



National  
Qualifications  
2018

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**2018 Design and Manufacture**

**National 5**

**Finalised Marking Instructions**

Scottish Qualifications Authority 2018

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## General marking principles for National 5 Design and Manufacture

*This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this paper. These principles must be read in conjunction with the specific marking instructions for each question. The marking schemes are written to assist in determining the 'minimal acceptable answer' rather than listing every possible correct and incorrect answer.*

- (a) Marks for each candidate response must **always** be assigned in line with these general marking principles and the specific marking instructions for the relevant question.
- (b) Marking should always be positive, ie marks should be awarded for what is correct and not deducted for errors or omissions.
- (c) If a specific candidate response does not seem to be covered by either the principles or specific marking instructions, and you are uncertain how to assess it, you must seek guidance from your team leader.
- (d) To be awarded marks candidates must respond to the command word used in the question. For example, listing a valid point, even if correct, should not be awarded marks if the question asked for an outline, description or explanation.
- (e) Mark consecutive responses to match the marks in 'name/state' questions. For example, if two responses are given to a one mark question, only the first response should be marked.
- (f) Candidates must answer all aspects of the question to gain full marks. For example, if the questions require two reasons candidates must make two valid and substantiated points relating to the question to gain both marks. If the questions require three stages to be described, candidates must provide a structure of characteristics and/or features of each of the three stages to be awarded all three marks.
- (g) For each candidate response, the following provides an overview of the marking principles. Refer to the specific marking instructions for further guidance on how these principles should be applied.
  - (i) Questions that ask candidates to **name/state**  
Candidates must provide the answer in brief form/name. Candidates will normally be required to make the same number of statements as marks available in the question.
  - (ii) Questions that ask candidates to **describe**  
Candidates must provide a statement or structure of characteristics and/or features. This should be more than an outline or a list. Candidates may refer to, for instance, a concept, experiment, situation, or facts in the context of, and appropriate to, the question. Candidates will normally be required to make the same number of factual/appropriate points as marks available in the question.
  - (iii) Questions that ask candidates to **explain**  
Candidates must generally relate cause and effect and/or make relationships between things clear. This will be related to the context of the question or a specific area within a question.

Marking instructions for each question

Section 1

Question			Expected answer(s)	Max mark	Additional guidance
1.	(a)	(i)	Alternative softwood:  Spruce.  Any other suitable response.	1	One mark for correct response.  Any other suitable response could include:  <ul style="list-style-type: none"> <li>• cedar</li> <li>• douglas fir</li> <li>• larch.</li> </ul> ' <i>Pine</i> ' scores zero but responses such as Scots pines/Piranha pine scores one mark.
		(ii)	Joining wood:  A description and/or sketch that could include some of the following:  <ul style="list-style-type: none"> <li>• marking out a joint</li> <li>• drilling an appropriate joint</li> <li>• applying glue to the edges of the pieces of softwood</li> <li>• clamping the glued pieces together.</li> </ul> Any other suitable response.	2	One mark for each valid description up to a maximum of two marks.  Responses that do not refer to appropriate tools score a maximum of one mark.  Marking out references score a maximum of one mark.  Candidates may refer to joining techniques such as dowelling or biscuits.  A basic response such as ' <i>Glue it</i> ' is not sufficient for one mark. However, a further description such as ' <i>apply glue</i> ' with a paintbrush' scores one mark.  A response such as ' <i>clamp it</i> ' or ' <i>put it in a vice</i> ' also scores one marks as the candidate has referred to process of holding the two pieces.

Question		Expected answer(s)	Max mark	Additional guidance
	(b)	(i)	1	One mark for correct response. No marks for flat bit or hole saw.
		(ii)	1	One mark for correct response. <i>'jobber drill'</i> scores one mark. <i>'Pilot drill'</i> scores zero marks as this does not refer to the type of drill bit.
		(iii)	1	One mark for correct response. Any other suitable response could include: <ul style="list-style-type: none"><li>band saw</li><li>orbital sander</li><li>jig saw.</li></ul> References to <i>'sander'</i> on its own, although not specifically stating a type of machine, scores one mark.
		(iv)	1	One mark for correct response. A response such as <i>'to ensure the screws don't stick out'</i> scores one mark. Responses such as <i>'to make it look attractive'</i> score zero marks as this is not appropriate to the context of the question ie the underside of the base. <i>'to accommodate countersink screws'</i> scores one mark.

