Question number	Answer	Mark
2(a)	Any **one** explanation and a linked justification: 1. it can be melted (1) resulting in good fluidity/high flexural strength (1) 2. relatively slippery surface (1) so can be removed from moulds easily (1)	**(2)**

Question number	Answer	Mark
2(b)	**One** mark for the identification of each stage of the process: 1. Melted polymer is gathered at the front of the screw (1) 2. Plunger/screw injects polymer into mould (1). 3. Mould/moulding is water cooled (1). 4. Mould is opened/moulding removed using ejector pins (1). 5. Mould is cleaned/lubricated/closed, ready for next moulding (1) Stage 1  Stage 2 	**(4)**

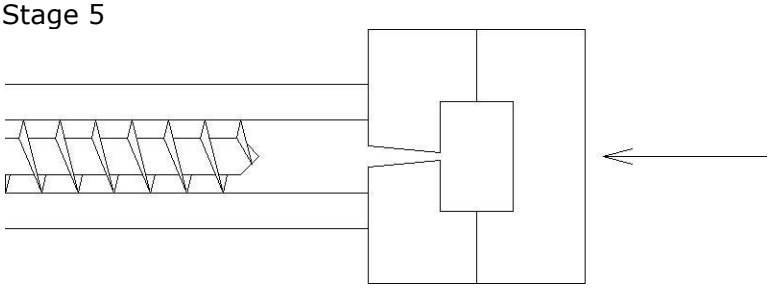
Stage 3



Stage 4



Stage 5



Note: Stage 5 could be shown as Stage 1

Question number	Answer	Additional guidance	Mark
2(c)	Any **two** explanations that include identification of an advantage (1) and linked justifications of that advantage (1) + (1). 1. Injection moulding requires minimal excess material to be removed (1) which reduces waste (1) therefore reduces cost of the bowl (1) 2. Injection moulding results in an even thickness of product (1) which gives increased strength (1) meaning the bowl will last longer (1) 3. The bowls can be made with cut-away areas already formed (1) which speeds up manufacture (1) reduces labour costs for making the bowl (1) 4. Can be moulded with a thicker lip around the base (1) that gives increased strength (1) making the bowl more robust (1)	Do not accept repeated justifications. Maximum of 4 marks for responses that give valid advantage and explanation, without specific link to the requirements for the bowl and/or commercial production.	**(6)**

Question number	Answer	Additional guidance	Mark
3(a)	Any **two** additional tools which could be used: 1. Adjustable square/sliding bevel (1) 2. Set square (1) 3. Try square (1) 4. Protractor (1) 5. Template (1)	Do not accept any answers which refer to other forms of markers e.g. pen, felt pen, biro.	**(2)**

Question number	Answer	Additional guidance	Mark
3(b)	Any **two** explanations that include identification of a reason (1) and linked justification of that reason (1). 1. Large runs can be done quickly (1) increasing company profit/output (1) 2. A more complex/photo quality image is possible (1) making the product potentially more appealing/realistic (1) 3. Process provides visual colour mixing (1) allowing an infinite range of colours to be used (1)	Do not accept repeated justification.	**(4)**

Question number	Answer	Additional guidance	Mark
3(c)	Any **two** explanations that include identification of an advantage (1) and linked justifications of that advantage (1) + (1). 1. The speed of the stamping out process is faster (1) as it is a single action process (1) meeting demand more easily (1) 2. There is no burning of the edges (1) so specialist card is not needed (1) cutting down the cost (1) 3. Stamping out can cut through more layers at once (1) reducing the material handling (1) reducing labour costs (1)	Do not accept repeated justifications. Maximum of 4 marks for responses that give valid advantage and explanation, without specific link to the requirements for the Christmas tree model and/or the method of production.	**(6)**

Question number	Answer	Additional guidance	Mark
4(a)	Any **three** explanations that include identification of a reason (1) and linked justification of that reason (1). 1. The simple shape requires a simple former (1) which keeps the set-up cost down (1) 2. The forming only needs to be thin/shallow as the thickness of the cells is small (1) which keeps the amount/cost of material down (1) 3. The plastic can be heated and formed quickly (1) keeping production rates high (1) 4. A multiple pattern could be used to produce several blister pack simultaneously (1) using the entire surface of the machine/increasing the efficiency (1)	Do not accept repeated justification.	**(6)**

Question Number	Answer	Additional guidance	Mark
4(b)	Any **two** advantages that include identification of a reason (1) and linked justification of that reason (1). 1. The product is easily recognisable (1) so consumers can quickly locate what they are looking for (1) 2. The trademark cannot be copied (1) so customers are guaranteed to be buying what they think they are buying (1) 3. Trademarks are a sign of quality (1) so products can be priced accordingly (1)	Do not accept repeated justification.	**(4)**

