



## ATAR course examination, 2022

### Question/Answer booklet

# MATERIALS DESIGN AND TECHNOLOGY

## Section Three

Please place your student identification label in this box

WA student number:    In figures

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In words

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### Time suggested for this section

Suggested working time for this section: ninety minutes

### Materials required for this section

*To be provided by the supervisor*

This Question/Answer booklet

### *To be provided by the candidate*

Standard items:    pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items:    up to three calculators, which do not have the capacity to create or store programmes or text, are permitted in this ATAR course examination

Place a tick (✓) in one of the following boxes to indicate your examination context

Wood                   

Metal                   

Textiles                   

Number of additional answer booklets used (if applicable):

### Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised material. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

## Structure of the examination

The Materials Design and Technology ATAR course examination consists of a written component and a practical (portfolio) component.

## Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of written examination
Section One Short answer	3	3	20	31	15
Section Two Extended answer	4	4	40	42	25
Section Three Candidates to choose <b>one</b> of the following contexts: Wood Metal Textiles	6	6	90	80	60
<b>Total</b>					100

## Instructions to candidates

- The rules for the conduct of the Western Australian external examinations are detailed in the *Year 12 Information Handbook 2022: Part II Examinations*. Sitting this examination implies that you agree to abide by these rules.
- Write your answers in this Question/Answer booklet preferably using a blue/black pen. Do not use erasable or gel pens.
- Answer the questions according to the following instructions.  
  
Section Three: Answer all of the questions within your context: Wood, Metal or Textiles.
- You must be careful to confine your answers to the specific questions asked and to follow any instructions that are specific to a particular question.
- Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

**Section Three: Sectionalised and extended answer****60% (80 Marks)**

You are required to choose **one** of the following options, according to the context you have studied in 2022.

Tick one of the boxes below to indicate your choice of context.

<b>Context</b>	<b>✓</b>	<b>Question</b>	<b>Pages</b>
<b>Wood</b>	<input type="checkbox"/>	8–13	4–15
<b>Metal</b>	<input type="checkbox"/>	14–19	16–27
<b>Textiles</b>	<input type="checkbox"/>	20–25	28–38

Now turn to the relevant pages and answer the questions for the context you have studied.

**Section Three: Wood context**

**60% (80 Marks)**

This section contains **six** questions. Answer **all** questions.

Suggested working time: 90 minutes.

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**Question 8**

**(15 marks)**

- (a) Using relevant terminology, identify **three** sources of inspiration that designers might use when designing a product. (3 marks)

One: \_\_\_\_\_

\_\_\_\_\_

Two: \_\_\_\_\_

\_\_\_\_\_

Three: \_\_\_\_\_

\_\_\_\_\_

- (b) Describe how the functional and aesthetic properties of materials influence the selection of materials for a product. (4 marks)

Functional: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Aesthetic: \_\_\_\_\_

\_\_\_\_\_

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- (c) Explain how a designer would use anthropometric data to meet the ergonomic requirements of a product. (4 marks)

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- (d) Explain how sustainability issues affect the design and production of products. (4 marks)

Design: \_\_\_\_\_

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Production: \_\_\_\_\_

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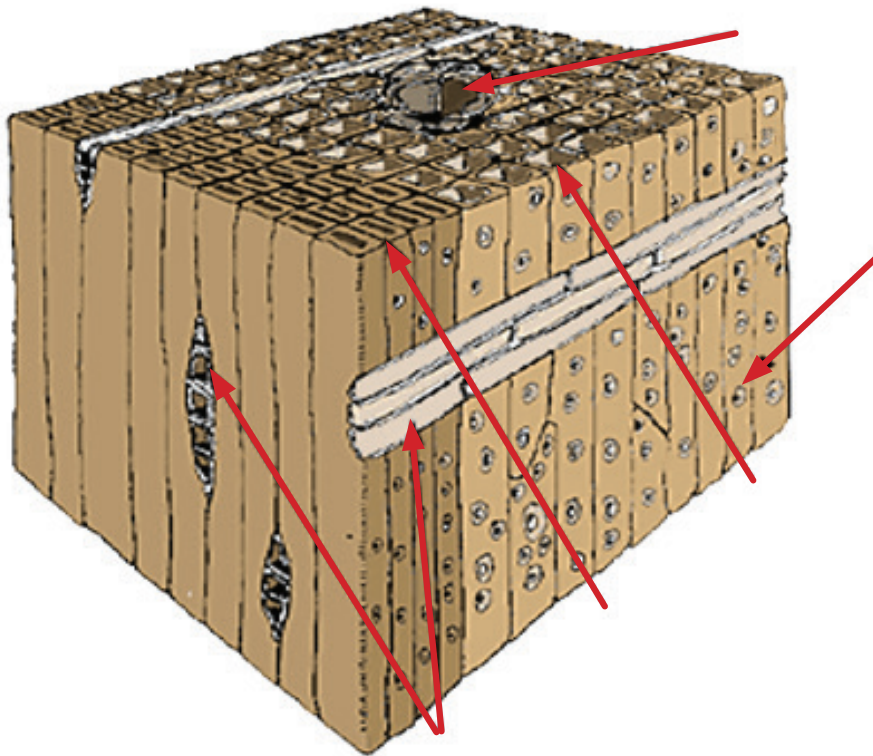
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Question 9