Question		Expected answer(s)	Max mark	Additional guidance
	(c) (i)	Pilot holes: Bradawl. Any other suitable response.	1	One mark for correct response. Reference to ' <i>hand drill</i> ' is acceptable for one mark. Obvious referral to a cordless drill scores zero marks. A ' <i>drill</i> ' scores zero marks as this does not identify a hand tool.
	(ii)	Cutting the curves: <ul style="list-style-type: none"> <li>Coping saw.</li> </ul> Any other suitable response.	1	One mark for correct response. Any other suitable response could include: <ul style="list-style-type: none"> <li>Abrafile.</li> </ul> References to filing score zero marks as the question specifically refers to cutting.
	(iii)	Wax instead of varnish: An explanation that includes two of the following reasons. <ul style="list-style-type: none"> <li>wax can be applied quickly using a cloth rather than a brush</li> <li>cleaning up is easier as no washing of a brush is required</li> <li>less chance of runs as wax is more viscous than varnish</li> <li>wax gives a smooth finish whereas varnish can feel rough</li> <li>wax gives an instant dry finish, while varnish takes a longer time to dry</li> <li>gives an alternative aesthetic quality.</li> </ul> Any other suitable response.	2	To be awarded marks candidates must provide an <b>explanation</b> when answering this question. Unqualified ' <i>quick</i> ', ' <i>cheap</i> ' or ' <i>easy</i> ' responses score zero marks. Minimal response accepted. ' <i>varnish is time consuming whereas wax is quicker</i> ' scores one mark.

Question	Expected answer(s)	Max mark	Additional guidance
(d)	<p>Manufacture of the T-piece:</p> <p>A description and/or sketch that could include some of the following:</p> <p>Marking out stage</p> <ul style="list-style-type: none"> <li>• mark position of joint on top surface with rule and pencil</li> <li>• draw lines at 90 degrees with try square</li> <li>• mark depth with marking gauge.</li> </ul> <p>Cutting stage</p> <ul style="list-style-type: none"> <li>• use a G-clamp to hold a guide piece of wood next to the line</li> <li>• cut the two lines to the required depth with a <b>tenon saw/gent's saw</b></li> <li>• remove the waste wood with a chisel (naming a specific chisel is not required)</li> <li>• level the bottom of the joint with a hand router/chisel.</li> </ul> <p>There is no requirement to refer to the identified stages in the correct sequence.</p> <p>Any other suitable response.</p>	4	<p>Candidates must refer to both the marking out and cutting stages to gain full marks.</p> <p>A maximum of three marks may be awarded to responses that only refer to one of the stages.</p> <p>Responses that do not refer to appropriate tools score a maximum of one mark.</p> <p>Candidates may use sketches to aid their descriptions.</p> <p>Lists of tools score zero marks eg <i>'use a saw and chisel'</i>.</p> <p><i>'Mark the distance with a ruler'</i> scores zero marks (a ruler should be used to measure).</p> <p>References to clamping/securing in vice on its own scores zero marks.</p> <p>Basic statements such as <i>'mark the wood with a pencil'</i> score zero marks.</p> <p><i>'Mark the lines with a try square'</i> scores one mark.</p> <p><i>'find the centre using a marking gauge'</i> scores one mark.</p> <p>References to sanding/filing the bottom of the joint score zero marks.</p>

Question		Expected answer(s)	Max mark	Additional guidance
	(e)	(i)	Centre lathe processes:  Name the following:  A - taper turning B - step turning C - knurling	3  One mark for each correct response.  Accept chamfering for A. Accept parallel turning for B.
		(ii)	Knurling: State two of the following adjustments: <ul style="list-style-type: none"> <li>change the tool</li> <li>reduce the spindle speed.</li> </ul> Any other suitable response.	2  One mark for each correct response.  Statements such as ' <i>change the speed</i> ' score one mark.  Wrong statements such as ' <i>speed the lathe up</i> ' score zero marks.  ' <i>change the angle of the compound slide</i> ' scores one mark as knurling may take place after taper turning.
	(f)	(i)	Forming the bowls:  An explanation that includes two of the following: <ul style="list-style-type: none"> <li>to create a 3D form so that it is more accurate</li> <li>to make sure the bowls are identical</li> <li>quicker when making more than one.</li> </ul> Any other suitable response.	2  One mark for each correct response.  Unqualified basic responses referring to ' <i>quicker</i> ' score zero mark.
		(ii)	Heating the plastic:  Oven.  Any other suitable response.	1  One mark for correct response.  Any other suitable response could include: <ul style="list-style-type: none"> <li>thermoforming centre</li> <li>vacuum former.</li> </ul> References to strip heater/heat gun score zero marks.