Question number	Answer	Mark
4(c)	Any **two** valid advantages: 1. Access to a wide range of products/services (1) 2. Availability of product information online (1) 3. Online discounts, promotions and savings (1) 4. Price comparison websites (1)	**(2)**

Question number	Answer	Mark
4(d)	Any **one** explanation that includes identification of a reason (1) and linked justifications of that reason (1) + (1). 1. In order to determine the desirability of the product (1) so they can manufacture in correct quantities (1) therefore avoiding unwanted/wasted products (1) 2. To compare their product with other similar products (1) in order to see advantages/disadvantages (1) and make appropriate changes/improvements (1) 3. To understand the demographics of sales (1) making the targeting of distribution sales more accurate (1) maximising sales (1)	**(3)**

Question number	Answer	Mark
4(e)	**AO3 1a = 3 marks, AO3 1b = 6 marks** This question asks candidates to evaluate the choice to use rubber as the material from which to manufacture a product in the context of a remote control body. Candidates should analyse the product in order to weigh up the potential advantages and disadvantages of rubber and give reasoned justification to qualify their judgements and conclusion. Candidates might refer to the following in their responses: • the remote control body has a thin wall section/complex shape and profile • the design requires internal mountings. • a range of colours can be offered • water proof nature of rubber • environmental influences • soft/flexible • grip Expansion that can be used to justify judgments relating to positive or negative points: • the form can be achieved with a relatively simple mould • does not need any additional surface finishing • rubber is capable of delivering the product to consistent level of quality time after time/suitable for high volume/the body will need to fit other components so must be same every time • internal mountings can easily be moulded into the remote control body, which allows it to be	**(9)**

	produced in one process • available in a wide range of colour options • rubber does not conduct heat well so remains warm/cool to the touch in relationship to the ambient temperature. • no sharp edges so not uncomfortable in a pocket • rubber will cushion the impact if dropped so protects the inner components • electronic components protected from rain/moisture/won't get wet	

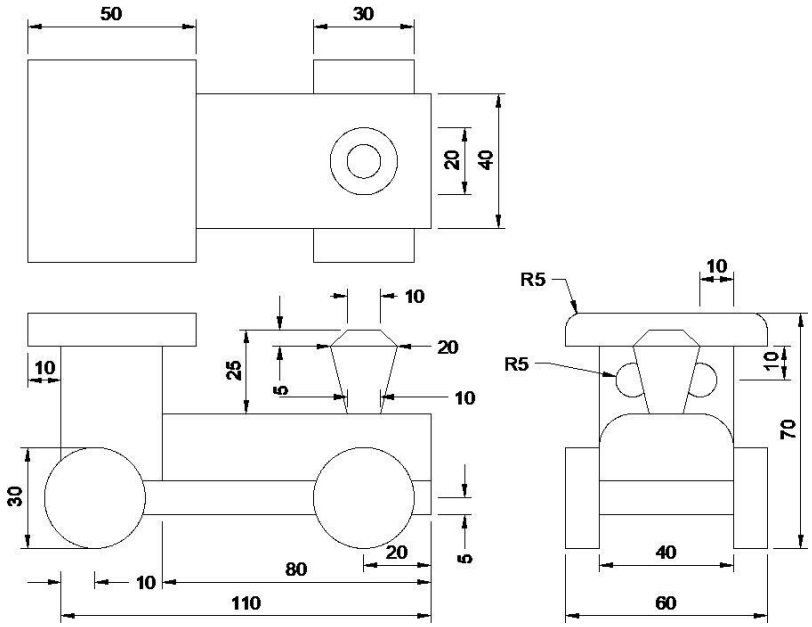
Level	Mark	Descriptor
	0	No rewardable materials
Level 1	1 – 3	• Applies a basic understanding to deconstruct information, making limited connections between concepts. • Incomplete evaluation with unresolved conclusion that demonstrates limited synthesises of understanding. • Judgements are tentatively supported by evidence.
Level 2	4 – 6	• Applies a competent understanding to deconstruct information and provide some clear connections between concepts. • Imbalanced evaluation that synthesises some relevant understanding into a generally coherent conclusion. • Judgements are occasionally supported by relevant evidence.
Level 3	7 - 9	• Applies a thorough understanding to deconstruct information and provides logical connections between concepts throughout. • Balanced evaluation that synthesises relevant understanding into a well-developed conclusion. • Judgements are supported by relevant evidence throughout.

