



MATERIALS DESIGN AND TECHNOLOGY

ATAR course examination 2018

Marking Key

Marking keys are an explicit statement about what the examining panel expect of candidates when they respond to particular examination items. They help ensure a consistent interpretation of the criteria that guide the awarding of marks.

Section One: Short answer

15% (30 Marks)

Question 1

(8 marks)

- (a) List **three** essential pieces of information that must be included on a working drawing **or** specification sheet. (3 marks)

Description	Marks
One mark for each relevant piece information that should be included on a working drawing or specification sheet	1–3
Total	3
Answers could include: <ul style="list-style-type: none"> • title block/name of drawing • scale • individual material sizes • grain line • overall sizes • context appropriate views (only 1 mark available for view) • joining methods • hidden detail. 	
Accept other relevant answers.	

- (b) Identify **three** consequences of an error in a working drawing **or** specification sheet. (3 marks)

Description	Marks
One mark for each relevant consequence	1–3
Total	3
Answers could include: <ul style="list-style-type: none"> • wrong amount of materials ordered • project being incorrect size • parts not fitting together as planned • deadlines missed due to reordering • wrong materials ordered • cost increase (budget). 	
Accept other relevant answers.	

- (c) Describe how a working drawing **or** specification sheet contributes to materials and costing predictions. (2 marks)

Description	Marks
Detailed description of how a working drawing or specification sheet dictates materials and costing predictions	2
Limited description of how a working drawing or specification sheet contributes to materials and costing predictions	1
Total	2
Answers could include: <p>Working drawings and specification sheets contribute by showing the overall materials and consumables needed to produce a full-sized product. This then becomes a reference for accurate ordering and costing of materials.</p>	
Accept other relevant answers.	

Question 2

(10 marks)

Define the following design fundamentals and describe how you applied each one in the design of **one** of your projects this year.

Description	Marks
For each design fundamental (5 x 2)	
One mark for the definition of the design fundamental	1
One mark for a relevant example relating to how the fundamental was applied	1
Subtotal	2
Total	10

Answers could include:

Aesthetics

Aesthetics is the study of the mind and how we interpret a product, for example the look of it

The use of contrasting timbers gave my project a great look and made it stand out against the other furniture in the room

The intercut pattern on the back of my chair was made of multiple piece of MS Rod and was very eye catching

The combined use of asymmetry, emphasis and proportion in the skater style one shoulder dress created a sense of balance.

Function

Function is the action or purpose of an object

The low and wide design of the table makes it perfect for the middle of the living area

The seat height and back rest height have been ergonomically designed to ensure that the chair can be used as an everyday chair that will be comfortable for the user

The addition of deep pockets in the skirt of the dress mean a clutch bag is not necessary when going out dancing.

Sustainability

Sustainability is the ability to avoid the overuse of natural resources in order to maintain an ecological balance

By only using jarrah for my inlay I was able to get all of my materials from the offcuts. This meant that I didn't need to order any new materials

As I used a lot of small decorative pieces on the chair I was able to source a lot of the material from the storage and recycling racks in the workshop

A polyester spandex blend scuba knit fabric means the dress can be washed in a regular, fast wash and does not need to be dry cleaned or ironed.

Safety

Safety is protecting the end user from or unlikely to cause danger, risk or harm while using the product

I gave my project a wide leg stance and a low top. This has given the table a low centre of gravity which will limit the chances of it tipping

The wide leg stance has made the chair very functional, letting it be used on uneven surfaces like grass

Because the dress is spandex it does not need a fastening that might catch on furniture or in hair.

Question 2 (continued)

Cost

Cost is your budget and how much you have to spend on materials, labour and consumables

By using pine as my main material and applying a darker stain I was able to limit my spending and stay within budget

By managing the usage of my materials and offcuts I was able to limit the costs and afford to get the chair powder-coated like the client requested

By buying fabric that was on a 150 metres wide roll, I was able to lay all pattern pieces side by side, saving on fabric costs.

Accept other relevant answers.

Question 3

(12 marks)

Using annotations, identify and evaluate the successful application of **three** ergonomic and **three** anthropometric features to this mountain bike on the image below.

Description	Marks
For three ergonomics features (maximum 2 marks for each annotation).	
Annotations are evaluated using appropriate terminology	2
Annotations identified with little justification	1
Subtotal	6
For three anthropometric features (maximum 2 marks for each annotation).	
Annotations are evaluated using appropriate terminology	2
Annotations identified with little justification	1
Subtotal	6
Total	12

Answers could include:

Ergonomics

- the grip – so that the rider’s hands don’t slip off
- the seat shape – so that the rider has a comfortable seating position
- the position of the brakes – easy for the rider to pull the brakes without taking a hand off the handle bar
- pedal sizes – the rider has enough area to get a good grip
- the grip on the valve cover
- grip on the pedals – so that the rider’s footwear doesn’t slip
- suspension – this absorbs the force of collisions, making a smoother ride.

Anthropometrics

- relationship of seat to handle bars – comfortable position for individual riders
- seat to pedals – the rider can easily move their legs without hitting the frame or handle bars
- diameter of the handles – allows the rider to have a good grip
- stack height of handle bar – allows the rider to ride in comfortable position
- access to the valve – rider can get their hand/fingers in between the wheel spokes
- crank length – allows the rider to rotate the pedals with little effort or strain
- wheel sizes – allows the user to take the bike onto certain types of terrain.

Accept other relevant answers.