Question		Expected answer(s)	Max mark	Additional guidance
	(iii)	<p>Cutting the circle:</p> <p>Name one of the following:</p> <ul style="list-style-type: none"> <li>• scroll saw</li> <li>• fret saw.</li> </ul> <p>Any other suitable response.</p>	1	<p>One mark for correct response.</p> <p>Any other suitable response could include:</p> <ul style="list-style-type: none"> <li>• band saw</li> <li>• jig saw</li> <li>• heegner saw.</li> </ul> <p>Responses referring to commercial manufacturing score zero.</p>
	(iv)	<p>Finishing the acrylic:</p> <p>A description that includes two of the following stages in the correct order:</p> <ul style="list-style-type: none"> <li>• Filing/scraping</li> <li>• Use abrasive papers/cloth/wool</li> <li>• Polishing/buffing.</li> </ul> <p>Any other suitable response.</p>	2	<p>One mark for correct description up to a maximum of two marks.</p> <p>One mark from each bullet point to a maximum of two.</p> <p>References to <i>'using a scraper'</i> scores one mark.</p> <p>References to machine sanders score zero marks.</p> <p>Any references to sand/glasspaper scores zero marks. Candidates should refer to emery/wet and dry paper.</p> <p>Only one mark can be awarded for any filing actions. eg <i>'you would cross file it'</i> scores one mark. <i>'you would first cross file it then draw file it'</i> scores one mark.</p>
(g)	(i)	<p>Non-ferrous metal:</p> <p>Aluminium.</p> <p>Any other suitable response.</p>	1	<p>One mark for correct response.</p> <p>Any other suitable response could include:</p> <ul style="list-style-type: none"> <li>• tin</li> <li>• zinc.</li> </ul>
	(ii)	<p>Marking parallel lines:</p> <p>Odd-leg callipers.</p>	1	<p>One mark for correct response.</p> <p><i>'Jenny callipers'</i> scores one mark</p>
	(iii)	<p>Marking the 90 degree angle:</p> <p>Engineers square.</p>	1	<p>One mark for correct response.</p> <p><i>'Try square'</i> scores zero.</p>

Question		Expected answer(s)	Max mark	Additional guidance
	(iv)	<p>Cutting the pointer:</p> <p>Name any one of the following:</p> <ul style="list-style-type: none"> <li>tin snips</li> <li>junior hacksaw</li> <li>hacksaw.</li> </ul> <p>Any other suitable response.</p>	1	<p>One mark for correct response.</p> <p>Reference to a cold chisel can be awarded a mark.</p> <p>References to a notcher/guillotine score a mark</p> <p>Coping saw scores one. (Blades are available that cut both wood and aluminium).</p>
2.	(a)	<p>Benefits of questionnaires:</p> <p>Explanation must reference benefits of using a questionnaire.</p> <p>Explanation contains any of the following reasons:</p> <ul style="list-style-type: none"> <li>a wide range of people can be sampled</li> <li>can be collated quickly</li> <li>specific questions can be asked eg aesthetics, ergonomics, function - to direct the person being surveyed</li> <li>can be written to suit the target market</li> <li>a rating system can be used to further refine the process</li> <li>the results are easy to present in the form of graphs/charts.</li> </ul> <p>Any other suitable response.</p>	3	<p>One mark for each valid point leading to a clear explanation up to a maximum of two marks.</p> <p>To be awarded marks candidates must provide an <b>explanation</b> when answering this question.</p> <p><i>'They are quick to do'</i> scores zero marks.</p> <p><i>'you can get lots of opinions and they are easy to collate'</i> scores two marks</p> <p><i>'you can get public opinion/feedback'</i> scores one mark.</p> <p><i>'easy to distribute via paper/email/internet'</i> scores one mark.</p>