Question number	**Answer**	**Additional guidance**	**Mark**
4(f)	In order for the candidates to solve the problem, they will need to recognise that each of the following stages are required. Stage 1: percentage per day 0.02 x 2 x 4 = 0.16 (1) Stage 2: days per battery 100 / 0.16 = 625 (1)	Accept alternative methods of correct working out. Error carried forward should be applied. Award full marks for correct answer only.	**(2)**

Question number	Answer	Additional guidance	Mark
5(a)	**Two** explanations that include an identification of a characteristic (1) and linked justification of that characteristic (1). 1. Dense (1) making it durable / so it will last longer (1) 2. Close grain (1) so it will take a paint/varnish finish well / so less paint/varnish is required (1) 3. Straight grain (1) so it is easy to manufacture / saving wear on cutters/machinery (1) 4. Relatively attractive grain/colour (1) so varnished parts look attractive / increasing the appeal (1) 5. Strong (1) so it will not break easily (1) 6. Tough (1) so it will resist impact (1) 7. Splinter resistant (1) resulting in a safer toy (1)	Do not accept repeated justification.	**(4)**

Question number	Answer	Mark
5(b)	**AO4 1b = 3 marks, AO4 1c = 3 marks** This question is about considerations relating to distribution and asks candidates to discuss this in the context of the toys. Creditworthy responses will make connections which show understanding of factors that need to be considered, going beyond general knowledge. Candidates might refer to the following in their responses: • Packaging • Transport mode • Fuel type • Distances • Weight/size • Time • Wages • Environment	**(6)**

Level	Mark	Descriptor
	0	No rewardable materials
Level 1	1 – 2	• Superficial discussion that considers a narrow range of factors, demonstrating limited understanding. • Partial application of understanding to the context of the question.
Level 2	3 – 4	• Coherent discussion that makes some relevant links between a sufficient range of factors, demonstrating competent understanding. • Generally sound application of understanding to the context of the question.
Level 3	5 - 6	• Comprehensive discussion that makes effective links between a wide range of factors, demonstrating thorough understanding. • Considered and effective application of understanding to the context of the question.

Question number	Answer	Mark
5(c)	An orthographic drawing that includes an image drawn with a ruler or free hand. Marks to be awarded for the following: 	**(8)**

Level	Mark	Descriptor
	0	No rewardable materials
Level 1	1 – 2	• Drawing is produced with limited attention to detail and lacks accuracy and precision. • Views inappropriately located. • Some features of the drawing may be included but lack detail and may be inappropriately positioned. • Line style is inconsistent and inappropriate throughout.
Level 2	3 – 5	• Drawing is produced with some precision and accuracy. • Most views in correct position with correct alignment. • Most drawing features are detailed with correct positioning and appropriate proportions. • Line style is broadly consistent and appropriate throughout.
Level 3	6 - 8	• Drawing is produced with precision and accuracy. • All views in correct position with correct alignment. • Drawing features are fully and correctly detailed with correct positioning and proportions. • Line style is consistent and appropriate throughout.

Question number	Answer	Mark
5(d)	In order for the candidates to solve the problem, they will need to recognise that each of the following stages are required: Stage 1 $\tan\theta$ = opposite (over) adjacent (1) Stage 2 θ = opposite (over) adjacent $\tan^{-1}$ (1) Stage 3 θ =10/40 $\tan^{-1}$ θ = 14.03^0 (1) Stage 4 + 90^0 = 104.03 (1) Stage 5 Three significant figures = 104 degrees (1)	**(5)**

Question number	Answer	Mark
6	**AO3 1a = 3 marks AO4 1c = 3 marks, AO3 2c = 3 marks** Candidates should consider the design of the juicer, showing understanding and the influence of Post Modernist philosophy. Impacts: • shape • materials • manufacturing techniques • aesthetics • ergonomics • form/function • comfort • sustainability Candidates might refer to the following in their responses: • usefulness versus beauty/function is led by form • beautiful/artistic/elaborate design for the masses • directed against logical thought/design • not letting the past influence thinking/subjective designing • use of stylised shapes/images • use of streamlined/organic shapes/images • designs which contained an element of humour • naming products to bring them to life • experimentation with art forms • use of new technologies • 'better to create a creative mistake than a stagnant work in good taste' • light and economical products • consideration of energy use • consideration of packaging • 'less is bore' • expressive and individual rather than functional • retro design thinking • deconstruction	**(9)**

Level	Mark	Descriptor
	0	No rewardable materials
Level 1	1 – 3	• Applies a basic understanding to deconstruct information, making limited connections between concepts. • Partial application of understanding of technical factors to the context of the question. • Partial application of understanding of design theory to the context of the question.
Level 2	4 - 6	• Applies a competent understanding to deconstruct information and provide some clear connections between concepts. • Generally sound application of understanding of

		technical factors to the context of the question. • Generally sound application of understanding of design theory to the context of the question.
Level 3	7 - 9	• Applies a thorough understanding to deconstruct information and provides logical connections between concepts throughout. • Considered and effective application of understanding of technical factors to the context of the question. • Considered and effective application of design theory understanding to the context of the question.