Section Two: Extended answer

25% (38 Marks)

Question 4

(7 marks)

- (a) Using an example, explain the difference between a hazard and a risk. (2 marks)

Description	Marks
Detailed example explaining the difference between a hazard and a risk	2
Limited explanation of the difference between a hazard and a risk	1
Total	2
<p>Answers could include:</p> <p>Definition: A hazard is something that can cause harm and a risk is the chance any hazard will actually cause somebody harm.</p> <p>Example: If you were to come across a snake in your workshop you would class that as a hazard. This is because the snake has the potential to do harm to you. The risk is the likelihood that the snake will hurt you; the closer you get to it the higher the risk.</p> <p>Accept other relevant answers.</p>	

- (b) Identify
- two**
- pieces of information that can be found on a material safety data sheet and explain why material safety data is important. (5 marks)

Description	Marks
For each of two pieces of information (maximum 1 mark per example)	
Correctly identifies information found on a material safety data sheet	1
Subtotal	2
Explains why material safety data is important	3
Describes why material safety data is important	2
States why material safety data is important	1
Subtotal	3
Total	5
<p>Answers could include:</p> <p>Information found on a material safety data sheet:</p> <ul style="list-style-type: none"> • product information: product identifier (name) • manufacturer and suppliers names, addresses, phone numbers • emergency phone numbers • hazardous ingredients • physical data • fire or explosion hazard data • reactivity data: information on the chemical instability of a product and the substances it may react with • toxicological properties: health effects • preventive measures • first aid measures • storage • disposal. <p>Explanation of why material safety data is important: Material safety data helps to make people aware of the potential hazards of using a particular product. By reading this information, those people who use a particular product can find out more about its hazardous ingredients, as well as how to handle and store the product appropriately. Personal safety when using the product, as well as the type of first aid that should be applied in the event of an emergency, are also detailed.</p> <p>Accept other relevant answers.</p>	

Question 5

(10 marks)

- (a) In light of this statement, explain how the designer could have collected information to identify and predict the needs and wants of consumers with regard to the hair dryer pictured above. (4 marks)

Description	Marks
Comprehensive explanation of how a designer collects the information to identify and predict the needs and wants of the consumers	4
Detailed explanation of how a designer collects the information to identify and predict the needs and wants of the consumers	3
Brief explanation of how a designer collects the information to identify and predict the needs and wants of the consumers	2
Limited explanation of how a designer collects the information to identify and predict the needs and wants of the consumers	1
Total	4
<p>Answers could include: A designer can use a wide variety of ways to collect information. They can use online surveys, focus groups or look at the current market. From this information they can predict the wants and needs of the consumers by gaining an insight into what they like and don't like, what they would be willing to spend and what they want from the product. By doing this the designer will have a list of points that they can use to help them design their concepts.</p>	
Accept other relevant answers.	

- (b) Outline **three** wants and/or needs that a consumer might consider when selecting a hair dryer. (6 marks)

Description	Marks
For each of three wants and/or needs (maximum two marks per example)	
Outlines clearly a want or need that might be considered	2
Identifies a want or need that might be considered	1
Subtotal	2
Total	6
<p>Answers could include:</p> <ul style="list-style-type: none"> • weight – how heavy? • speed – what speeds are available? • power – what's the usage? • functions – are there any functions other than blow drying? • cost – what is the cost? • aesthetics – colours? • ergonomics – size? • settings – easy to reach? • durability – what materials have been used? • quality of build – feels cheap? feels durable? • country of origin – is it from a country that has ethical work practice? 	
Accept other relevant answers.	

Question 6

(11 marks)

- (a) Analyse the **two** car stereos in relation to the following influences on design, using the specifications provided to support your analysis. (9 marks)

Description	Marks
Innovation	
Comprehensive analysis of innovation, with reference to the specifications	3
Some analysis of innovation with reference to the specifications	2
One fact stated about innovation	1
Subtotal	3
Lifestyle	
Comprehensive analysis of lifestyle, with reference to the specifications	3
Some analysis of lifestyle with reference to the specifications	2
One fact stated about lifestyle	1
Subtotal	3
Consumer demand	
Comprehensive analysis of consumer demand, with reference to the specifications	3
Some analysis of consumer demand with reference to the specifications	2
One fact stated about consumer demand	1
Subtotal	3
Total	9
Comprehensive answers could include:	
<p>Innovation Innovation of the car stereo follows the home and personal stereos, and in the 1990's the CD player was the most innovative feature that could be included, whereas now car stereos can be connected by cable or bluetooth to a smartphone.</p>	
<p>Lifestyle Busy lifestyles and the need for commuting means drivers want to be able to perform other functions in their cars safely, such as using on screen map navigation, making and receiving calls using Siri and even having Siri read texts out loud and sending them for the driver so the driver does not need to take his or her hands off the steering wheel.</p>	
<p>Consumer demand Consumers of today expect to be connected 24/7. The demand for the Apple CarPlay/Android Auto feature that connects directly to the driver's smart phone may mean that cars with this feature installed will outsell cars that do not have the feature. This is much like cars that did not have CD players in the late 1990's were likely outsold by those with them.</p>	

Question 6 (continued)

- (b) Describe the relationship between innovation, lifestyle and consumer demand. (2 marks)

Description	Marks
Comprehensive description of the relationship between innovation, lifestyle and consumer demand	2
States a fact or makes a statement about the relationship between innovation, lifestyle and consumer demand	1
Total	2
<p>Sample answer:</p> <p>Innovation is often dependent on the consumer demand for improvement in a product which is in turn influenced by current lifestyle trends. The use of smartphones for managing one's life is a current lifestyle trend. Designers investigate ways to innovate products in order to improve them so that they remain competitive, such as in the Samsung/Android versus iPhone market battle. The idea is that by making innovations that create improvements to lifestyle or make life easier, that consumer demand for that product will in turn increase.</p>	
Accept other relevant answers.	

Question 7

(10 marks)

Outline **five** effects of automation on production for companies and their employees.

Description	Marks
For each of five examples (maximum of two marks for each example)	
Detailed answer outlining an effect automation has had on production	2
Limited answer identifying an effect automation has had on production	1
Subtotal	2
Total	10
Effects could include: <ul style="list-style-type: none"> • initial set up costs • break down and maintenance costs • increased labour productivity • reduced labour costs • offsets the effect of labour shortages • reduces/eliminates routine manual tasks • improves work safety • improves manufacture quality • reduces the wait time between ordering and manufacturing • it can complete tasks that manual operates could find hard or dangerous • loss of manual labour jobs • set up and running costs • training upskilling costs • increased health benefits • less injuries through repetitive tasks and manual lifting. 	
Accept other relevant answers.	