Question		Expected answer(s)	Max mark	Additional guidance
	(b)	<p>Specification:</p> <p>Description must reference the use of a specification in the design process.</p> <p>Description of any of the following:</p> <ul style="list-style-type: none"> <li>to give guidance during the design process</li> <li>as an ongoing evaluation tool.</li> </ul> <p>Any other suitable response.</p>	2	<p>One mark for each valid description up to a maximum of two marks.</p> <p>Candidates do not need to name the stage of the design process to gain marks.</p> <p>Definitions of a specification scores zero.</p> <p>Descriptions such as:</p> <p><i>'to check if the product is within budget and to check the performance aspects of the product'</i> gains two marks.</p>
3.	(a)	<p>Morphological analysis:</p> <p>A description that refers to the following stages:</p> <ul style="list-style-type: none"> <li>identify a set of suitable parameters for the table heading</li> <li>populate the rows with suitable attributes</li> <li>choose combinations of attributes</li> <li>generate ideas from results.</li> </ul> <p>Any other suitable response.</p>	3	<p>One mark for correct response up to a maximum of three marks.</p> <p>It is possible to gain three marks by drawing a morphological analysis table that highlights the bullet points to the left.</p>
	(b)	<p>Idea generation techniques:</p> <p>Brainstorming.</p> <p>Any other suitable response.</p>	1	<p>One mark for correct response.</p> <p>Candidates may also gain marks by referring to the following:</p> <ul style="list-style-type: none"> <li>taking your pencil for a walk</li> <li>thought showers</li> <li>technology transfer</li> <li>analogy/biomimicry</li> <li>lateral thinking</li> <li>SCAMPER</li> <li>moodboard.</li> </ul> <p>Existing products score zero.</p> <p>Mind maps score zero as it is not an idea generation technique.</p>

Question	Expected answer(s)	Max mark	Additional guidance
4.	<p>Computer generated graphics:</p> <p>Description containing any of the following benefits:</p> <ul style="list-style-type: none"> <li>• alignment of parts prior to assembly can be communicated</li> <li>• it is easy to gain a quick visual indication of the number of parts</li> <li>• a fully rendered model can be used to evaluate aesthetics</li> <li>• the concept can be sent electronically very quickly</li> <li>• alterations can be made very quickly</li> <li>• the model can be orientated to different angles</li> <li>• a machining file can be generated from the model</li> <li>• suitable to show to client</li> <li>• doesn't use materials like a physical model.</li> </ul> <p>Any other suitable response.</p>	3	<p>One mark for each valid point leading to a clear description up to a maximum of three marks.</p> <p>Unqualified '<i>quick</i>' '<i>easy</i>' and '<i>accurate</i>' score zero marks.</p> <p>Marks can be awarded for responses regarding computer graphics/models.</p> <p><i>'can't be lost as easy as a sketch'</i> scores zero marks.</p> <p><i>'To see if there are any mistakes'</i> scores zero marks - too generic.</p> <p><i>'you can see it in 3D'</i> on its own scores zero mark, however, <i>'you can see it in 3D therefore you can spin it around to view from different sides'</i> scores one mark.</p> <p>References to cost must be qualified.</p>
5.	<p>(a)</p> <p>Sketch model:</p> <p>An explanation that includes two of the following reasons:</p> <ul style="list-style-type: none"> <li>• sizes and proportions can be quickly checked before developing further</li> <li>• allows the user to interact with the blender and give feedback</li> <li>• sketch models are quick to produce allowing a lot to be made in a shorter time.</li> </ul> <p>Any other suitable response.</p>	2	<p>One mark for each valid explanation up to a total of two marks.</p> <p>To be awarded marks candidates must make reference to the development of the blender.</p> <p>Generic responses on the benefits of sketch models score zero marks.</p> <p>Responses that clearly refer to graphics gain zero marks.</p> <p><i>'rough idea of what the product could look like'</i> gains one mark</p> <p><i>'they are quick to make'</i> scores zero marks.</p>