(17 marks)

- (a) Label the **five** parts of the wood structure indicated with the red arrows below. (5 marks)



- (b) Using an example, describe how the cellular structure of softwoods contributes to the properties of the timber. (3 marks)

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(c) Identify **three** physical characteristics of hardwood trees. (3 marks)

One: \_\_\_\_\_

\_\_\_\_\_

Two: \_\_\_\_\_

\_\_\_\_\_

Three: \_\_\_\_\_

\_\_\_\_\_

(d) Describe **three** defects that can be caused by seasoning timber. (6 marks)

One: \_\_\_\_\_

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Two: \_\_\_\_\_

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Three: \_\_\_\_\_

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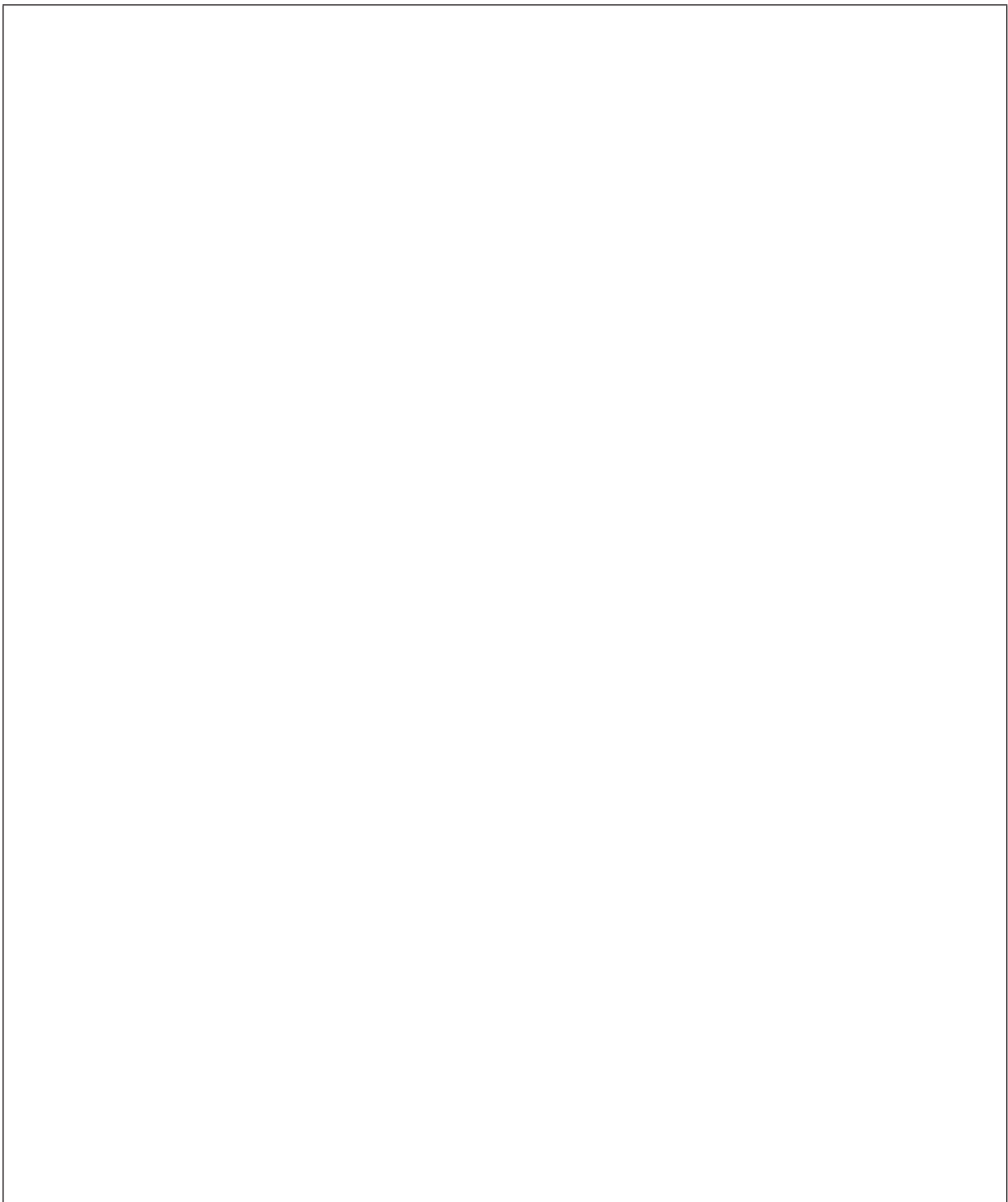
**Question 10**