Section Three: Wood context

60% (75 Marks)

Question 8

(10 marks)

- (a) Explain why testing a range of materials is important when researching the most suitable material to use for a project. (2 marks)

Description	Marks
Detailed explanation of testing and why it is important	2
Superficial explanation of testing and why it is important	1
Total	2
<p>Sample answer:</p> <p>Testing a range of materials compares their physical properties to determine which materials are suited to certain tasks. It can involve a relatively simple test to determine what material could be suitable for a specific project.</p>	

- (b) Explain how you would carry out a workshop testing technique to test a range of materials for hardness and how you would analyse the results. (8 marks)

Description	Marks
Comprehensive explanation of the testing technique including set-up, how the test was carried out, control measures to be considered and how the results would be interpreted	7–8
Detailed explanation of most of the testing technique including set-up, how the test was carried out, control measures to be considered and how the results would be interpreted	5–6
Limited explanation of the testing technique including how the test was carried out, control measures to be considered and how the results would be interpreted	3–4
Superficial explanation with a few correct points describing the testing technique. No mention of results and analysis	1–2
Total	8
<p>Answers could include:</p> <p>Set up Material samples are all the same size Mark the centre of each piece Set up your jig/testing technique.</p> <p>How the test is carried out A weight is dropped at a set height onto each piece of material. You must ensure that the weight hits the centre of the materials as you may get a different result if it hits off to the side.</p> <p>Control measures The tests must be carried out at the same time Same weight dropped on each piece The test must be carried out on a level surface.</p> <p>Interpreting the results Once the test is complete you would then compare the indentations left on the material's surface. The larger the indentation, the less hard the material is. The smaller the indentation means the material is harder.</p>	

Question 9

(9 marks)

Explore the life cycle of the product below. The main material used is pine. You should discuss the following:

- use of energy and materials
- pollution and waste management
- minimising waste at the end of the life of the product.

Description	Marks
Use of energy and materials	
Comprehensive discussion of energy and materials in product life cycle	3
Detailed discussion of energy and materials in product life cycle	2
Limited discussion of energy and materials in product life cycle	1
Subtotal	3
Pollution and waste management	
Comprehensive discussion of pollution and waste management in product life cycle	3
Detailed discussion of pollution and waste management in product life cycle	2
Limited discussion of pollution and waste management	1
Subtotal	3
Minimising waste at the end of the life of the product	
Comprehensive discussion of minimising waste at the end of the product's life	3
Detailed discussion of minimising waste at the end of the product's life	2
Limited discussion of minimising waste	1
Subtotal	3
Total	9
<p>Answers could include:</p> <p>Use of energy and materials</p> <ul style="list-style-type: none"> • what type of machinery is needed to extract/harvest the material? • where is it being sourced? • is it sustainable? • pollution during conversion • waste by-products • transportation needed • embedded energy in the materials production. <p>Pollution and waste management</p> <ul style="list-style-type: none"> • what types of machinery are being used to convert the material? • how is it being seasoned/converted? • can the off-cuts be recycled? • how can we limit pollution? • what damage is caused to the environment? • transport of materials a different stage. <p>Minimising waste at the end of the life of the product</p> <ul style="list-style-type: none"> • can it be broken down easily to salvage parts? • is it easy to recycle? • what type of finish has been applied? • easy to disassemble? • what is being used to hold it together? • economic market for it? worth recycling? <p>Accept other relevant answers.</p>	

Question 10

(26 marks)

- (a) Using the information on the previous page, produce a developed design concept that could be presented to the client. Use annotations to justify your decisions. (14 marks)

Description	Marks
For the sketch (maximum 4 marks)	
Exceptional drawing showing high level of detail	4
Good drawing showing good detail	3
Satisfactory drawing showing some detail	2
Limited drawing with minimal detail	1
Subtotal	4
For each annotation (2 marks, to a maximum of 10 marks)	
Annotations are justified using appropriate terminology	2
Annotations identified with little justification	1
Subtotal	10
Total	14
Annotations should address the client's wants and design specifications: <ul style="list-style-type: none"> • taper leg • square top with a decorative edge • double pin stripe inlay on the top • post box styled drawer front • shelf incorporated somewhere • combination of timbers. 	

- (b) With reference to production and strength, compare **two** suitable joining techniques that could be used to produce the table top. (6 marks)

Description	Marks
Correctly identifies each joining technique	1–2
Subtotal	2
Comprehensive comparison of the production and strength of each joining technique	
Detailed comparison of the production and strength of each joining technique	4
Describes the production and strength of each joining technique but has no comparison	3
Limited description of joining techniques	2
Subtotal	4
Total	6
Answers could include comparisons between joining techniques such as: <p>Butt joint The simplest of the widening joints, the edges are simply glued together. Because of the limited gluing area the joining method isn't very strong. To ensure a strong bond, you would need to ensure that you used a strong adhesive such as epoxy resin and that the join area is even.</p>	

<p>Domino joint Domino joint is a modern take on the biscuit joint. Boards are held together using wooden dominos that are designed to expand when drying. The slots for the dominos are cut using a domino cutter. The grain of the dominos is perpendicular to the timber’s grain which increases the joint’s strength. This power tool provides accurate cuts and is quick to do. Due to its large gluing area this joining method is very strong.</p> <p>Biscuit joint The biscuit joint is similar to the domino joint, but the joining material is a disc shape.</p> <p>Groove and Feather joint This joining method is achieved by cutting two identical slots in the joining faces of the boards. Then a small strip of material is cut to slot into the grooves; this is known as a feather. If the grain of the feather runs in the same direction as the slot it could break over time as the pressure is on the grain. This join has a large gluing area which helps its strength.</p> <p>Knock Down Fittings This joint allows the user to assemble and disassemble the top using a variety of configurations.</p>

- (c) With reference to their properties and suitability, compare **two** appropriate finishes for this product. (6 marks)