Question number	Answer	Mark
7(a)	**AO3 1a = 3 marks, AO3 2a = 1 mark, AO3 2b = 2 marks** This question is about considerations relating to manual labour versus automated robotic machinery and asks candidates to discuss this in the context of a mass production line. Creditworthy responses will make connections which show understanding of factors that need to be considered, going beyond general knowledge. Candidates might refer to the following in their responses: • The robots can work quickly decreasing production time/increased productivity decreasing lead time • Once programmed the robots repeat accurately increasing quality outcomes reducing human error • Robots work 24/7 and do not tire, reducing labour costs • Production can be hazardous removes humans from hazardous areas reducing the chances of injury • Can be reprogrammed quickly reducing need for training/updating skills reducing training costs • Humans can think for themselves and make decisions • Humans will stop if they find errors • Humans take pride in their work • Humans can suggest improvements to procedures/processes.	**(6)**

Level	Mark	Descriptor
	0	No rewardable materials
Level 1	1 – 2	• Superficial discussion that considers a narrow range of factors, demonstrating limited understanding. • Partial application of understanding to the context of the question.
Level 2	3 – 4	• Coherent discussion that makes some relevant links between a sufficient range of factors, demonstrating competent understanding. • Generally sound application of understanding to the context of the question.
Level 3	5 - 6	• Comprehensive discussion that makes effective links between a wide range of factors, demonstrating thorough understanding. • Considered and effective application of understanding to the context of the question.

Question number	Answer	Additional guidance	Mark
7(b)	Any **two** explanations that include identification of an advantage (1) and linked justifications of that advantage (1) + (1). 1. Robot efficiency has reduced the number of jobs available (1) therefore making people redundant (1) reducing quality of life (1) 2. Robots have replaced humans on the production line (1) leading to only relatively unskilled jobs being available (1) reducing job satisfaction/morale (1) 3. The highly complex technical nature of robots (1) has resulted in high-skilled technical jobs (1) which have given some people an increase in earning potential (1)	Do not accept repeated justifications. Maximum of 4 marks for responses that give valid advantage and explanation, without specific link to the requirements of employment.	**(6)**

Question number	Answer	Mark
8	**AO3 1a = 4 marks, AO3 1b = 8 marks** This question asks candidates to evaluate the choice to use a batch production system in preference to a one-off production system. Candidates should analyse the product in order to weigh up the potential benefits and disadvantages of this manufacturing choice and give reasoned justification to qualify their judgements and conclusion. Points of analysis: • Speed of manufacture of components • Speed of assembly • Accuracy • Repetitive accuracy • Finishing techniques • Labour costs • Initial set-up costs • Chairs can be produced/sold cheaper Points of evaluation: • The use of formers allows repetitive accuracy/easy of manufacture • The use of jigs speeds up assembly • The cost of setting up jigs and formers versus labour cost has to be factored into the overall costing. • Batch cutting components saves a lot of down-time for the machines • The necessity to have large numbers of clamps/jigs can be expensive • The speed of manufacture will be increased • Some consumers may prefer the imperfections of one-off production/individuality • There will be no advantage of bulk buying for either method due to the scale of the production run	**(12)**

Level	Mark	Descriptor
	0	No rewardable materials
Level 1	1 – 3	• Applies a basic understanding to deconstruct information, making limited connections between concepts. • Incomplete evaluation with unresolved conclusion that demonstrates limited synthesis of understanding. • Judgements are tentatively supported by evidence.
Level 2	4 – 6	• Applies a generally sound understanding to deconstruct information and provide some clear connections between concepts. • Imbalanced evaluation that synthesises some relevant understanding into a generally coherent conclusion. • Judgements are occasionally supported by relevant evidence.
Level 3	7 - 9	• Applies an effective understanding to deconstruct

		information and provide logical connections between concepts. • Balanced evaluation that synthesises relevant understanding into a considered conclusion. • Judgements are mostly supported by relevant evidence.
Level 4	10 - 12	• Applies a comprehensive understanding to deconstruct information and provides insightful connections between concepts throughout. • Thorough and balanced evaluation that synthesises relevant understanding into a well-developed conclusion. • Judgements are supported by pertinent evidence throughout.