Question		Expected answer(s)	Max mark	Additional guidance
	(b)	<p>Full-scale model:</p> <p>An explanation that includes two of the following reasons:</p> <ul style="list-style-type: none"> <li>• the capacity of the bowl can be checked so that it can hold enough fruit/veg etc.</li> <li>• size of handle can be evaluated so that it fits the hand</li> <li>• size of dial can be evaluated to see if it fits the fingers</li> <li>• footprint on kitchen work surface can be seen easily to judge how much space would be required</li> <li>• checking that parts fit together</li> <li>• checking proportion of parts.</li> </ul> <p>Any other suitable response.</p>	2	<p>One mark for each valid explanation up to a total of two marks.</p> <p>Repeat of answers from 5(a) cannot be awarded marks.</p> <p>To be awarded marks candidates must make reference to the development of the blender.</p> <p>Responses involving showing to the client can be awarded a mark as this infers part of the development.</p> <p><i>‘to see how big it is’</i> or <i>‘to test the size’</i> scores one mark.</p>

Question			Expected answer(s)	Max mark	Additional guidance
6.	(a)	(i)	<p>Function:</p> <p>Description must reference how the function of <b>one or both</b> of the backpacks have been influenced by the target market.</p> <p><b>Backpack A</b> Typical responses could include reference to:</p> <ul style="list-style-type: none"> <li>• can store commonly used walking/climbing equipment</li> <li>• includes lots of compartments to organise equipment</li> <li>• the lightweight material makes the backpack easy to carry in the hills</li> <li>• the straps are adjustable to suit different users</li> <li>• the colour is bright meaning that the user is easily seen outdoors</li> <li>• the fabric is easy to clean if it gets dirty in the hills.</li> </ul> <p>Any other suitable response.</p> <p><b>Backpack B</b> Typical responses could include reference to:</p> <ul style="list-style-type: none"> <li>• the backpack is small so easy to carry for a child</li> <li>• there are separate sections for items like pencils, water bottle etc.</li> <li>• the backpack material is resistant to spills/will not stain.</li> </ul> <p>Any other suitable response.</p>	2	<p>One mark for each valid point leading to a clear description up to a maximum of two marks.</p> <p>No marks should be awarded for generic statements.</p> <p><i>'Backpack A is large because hill walkers need to carry lots of stuff'</i> scores one mark.</p> <p><i>'Backpack B is small'</i> scores zero marks.</p> <p><i>'Backpack B is small and easy for a child to carry'</i> scores one mark.</p> <p><i>'the colour is bright'</i> scores zero marks.</p>

Question	Expected answer(s)	Max mark	Additional guidance
	<p>(ii) Aesthetics:</p> <p>Description must reference how the aesthetics of <b>one or both</b> of the backpacks have been influenced by the target market.</p> <p><b>Backpack A</b> Typical responses could include reference to:</p> <ul style="list-style-type: none"> <li>• the contrast of the orange and grey colours would appeal to an adult consumer</li> <li>• the target market may associate a sense of weight/balance provided by the use of black at the bottom of the backpack</li> <li>• the bright colour will make the backpack stand out in the hills.</li> </ul> <p><b>Backpack B</b> Typical responses could include reference to:</p> <ul style="list-style-type: none"> <li>• the animal theme appeals to children</li> <li>• the bright pink colour may appeal to children</li> <li>• children would be attracted by the shiny surface of the material.</li> </ul> <p>Any other suitable response.</p>	2	<p>One mark for each valid point leading to a clear description up to a maximum of two marks.</p> <p>Answers provided must provide a link between target market and aesthetics.</p> <p>No marks should be awarded for generic statements ie <i>'the colours are bright'</i> scores zero.</p> <p>Backpack A <i>'hillwalkers would want the vibrant red colour so that they can be seen on the hill in case they got lost'</i> scores one mark</p> <p>Backpack B <i>'the bright colours used appeal to children'</i> score one mark.</p>
	<p>(b) Marketing techniques:</p> <p>State two of the following marketing techniques:</p> <ul style="list-style-type: none"> <li>• introductory offers</li> <li>• free gifts</li> <li>• celebrity endorsement</li> <li>• adverts</li> <li>• sell under brand name</li> <li>• reviews.</li> </ul> <p>Any other suitable response.</p>	2	<p>One mark for each technique stated up to a maximum of two marks.</p> <p>Multiple references to adverts eg TV/newspaper adverts can only be awarded one mark.</p> <p>Multiple references to introductory offers eg vouchers/BOGOF can only be awarded one mark.</p>