Description	Marks
Correctly identifies each appropriate finish	1–2
Subtotal	2
Comprehensive comparison of the properties of each finish	4
Detailed comparison of the properties of each finish	3
Describes the properties each finish but has no comparison	2
Limited description of finishes	1
Subtotal	4
Total	6
<p>Answers could include:</p> <p>Varnish Varnish is a hard wearing finish that is almost non-permeable, has good water resistance, durability and is heat resistant. When applying is slow to dry. Once dry it can mark easily. It is also very difficult to repair.</p> <p>Oil Oil finishes have a medium to hard rating, they are hard wearing and have a good level of water resistance. It does require multiple coats as the oil soaks into the grains. It is very easy to apply. Unlike varnish, oil finishes can be repaired easily.</p> <p>Wax Wax is designed to feed and protect the wood, but it will not penetrate a sealed surface.</p>	

Question 11

(10 marks)

Using the correct terminology, explain how you would construct the **three** pieces that make up the puzzle. You should mention marking out, cutting, shaping and finishing.

Description	Marks
Qualitative explanation of how to mark out, cut, shape and finish each part of the project	9–10
Highly detailed explanation of how to mark out, cut, shape and finish each part of the project	7–8
Detailed explanation of how to mark out, cut, shape and finish each part of the project	5–6
Limited explanation of how to mark out, cut, shape and finish each part of the project	3–4
Superficial explanation of how to mark out, cut, shape and finish each part of the project	1–2
Total	10
Answers could include:	
Marking out Using the drawing as a reference all parallel lines to the long edge should be marked 12 mm in with a marking gauge. Then, using a try square, all lines that run across the faces should be marked. It is important that all lines match up.	
Cutting The waste material in the centre of each piece can be removed using different techniques. An example of this is to use a drill press and an 8 mm (or similar) to drill out the centre of pieces. Then I would remove the slots using a tenon saw. You would need to take care so that you don't damage the face as you cut through. Once this is completed I would cut the length into the three pieces.	
Shaping To clean up the inside faces I would use a mortise chisel and files to ensure all parts are shaped correctly. I would use a universal sander to sand the ends to the line. Before moving onto finishing I would test fit the pieces to ensure they fit correctly.	
Finishing I would sand each face with a variety of abrasive papers, starting low and working my up to a high grit such as P1000. Once I have all the surfaces smooth and even, I would apply a thin coat of Danish oil to seal the material.	
Accept other relevant answers.	

Question 12

(8 marks)

Globalisation of the production of materials affects both individuals and nations. With reference to **one** material, discuss the potential positive and negative impacts of globalisation of this material on the following:

Description	Marks
Local industry	
Highly detailed discussion of positive and negative impacts of globalisation on local industry	4
Detailed discussion of positive and negative impacts of globalisation on local industry	3
Limited discussion of positive and negative impacts of globalisation on local industry	2
Superficial discussion of positive and negative impacts of globalisation on local industry	1
Subtotal	4
International industry	
Highly detailed discussion of positive and negative impacts of globalisation on international industry	4
Detailed discussion of positive and negative impacts of globalisation on international industry	3
Limited discussion of positive and negative impacts of globalisation on international industry	2
Superficial discussion of positive and negative impacts of globalisation on international industry	1
Subtotal	4
Total	8
Answers could include:	
<p>Local industry</p> <p>Positives:</p> <ul style="list-style-type: none"> • access to different timber in communities where options are limited, via online ordering • wider variety of products is available • independent retailers have better access to international products • local businesses have wider access to clients via social media such as Instagram or Facebook • online sales are possible so local businesses can reach beyond their local scope • opportunities to look at sustainable options or other niche materials and processing methods <p>Negatives:</p> <ul style="list-style-type: none"> • reduction in local processing leads to reduction in jobs in local communities • smaller independent companies face competition from larger national and international corporations • competition from the online market for materials • in some cases the material is felled in Australia, but then processed elsewhere before being sold back to Australians at a higher price, meaning there is a lack of value adding. 	

Question 12 (continued)

International industry

Positives:

- ease of communications between national branches
- distribution is streamlined and more easily tracked
- first world countries benefit due to bigger budgets and better access to resources
- better access to information on whether timber bought overseas is ethical or sustainable
- global companies may have more sophisticated research and development.

Negatives:

- reduction in manufacturing as companies go offshore to save money
- no restrictions are placed on material that is not farmed ethically
- materials may not be worth as much due to the fluctuating value of the dollar
- lack of support from the government to counteract problems with the profitability
- high taxes.

Accept other relevant answers.

Question 13

(12 marks)

Using examples, explain how you documented all **six** stages of the design and production process throughout your portfolio this year.

Description	Marks
Comprehensive explanation of the documentation of all of the stages of the design and production process throughout their portfolio this year	11–12
Qualitative explanation of the documentation of 5–6 stages of the design and production process throughout their portfolio this year	9–10
Highly detailed explanation of the documentation of 4–5 stages of the design and production process throughout their portfolio this year	7–8
Detailed explanation of the documentation of 3–4 stages of the design and production process throughout their portfolio this year	5–6
Limited explanation of the documentation of 2–3 stages of the design and production process throughout their portfolio this year	3–4
Superficial explanation of the documentation of one stage throughout their portfolio	1–2
Total	12
<p>Answers could include:</p> <p>Criterion 1 – Statement of intent/design proposal</p> <ul style="list-style-type: none"> • client interview • statement of intent • mind map <p>Criterion 2 – Research</p> <ul style="list-style-type: none"> • materials • material testing • finishes • joining techniques • adhesives • existing solutions • justification of selections in reference to statement of intent • looks at design fundamentals <p>Criterion 3 – Development of ideas and concepts</p> <ul style="list-style-type: none"> • concepts • developments • client feedback • solution • justification of selections in reference to statement of intent • looks at design fundamentals <p>Criterion 4 – Production proposal (materials/planning process)</p> <ul style="list-style-type: none"> • costing • materials list • production plan • working drawings • Gantt charts • sequence of operations/flow diagrams • safety considerations/risk management 	