**(16 marks)**

A client has approached you to design a bedside table for their master suite. The client has set the following requirements:

- table top should be 500 mm × 500 mm
- incorporate natural timbers and an alternative material
- have a suitable finish
- have storage for small everyday items
- be a modern style.

- (a) Using the space below draw, render and annotate a 3D presentation drawing that meets your client's needs. (8 marks)



**See next page**



- (b) Identify a suitable joining method for the project and justify its suitability. (4 marks)

Joining method: \_\_\_\_\_

Justification: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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- (c) Outline the production steps you would follow to make the join identified in part (b). (4 marks)

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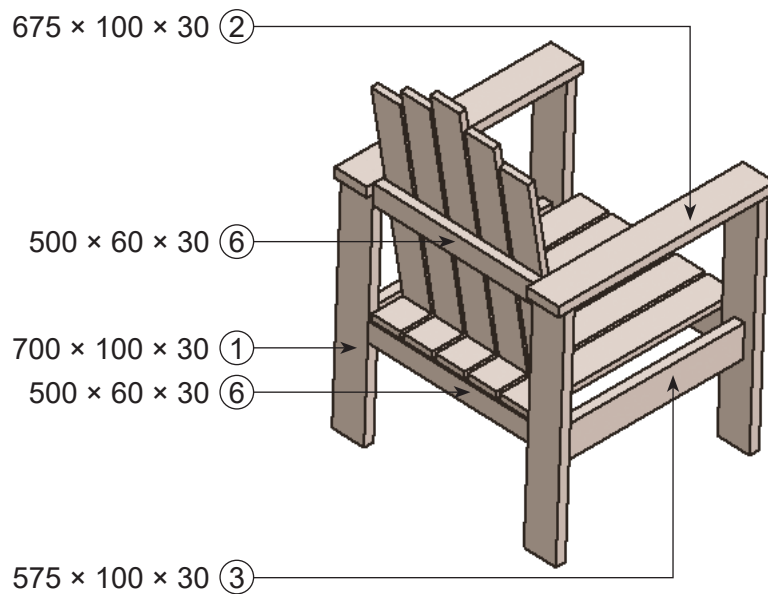
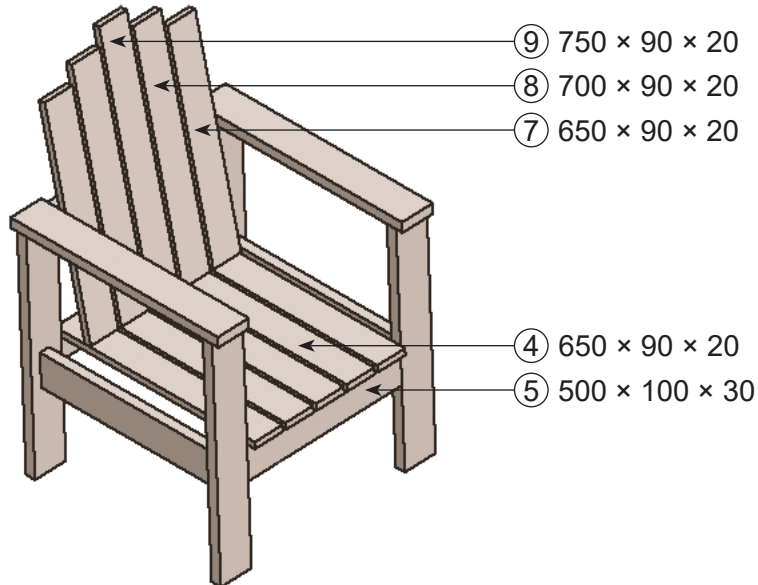
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Question 11