Question		Expected answer(s)	Max mark	Additional guidance
7.	(a)	<p>Ergonomics:</p> <p>Description must reference how ergonomics may have influenced the camera.</p> <p>Typical responses could include reference to:</p> <ul style="list-style-type: none"> <li>• the size of the handle to fit the hand</li> <li>• the size of the button to fit the finger</li> <li>• the weight of the camera so that it is easy for a child to support</li> <li>• how hard you need to press the button</li> <li>• can you see clearly through the view finder/see the screen easily</li> <li>• is the layout of the control features easy to understand?</li> </ul> <p>Any other suitable response.</p>	4	<p>One mark for each valid point leading to a clear description up to a maximum of four marks.</p> <p>To be awarded marks candidates must provide a <b>description</b> when answering this question.</p> <p>Candidates may refer to:</p> <ul style="list-style-type: none"> <li>• Anthropometrics</li> <li>• Physiology</li> <li>• Psychology.</li> </ul> <p>There is no requirement to refer to any of these by name.</p> <p>Aesthetic responses (possible confusion with psychology) scores zero marks.</p> <p>A list of parts scores zero marks.</p> <p>Basic specification type statements such as: <i>'It must be easy to work'</i> score zero marks.</p> <p>Higher order specification type statements can gain marks: <i>'The button must be easy to press'</i> score one mark.</p>

Question	Expected answer(s)	Max mark	Additional guidance
(b)	<p>Performance:</p> <p>Description must reference how performance may have influenced the camera.</p> <p>Typical responses could include reference to:</p> <ul style="list-style-type: none"> <li>• maintenance</li> <li>• life expectancy</li> <li>• fitness-for-purpose</li> <li>• safety</li> <li>• changing batteries</li> <li>• withstanding misuse</li> <li>• easy to clean</li> <li>• value for money.</li> </ul> <p>Candidates can gain marks with multiple responses under each bullet point.</p>	2	<p>One mark for each valid point leading to a clear description up to a maximum of two marks.</p> <p>Responses similar to previous question can be awarded marks.</p> <p>Basic responses regarding function that do not indicate how well the product does its job score zero marks.</p> <p>eg <i>'it is easy to see through the view finder'</i> scores zero marks, however, <i>'the designer has used clear transparent material for the viewfinder which makes it easy for the child to see through the viewfinder'</i>, scores one mark.</p> <p><i>'the lens should be clear to look through'</i> scores zero.  <i>'the lens should be clear to look through to ensure that you can see what you are taking a photo of'</i> scores one.</p> <p><i>'the flash should be bright'</i> scores zero.  <i>'the flash should be bright so that you can take photos in the dark'</i> scores one.</p> <p><i>'it should be light in weight'</i> scores zero.  <i>'it should be light in weight so it is easy to carry around'</i> scores one.</p> <p><i>'The camera is made from hard plastic'</i> scores one mark (life expectancy).</p> <p><i>'The batteries should be easy to change'</i> scores one mark.</p> <p>Generic responses such as <i>'it should work well'</i> scores zero.</p>

Question	Expected answer(s)	Max mark	Additional guidance
(c)	<p>Technology push:</p> <p>A description that includes two research into new materials pushes the development on new products</p> <ul style="list-style-type: none"> <li>• research into new technology pushes the development on new products</li> <li>• research into new production methods pushes the development on new products</li> <li>• innovative technology generates new products</li> <li>• new products are created that are not based on market research.</li> </ul> <p>Any other suitable response.</p>	2	<p>One mark for each description up to a maximum of two marks.</p> <p>To be awarded marks candidates must provide a <b>description</b> when answering this question.</p> <p>Responses may be generic or could refer to a product such as the camera.</p> <p>Basic definitions of technology push scores one mark eg '<i>new technology being used to develop products.</i>'</p> <p><i>An extended response referring to one of the bullet points on the left giving a suitable example can score two marks.</i></p> <p>Description could reference how technology push has influenced the development of cameras.</p> <p>Typical responses could include reference to:</p> <ul style="list-style-type: none"> <li>• miniaturisation of technology</li> <li>• the change from film to digital storage media</li> <li>• an increase in the number of pictures it is possible to store</li> <li>• an increase in picture resolution</li> <li>• increased optical and digital zoom</li> <li>• the change to LCD screens from viewfinders.</li> </ul>