Question 13 (continued)

Criterion 5 – Evidence of production (visual/time process)

- production journal
- evidence of risk management
- pictures of each stage of manufacture
- modified plans/costing
- modified drawings

Criterion 6 – Finished product and final evaluation

- client evaluation
- self-evaluation
- compare to statement of intent

Section Three: Metal Context

60% (75 Marks)

Question 14

(10 marks)

- (a) Explain why testing a range of materials is important when researching the most suitable material to use for a project. (2 marks)

Description	Marks
Detailed explanation of testing and why it is important	2
Superficial explanation of testing and why it is important	1
Total	2
<p>Sample answer:</p> <p>Testing a range of materials compares their physical properties to determine which materials are suited to certain tasks. It can involve a relatively simple test to determine what material could be suitable for a specific project.</p>	

- (b) Explain how you would carry out a workshop testing technique to test a range of materials for hardness and how you would analyse the results. (8 marks)

Description	Marks
Comprehensive explanation of the testing technique including set-up, how the test was carried out, control measures to be considered and how the results would be interpreted	7–8
Detailed explanation of most of the testing technique including set-up, how the test was carried out, control measures to be considered and how the results would be interpreted	5–6
Limited explanation of the testing technique including how the test was carried out, control measures to be considered and how the results would be interpreted	3–4
Superficial explanation with a few correct points describing the testing technique. No mention of results and analysis	1–2
Total	8
<p>Answers could include:</p> <p>Set-up Material samples are all the same size Mark the centre of each piece Set up your jig/testing technique</p> <p>How the test is carried out A weight is dropped at a set height onto each piece of material. You must ensure that the weight hits the centre of the materials as you may get a different result if it hits off to the side</p> <p>Control measures The tests must be carried out at the same time Same weight dropped on each piece The test must be carried out on a level surface</p> <p>Interpreting the results Once the test is complete you would then compare the indentations left on the material's surface. The larger the indentation, the less hard the material is. The smaller the indentation means the material is harder.</p>	

Question 15

(9 marks)

Explore the life cycle of the product below. The main material used is mild steel tubing. You should discuss the following:

- use of energy and materials
- pollution and waste management
- minimising waste at the end of the life of the product.

Description	Marks
Use of energy and materials	
Comprehensive discussion of energy and materials in product life cycle	3
Detailed discussion of energy and materials in product life cycle	2
Limited discussion of energy and materials in product life cycle	1
Subtotal	3
Pollution and waste management	
Comprehensive discussion of pollution and waste management in product life cycle	3
Detailed discussion of pollution and waste management in product life cycle	2
Limited discussion of pollution and waste management	1
Subtotal	3
Minimising waste at the end of the life of the product	
Comprehensive discussion of minimising waste at the end of the product's life	3
Detailed discussion of minimising waste at the end of the product's life	2
Limited discussion of minimising waste	1
Subtotal	3
Total	9

Answers could include:

Use of energy and materials

- what type of machinery is needed to extract the material?
- where is it being sourced?
- is it sustainable?
- pollution during conversion
- waste by-products
- transportation needed

Pollution and waste management

- what types of machinery are being used to convert the material?
- was the material sustainably sourced?
- how was the finish applied?
- can the off-cuts be recycled?
- how can we limit pollution?

Minimising waste at the end of life of the product

- can it be broken down easily to salvage parts?
- is it easy to recycle?
- what type of finish has been applied?
- easy to disassemble?
- what is being used to hold it together?

Accept other relevant answers.

Question 16

(26 marks)

- (a) Using the information on the previous page, produce a developed design concept that could be presented to the client. Use annotations to justify your decisions. (14 marks)

Description	Marks
For the sketch (maximum 4 marks)	
Exceptional drawing showing high level of detail	4
Good drawing showing good detail	3
Satisfactory drawing showing some detail	2
Limited drawing with minimal detail	1
Subtotal	4
For each annotation (2 marks, to a maximum of 10 marks)	
Annotations are justified using appropriate terminology	2
Annotations identified with little justification	1
Subtotal	10
Total	14
Annotations should address the client's wants and design specifications: <ul style="list-style-type: none"> • modern design • curved feature • simple geometric lines in the back • square seat • styled supports on legs • a combination of metals used • weather-resistant • high back. 	

- (b) With reference to production and strength, compare **two** suitable joining techniques that could be used to produce the chair. (6 marks)

Description	Marks
Correctly identifies each suitable joining technique.	1–2
Subtotal	2
Comprehensive comparison of the production and strength of each joining technique	
Detailed comparison of the production and strength of each joining technique	4
Describes the production and strength of each joining technique but has no comparison	3
Limited description of joining techniques	2
Subtotal	4
Total	6
Answers could include: <p>MIG welding</p> <ul style="list-style-type: none"> • MIG is faster and less labour intensive • easy to train operator to weld • can require more clean-up due to welding splatter • parts are much easier to tack together with the MIG • good welding penetration • strong welding process. 	

Question 16(b) (continued)

<p>TIG welding</p> <ul style="list-style-type: none"> • TIG process is slower and more labour intensive to weld • TIG process is neater and has less welding splatter • more time needed to train people to use • potentially less clean-up • excellent welding penetration.
Accept other relevant answers.

(c) With reference to their properties and suitability, compare **two** appropriate finishes for this product. (6 marks)

Description	Marks
Correctly identifies each suitable finish.	1–2
Subtotal	2
Comprehensive comparison of the properties of each finish	4
Detailed comparison of the properties of each finish	3
Describes the properties each finish but has no comparison	2
Limited description of finishes	1
Subtotal	4
Total	6

Answers could include comparisons between finishes such as:

Powder coating

- reasonable weather resistance
- quick production process
- requires specialised equipment and trained technicians to apply powder coating
- reasonable surface preparation required
- expensive for one-off pieces.