Question			Expected answer(s)	Max mark	Additional guidance
8.	(a)	(i)	<p>Thermoplastic for handle:</p> <p>Identify a suitable thermoplastic:</p> <ul style="list-style-type: none"> <li>• Polypropylene (or PP)</li> <li>• ABS</li> <li>• Polystyrene (HIPS).</li> </ul> <p>Typical responses could include reference to:</p> <ul style="list-style-type: none"> <li>• impact resistant - knife gets bashed and dropped</li> <li>• durable - resists wear of moving parts</li> <li>• does not snap easily - will resist being pushed when cutting</li> <li>• can be coloured to suit user preference</li> <li>• scratch resistant - could be put in and out of tool box etc.</li> </ul> <p>Any other suitable response.</p>	2	<p>One mark for naming a suitable thermoplastic.</p> <p>Candidates can refer to either the production or use of the knife.</p> <p>Other possible thermoplastics:</p> <ul style="list-style-type: none"> <li>• Nylon</li> <li>• Cellulose Acetate</li> <li>• HDPE</li> <li>• uPVC</li> <li>• Polycarbonate.</li> </ul> <p>Zero marks for:</p> <ul style="list-style-type: none"> <li>• PVC</li> <li>• LDPE</li> <li>• PE/POLYTHENE</li> <li>• PET</li> </ul> <p>(All consider too flexible)</p> <ul style="list-style-type: none"> <li>• Acrylic (too brittle).</li> </ul> <p>One mark for a valid point explaining its suitability.</p> <p>Typical response may be:</p> <p>‘won’t get damaged’ scores zero mark, however, ‘won’t get damaged as easily as acrylic’ scores one mark.</p> <p>Unqualified reference to singular material properties such as:  ‘strong’  ‘durable’  ‘cheap’  ‘waterproof’  ‘flexible’  ‘lightweight’ scores zero.</p> <p>For example:  ‘it is strong’ or ‘it is durable’ scores zero marks, however, ‘... is suitable as it resists wear of moving parts such as the sliding button’ scores one mark.</p> <p>‘available in many colours’ scores zero.</p>

Question	Expected answer(s)	Max mark	Additional guidance
	<p>(ii) Thermoplastic for package:</p> <p>Identify a suitable thermoplastic:</p> <ul style="list-style-type: none"> <li>• Polystyrene (HIPS)</li> <li>• ABS</li> <li>• Polypropylene (or PP).</li> </ul> <p>Typical responses could include reference to:</p> <ul style="list-style-type: none"> <li>• flexible - allows knife to be held in place</li> <li>• scratch resistant - makes packaging always look good</li> <li>• transparent - can see contents</li> <li>• available in sheet form so that it is easy to manufacture.</li> </ul> <p>Any other suitable response.</p>	2	<p>One mark for naming a suitable thermoplastic.</p> <p>Explanations must not repeat from section (i).</p> <p>Other possible thermoplastics:</p> <ul style="list-style-type: none"> <li>• PVC</li> <li>• Nylon</li> <li>• Cellulose Acetate</li> <li>• HDPE</li> <li>• LDPE</li> <li>• uPVC</li> <li>• PE/Polythene</li> <li>• PET</li> <li>• Polycarbonate.</li> </ul> <p>Zero marks for:</p> <ul style="list-style-type: none"> <li>• Acrylic- too brittle.</li> </ul> <p>One mark for a valid point explaining its suitability.</p> <p>Unqualified reference to singular material properties such as:  '<i>strong</i>'  '<i>durable</i>'  '<i>cheap</i>'  '<i>waterproof</i>'  '<i>flexible</i>'  '<i>lightweight</i>'  '<i>transparent</i>' scores zero.</p> <p>For example:  '<i>available in a range of colours</i>' - zero marks, however,  '<i>...is suitable as the packaging is see through and ... can be supplied in transparent form</i>' scores one mark.</p> <p><i>'lightweight'</i> on its own- zero marks, however,  '<i>lightweight for transportation</i>' scores one mark.</p>

Question		Expected answer(s)	Max mark	Additional guidance
	(b) (i)	Injection moulding.	1	One mark for correct process.
	(ii)	Vacuum forming. Any other suitable response.	1	Any other suitable response could include:  Thermoforming.  One mark for correct process.
	(c)	Die casting: State any two of the following: <ul style="list-style-type: none"> <li>• split lines</li> <li>• injection marks</li> <li>• ejection marks</li> <li>• flashing</li> <li>• good surface finish</li> <li>• accuracy</li> <li>• complexity.</li> </ul> Any other suitable response.	2	One mark for each identification feature of die casting up to a maximum of two marks.  <i>'made from metal'</i> scores one mark.