Hot-dipped galvanising

- reasonable weather resistance
- quick production process
- requires specialised equipment and trained technicians to apply hot-dipped galvanising
- reasonable surface preparation required
- expensive for one-off pieces.

Paint

- reasonable weather resistance
- reasonable abrasion and scratch resistance
- reasonable surface preparation
- does not require highly trained technicians and specialised equipment to apply paint
- paint is easy to use and acquire.

Accept other relevant answers.

Question 17

(10 marks)

Using the correct terminology, explain how you would construct Parts A, B, C and D. You should mention marking out, cutting, joining, shaping and turning.

Description	Marks
Qualitative explanation of how you would mark out, cut, join, shape and turn each part of the project	9–10
Highly detailed explanation of how you would mark out, cut, join, shape and turn each part of the project	7–8
Detailed explanation of how you would mark out, cut, join, shape and turn each part of the project	5–6
Limited explanation of how you would mark out, cut, join, shape and turn each part of the project	3–4
Superficial explanation of how you would mark out, cut, join, shape and turn each part of the project	1–2
Total	10
<p>Answers could include:</p> <p>Part A</p> <ul style="list-style-type: none"> • round bar > Ø23 mm turned down on metal lathe to finished size of Ø23 mm • face end • centre drill face • bore with Ø5 mm drill > 8 mm deep • part off at > 8 mm • turn and face-off back • mark and centre onto clamp body and MIG weld into place. <p>Part B</p> <ul style="list-style-type: none"> • round bar > Ø23 mm turned down on metal lathe to finished size of Ø23 mm • face end • centre drill face • bore with Ø5 mm drill > 8 mm deep • chamfer hole • part off at > 8 mm • turn and face-off back • use engineers hammer to peen into place on threaded bar. <p>Part C</p> <ul style="list-style-type: none"> • cut threaded bar to > 215 mm • face and turn one end to Ø5 mm and turn along 15 mm • face and turn the other end to Ø10 mm and turn along 20 mm • use engineers hammer to peen part B into place on Ø5 mm end of threaded bar • silver solder or braze part onto threaded bar. <p>Part D</p> <ul style="list-style-type: none"> • round bar > Ø23 mm turned down on metal lathe to finished size of Ø23 mm • face end • centre drill face • bore hole Ø10.5 mm > 25 mm deep in preparation for tapping with M12 tap • part off or cut off using cold saw at > 25 mm • turn and face-off back to 25 mm • use M12 tap to thread part D • mill 10 mm wide flat. <p>Accept other relevant answers.</p>	

Question 18

(8 marks)

Globalisation of the production of materials affects both individuals and nations. With reference to **one** material, discuss the potential positive and negative impacts of globalisation of this material on the following:

Description	Marks
Local industry	
Highly detailed discussion of positive and negative impacts of globalisation on local industry	4
Detailed discussion of positive and negative impacts of globalisation on local industry	3
Limited discussion of positive and negative impacts of globalisation on local industry	2
Superficial discussion of positive and negative impacts of globalisation on local industry	1
Subtotal	4
International industry	
Highly detailed discussion of positive and negative impacts of globalisation on international industry	4
Detailed discussion of positive and negative impacts of globalisation on international industry	3
Limited discussion of positive and negative impacts of globalisation on international industry	2
Superficial discussion of positive and negative impacts of globalisation on international industry	1
Subtotal	4
Total	8

Answers could include:

Local industry

Positives:

- access to different metals in communities where options are limited, via online ordering
- wider variety of products is available
- independent retailers have better access to international products
- local businesses have wider access to clients via social media such as Instagram or Facebook
- online sales are possible so local businesses can reach beyond their local scope
- opportunities to look at sustainable options or other niche materials and processing methods.

Negatives:

- reduction in local processing leads to reduction in jobs in local communities
- smaller independent companies face competition from larger national and international corporations
- competition from the online market for materials
- in some cases the material is mined in Australia, but then processed elsewhere before being sold back to Australians at a higher price, meaning there is a lack of value adding.

International industry

Positives:

- ease of communications between national branches
- distribution is streamlined and more easily tracked
- first world countries benefit due to bigger budgets and better access to resources
- better access to information on whether material bought overseas is ethical or sustainable
- global companies may have more sophisticated research and development.

Negatives:

- reduction in manufacturing as companies go offshore to save money
- no restrictions are placed on material that is not obtained ethically
- materials may not be worth as much due to the fluctuating value of the dollar
- lack of support from the government to counteract problems with the profitability
- high taxes.

Accept other relevant answers.

Question 19

(12 marks)

Using examples, explain how you documented all **six** stages of the design and production process throughout your portfolio this year.

Description	Marks
Comprehensive explanation of the documentation of all of the stages of the design and production process throughout their portfolio this year	11–12
Qualitative explanation of the documentation of 5–6 stages of the design and production process throughout their portfolio this year	9–10
Highly detailed explanation of the documentation of 4–5 stages of the design and production process throughout their portfolio this year	7–8
Detailed explanation of the documentation of 3–4 stages of the design and production process throughout their portfolio this year	5–6
Limited explanation of the documentation of 2–3 stages of the design and production process throughout their portfolio this year	3–4
Superficial explanation of the documentation of one stage throughout their portfolio	1–2
Total	12
<p>Answers could include:</p> <p>Criterion 1 – Statement of intent/design proposal</p> <ul style="list-style-type: none"> • client interview • statement of intent • mind map <p>Criterion 2 – Research</p> <ul style="list-style-type: none"> • materials • material testing • finishes • joining techniques • adhesives • existing solutions <p>Criterion 3 – Development of ideas and concepts</p> <ul style="list-style-type: none"> • concepts • developments • client feedback • solution <p>Criterion 4 – Production proposal (materials/planning process)</p> <ul style="list-style-type: none"> • costing • materials list • production plan • working drawings <p>Criterion 5 – Evidence of production (visual/time process)</p> <ul style="list-style-type: none"> • production journal • pictures • modified plans/costing <p>Criterion 6 – Finished product and final evaluation</p> <ul style="list-style-type: none"> • client evaluation • self-evaluation • compare to statement of intent. 	

Section Three: Textiles context

60% (75 Marks)

Question 20

(10 marks)

- (a) Explain why testing a range of materials is important when researching the most suitable material to use for a project. (2 marks)

Description	Marks
Detailed explanation of testing and why it is important	2
Superficial explanation of testing and why it is important	1
Total	2
<p>Sample answer:</p> <p>Testing a range of materials compares their physical properties to determine which materials are suited to certain tasks. It can involve a relatively simple test to determine what material could be suitable for a specific project.</p>	

- (b) Explain how you would carry out a workshop testing technique to test a range of materials for shrinkage and how you would analyse the results. (8 marks)

Description	Marks
Comprehensive explanation of the testing technique including set-up, how the test was carried out, control measures to be considered and how the results would be interpreted	7–8
Detailed explanation of most of the testing technique including set-up, how the test was carried out, control measures to be considered and how the results would be interpreted	5–6
Limited explanation of the testing technique including how the test was carried out, control measures to be considered and how the results would be interpreted	3–4
Superficial explanation with a few correct points describing the testing technique. No mention of results and analysis	1–2
Total	8
<p>Answers could include:</p> <p>Set-up Material samples are all the same size Mark a square of each piece Ensure the washing machine is on a high spin speed</p> <p>How the test is carried out All pieces of fabric being tested are marked out, cut and placed in the washing machine together, then dried using the same method (in the dryer together, or line dried generally). These pieces must then be ironed using the same iron settings and measured again to ascertain levels of shrinkage to each piece.</p> <p>Control measures The tests must be carried out at the same time Marking out and cutting of samples must be accurate The tests should not be placed in the washer with other items</p> <p>Interpreting the results Once the test is complete you would then compare the reduction in size of the material's surface. The less shrinkage, the material is less likely to shrink when washed. The larger the reduction means the material is more prone to shrinkage.</p> <p>Accept other relevant answers.</p>	

Question 21

(9 marks)

Explore the life cycle of the product below. The main material used is polyester satin. You should discuss the following:

- use of energy and materials
- pollution and waste management
- minimising waste at the end of the life of the product.

Description	Marks
Use of energy and materials	
Comprehensive discussion of energy and materials in product life cycle	3
Detailed discussion of energy and materials in product life cycle	2
Limited discussion of energy and materials in product life cycle	1
Subtotal	3
Pollution and waste management	
Comprehensive discussion of pollution and waste management in product life cycle	3
Detailed discussion of pollution and waste management in product life cycle	2
Limited discussion of pollution and waste management	1
Subtotal	3
Minimising waste at the end of the life of the product	
Comprehensive discussion of minimising waste at the end of the product's life	3
Detailed discussion of minimising waste at the end of the product's life	2
Limited discussion of minimising waste	1
Subtotal	3
Total	9

Answers could include:

Use of energy and materials

- what type of machinery is needed to extract/harvest the material?
- where is it being sourced?
- is it sustainable?
- pollution during conversion
- waste by-products
- transportation needed

Pollution and waste management

- what types of machinery are being used to convert the material?
- how is it being dyed?
- can the off-cuts be recycled?
- how can we limit pollution?

Minimising waste at the end of the life of the product

- can it be deconstructed easily to salvage parts?
- are the fibres suitable to be recycled?
- what type of finish has been applied?
- is it biodegradable?
- what is being used to hold it together?

Accept other relevant answers.

Question 22

(26 marks)

- (a) Using the information on the previous page, produce a developed design concept that could be presented to the client. Use annotations to justify your decisions. (14 marks)

Description	Marks
For the sketch (maximum 4 marks)	
Exceptional drawing showing high level of detail	4
Good drawing showing good detail	3
Satisfactory drawing showing some detail	2
Limited drawing with minimal detail	1
Subtotal	4
For each annotation (2 marks, to a maximum of 10 marks)	
Annotations are justified using appropriate terminology	2
Annotations identified with little justification	1
Subtotal	10
Total	14
Annotations should address the client's wants and design specifications: <ul style="list-style-type: none"> • straps • decorative feature on bodice • lower the neck line • elastic hems in legs • elastic waist • pockets • seams and hems • material choice. 	

- (b) With reference to production and strength, compare **two** suitable joining techniques that could be used to produce the side seams. (6 marks)

Description	Marks
Correctly identifies each suitable joining technique.	1–2
Subtotal	2
Comprehensive comparison of the production and strength of each joining technique	
Detailed comparison of the production and strength of each joining technique	4
Describes the production and strength of each joining technique but has no comparison	3
Limited description of joining techniques	2
Subtotal	4
Total	6
Answers could include: <p>Stretch seam to allow for movement, using a small zig-zag stitch and overlocked edges</p> <p>Closed seam as the side seams do not stretch across the body, thus a straight seam with an overlocked edge</p> <p>Flat seam for strength and aesthetic appeal, thus a flat topstitched seam, finished with overlocking or possibly a twin needle.</p> Accept other relevant answers.	

Question 22 (continued)

- (c) With reference to their properties, compare **two** appropriate fabric finishes for this product. (6 marks)

Description	Marks
Correctly identifies each suitable finish.	1–2
Subtotal	2
Comprehensive comparison of the properties of each finish	4
Detailed comparison of the properties of each finish	3
Describes the properties each finish but has no comparison	2
Limited description of finishes	1
Subtotal	4
Total	6
<p>Answers could include comparisons between finishes such as:</p> <p>Scotchguard For stain-resistant protection that prevents the material breaking down over time. It can also have an aesthetic impact by reducing the appearance of stains and an impact on comfort by adding waterproofing to the material</p> <p>Anti-microbial Aims to protect the materials from breaking down by preventing growth of microbes and preventing odours in the fabric.</p> <p>Accept other relevant answers.</p>	

Question 23

(10 marks)

Using the correct terminology, explain how you would construct all of the pieces that make up the pattern. You should mention marking out, cutting, joining and finishing.