Question		Expected answer(s)	Max mark	Additional guidance
9.	(a)	<p>Description of benefits of 3D printers and laser cutters including any of the following:</p> <p>3D printers/Laser cutters</p> <ul style="list-style-type: none"> <li>models can be made with no craft skills</li> <li>the process is fully automated</li> <li>no need for workshops</li> <li>model can be created directly from CAD drawing</li> <li>creates complex models that are free from the restraints of traditional manufacturing techniques</li> <li>accuracy of parts</li> <li>reduces work force/wages as work is automated</li> <li>increased efficiency as machines can run 24 hours a day</li> <li>provides consistency as each part is manufactured identically.</li> </ul> <p>3D printer:</p> <ul style="list-style-type: none"> <li>same or similar materials to the final product can be used.</li> </ul> <p>Laser cutter:</p> <ul style="list-style-type: none"> <li>reduces lead time as less tooling is required</li> <li>have a faster production rate than tradition methods.</li> </ul> <p>Any other suitable response.</p>	4	<p>One mark for each benefit up to a maximum of four marks.</p> <p>Candidates may refer to 3D printers and/or laser cutters.</p> <p>Responses referring to the benefits of computerised systems can gain marks eg <i>'CNC files are easy to send via email/the internet'</i> or <i>'files are easy to modify on computerised systems.'</i></p> <p><i>'cheaper than by hand'</i> scores zero marks.</p> <p>Reference to 3D printers being quick/fast scores zero marks.</p> <p><i>'quicker to produce'</i> scores one mark only if laser cutter is specified.</p>

Question		Expected answer(s)	Max mark	Additional guidance
	(b)	<p>A description that includes two of the following.</p> <ul style="list-style-type: none"> <li>• fewer workers required</li> <li>• workers require a new skill set</li> <li>• lower salaries</li> <li>• economic decline of employee (or ex-employee) living area</li> <li>• processes are flexible in the manufacture of products</li> <li>• the price of 3D printers has made them affordable for home use meaning people can manufacture their own replacement parts.</li> </ul> <p>Any other suitable response.</p>	2	<p>One mark for each valid point leading to a clear description, up to a maximum of two marks.</p> <p>Unqualified '<i>quick</i>', '<i>cheap</i>' or '<i>easy</i>' responses score zero marks.</p>
10.		<p>Description of the steps designers and manufacturers could take to make products more sustainable including any of the following:</p> <ul style="list-style-type: none"> <li>• reduce</li> <li>• reuse</li> <li>• recycle</li> <li>• rethink</li> <li>• lifespan.</li> </ul> <p>Candidates can gain marks with multiple responses under each bullet point.</p>	3	<p>One mark for each valid point leading to a clear description, up to a maximum of three marks.</p> <p>Responses may be of an environmental nature.</p> <p><i>'Manufacturers could label parts to make products easier to recycle'</i> scores one mark.</p> <p><i>'extending the lifespan'</i> scores one, however, <i>'extending the lifespan by giving the steel a plastic coat'</i> scores two.</p> <p><i>'increasing thickness'</i> scores zero, however, <i>'increasing thickness to increase strength'</i> scores one mark.</p>

Question	Expected answer(s)	Max mark	Additional guidance
11.	<p>Description of benefits of using standard components including any of the following:</p> <ul style="list-style-type: none"> <li>• produced in standard sizes so easy to incorporate into designs</li> <li>• reduces the need for skilled workforce</li> <li>• cheaper than producing yourself</li> <li>• can be used on different products</li> <li>• reliable/quality assured by producer</li> <li>• ease of repair/maintenance</li> <li>• available in large quantities/easy to source</li> <li>• will fit common tools</li> <li>• can transfer across different products</li> <li>• don't have to manufacture them yourself</li> <li>• fewer stages in production.</li> </ul> <p>Any other suitable response.</p>	3	<p>One mark for each valid point leading to a clear description, up to a maximum of three marks.</p> <p>Unqualified '<i>quick</i>', '<i>cheap</i>' or '<i>easy</i>' responses score zero marks.</p> <p>Responses such as:</p> <p><i>'speeds up production process'</i> scores one mark.</p>

[END OF MARKING INSTRUCTIONS]