Description	Marks
Qualitative explanation of how to mark out, cut, join and finish each part of the project	9–10
Highly detailed explanation of how to mark out, cut, join and finish each part of the project	7–8
Detailed explanation of how to mark out, cut, join and finish each part of the project	5–6
Limited explanation of how to mark out, cut, join and finish each part of the project	3–4
Superficial explanation of how to mark out, cut, join and finish each part of the project	1–2
Total	10
<p>Answers could include:</p> <ol style="list-style-type: none"> 1. Fold fabric in half lengthways 2. Lay pattern pieces (except base) out onto fabric in line with grain and grainlines 3. Pin (and trace) the pattern onto the fabric 4. Cut 2 saddle bag pieces, 2 closure pieces, 2 strap pieces and 2 loop pieces 5. Pin strap pieces together and sew sides 6. Turn strap pieces through, press and topstitch 7. Fold edges over rings, double fold edges and topstitch to strap 8. Fold loop lengthways, stitch and turn through 9. Topstitch, feed through loop and stitch to edge of base. 10. Pin zip to closure pieces on either side and stitch in a centred exposed format 11. Pin and stitch finished closure pieces to top of saddle bag in closed seams and overlock 12. Unzip closure, pin and stitch each side of the saddle bag to the base, stitch and overlock in a closed seam 13. Pin base edges of saddle bag to closures, stitch and overlock in closed seams to finish 14. Finishing – trim any loose threads and check all components. <p>Accept other relevant answers.</p>	

Question 24

(8 marks)

Globalisation of the production of materials affects both individuals and nations. With reference to **one** material, discuss the potential positive and negative impacts of globalisation of this material on the following:

Description	Marks
Local industry	
Highly detailed description of positive and negative impacts of globalisation on local industry	4
Detailed description of positive and negative impacts of globalisation on local industry	3
Limited description of positive and negative impacts of globalisation on local industry	2
Superficial description of positive and negative impacts of globalisation on local industry	1
Subtotal	4
International industry	
Highly detailed description of positive and negative impacts of globalisation on international industry	4
Detailed description of positive and negative impacts of globalisation on international industry	3
Limited description of positive and negative impacts of globalisation on international industry	2
Superficial description of positive and negative impacts of globalisation on international industry	1
Subtotal	4
Total	8
<p>Answers could include:</p> <p>Local industry</p> <p>Positives:</p> <ul style="list-style-type: none"> • access to cotton in communities where cotton was once scarce, via online ordering • wider variety of products is available • independent retailers have better access to international products • local organic cotton businesses have wider access to clients via social media such as Instagram or Facebook • online sales are possible so local businesses can reach beyond their local scope • opportunities to look at organic, sustainable options or other niche cotton farming processing methods. <p>Negatives:</p> <ul style="list-style-type: none"> • reduction in local farming of cotton leads to the reduction in jobs in local communities • smaller independent companies face competition from larger national and international corporations • reduction in textile manufacturing has led to a reduction in jobs • competition from the online market for cotton • in some cases the cotton is farmed in Australia, but then processed elsewhere before being sold back to Australians at a higher price, meaning there is a lack of value adding. 	

International industry

Positives:

- ease of communications between national branches
- distribution is streamlined and more easily tracked
- first world countries benefit due to bigger budgets and better access to resources
- better access to information on whether cotton bought overseas is ethical or organic
- global companies may have more sophisticated research and development.

Negatives:

- reduction in manufacturing as companies go offshore to save money
- no restrictions are placed on cotton that is not farmed ethically
- funding is scarce for the agriculture industry as focus on plant fibre farming is reduced
- lack of support from the government to counteract problems with the profitability of the farming of cotton
- high taxes.

Accept other relevant answers.

Question 25

(12 marks)

Using examples, explain how you documented all **six** stages of the design and production process throughout your portfolio this year.

Description	Marks
Comprehensive explanation of the documentation of the stages of the design and production process throughout their portfolio this year	11–12
Qualitative explanation of the documentation of 5–6 stages of the design and production process throughout their portfolio this year	9–10
Highly detailed explanation of the documentation of 4–5 stages of the design and production process throughout their portfolio this year	7–8
Detailed explanation of the documentation of 3–4 stages of the design and production process throughout their portfolio this year	5–6
Limited explanation of the documentation of 2–3 stages of the design and production process throughout their portfolio this year	3–4
Superficial explanation of the documentation of one stage throughout their portfolio	1–2
Total	12
<p>Answers could include:</p> <p>Criterion 1 – Statement of intent/design proposal</p> <ul style="list-style-type: none"> • client interview • statement of intent • mind map <p>Criterion 2 – Research</p> <ul style="list-style-type: none"> • materials • material testing • finishes • joining techniques • adhesives • existing solutions <p>Criterion 3 – Development of ideas and concepts</p> <ul style="list-style-type: none"> • concepts • developments • client feedback • solution <p>Criterion 4 – Production proposal (materials/planning process)</p> <ul style="list-style-type: none"> • costing • materials list • production plan • working drawings <p>Criterion 5 – Evidence of production (visual/time process)</p> <ul style="list-style-type: none"> • production journal • pictures • modified plans/costing <p>Criterion 6 – Finished product and final evaluation</p> <ul style="list-style-type: none"> • client evaluation • self-evaluation • compare to statement of intent. 	

ACKNOWLEDGEMENTS

- Question 4(a)** Text under 'Definition' adapted from: Work Smart: From the TUC. (n.d.). *What is the difference between a 'Hazard' and a 'Risk'?*. Retrieved September, 2018 from, <https://worksmart.org.uk/health-advice/health-and-safety/hazards-and-risks/what-difference-between-hazard-and-risk>
- Question 4(b)** Text under 'Information found on a material safety data sheet' from: Canadian Centre for Occupational Health and Safety (CCOHS). (n.d.). *Material Safety Data Sheets (MSDSs) - General (WHMIS 1988), What information is on the MSDs?*. Retrieved September, 2018, from <https://www.ccohs.ca/oshanswers/legisl/msdss.html>

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