(9 marks)

Using the drawings below, materials list and price list, complete the costing table for the parts of **one** chair. Round costs to the nearest cent. All sizes are in millimetres (mm).



Size (mm)	Cost per linear metre
90 × 20	\$11.99
110 × 20	\$14.99
42 × 42	\$5.49
60 × 30	\$12.99
100 × 30	\$21.15

See next page

Part	Material size	Number required	Total length required (m)	Cost per linear metre	Total cost of parts
1					
2					
3					
4					
5					
6					
7					
8					
9					

**Question 12**

**(13 marks)**

- (a) Identify **one** innovation in the furniture/cabinet making industry. (1 mark)

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- (b) State **two** advantages and **two** disadvantages of the innovation identified in part (a). (4 marks)

Advantages

One: \_\_\_\_\_

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Two: \_\_\_\_\_

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Disadvantages

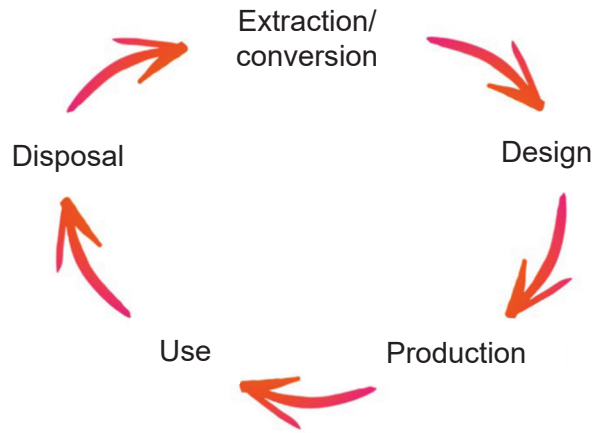
One: \_\_\_\_\_

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Two: \_\_\_\_\_

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- (c) Using the diagram below, outline **four** ways in which designers are using innovations in the furniture/cabinet making industry to improve the life cycle of products. (8 marks)



One: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Two: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Three: \_\_\_\_\_

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\_\_\_\_\_

Four: \_\_\_\_\_

\_\_\_\_\_

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\_\_\_\_\_

**Question 13**

**(10 marks)**

It is difficult to calculate the value of timber to humankind. Throughout history the processing and use of timber has shaped all aspects of living in every country and community. Major, game-changing steps in our history are the result of using timber.

Discuss the historical impact that the processing **and** use of timber has had on society.

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**Section Three: Metal context**

**60% (80 Marks)**

This section contains **six** questions. Answer **all** questions.

Suggested working time: 90 minutes.

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**Question 14**

**(15 marks)**

- (a) Using relevant terminology, identify **three** sources of inspiration that designers might use when designing a product. (3 marks)

One: \_\_\_\_\_

\_\_\_\_\_

Two: \_\_\_\_\_

\_\_\_\_\_

Three: \_\_\_\_\_

\_\_\_\_\_

- (b) Describe how the functional and aesthetic properties of materials influence the selection of materials for a product. (4 marks)

Functional: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Aesthetic: \_\_\_\_\_

\_\_\_\_\_

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- (c) Explain how a designer would use anthropometric data to meet the ergonomic requirements of a product. (4 marks)

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- (d) Explain how sustainability issues affect the design and production of products. (4 marks)

Design: \_\_\_\_\_

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Production: \_\_\_\_\_

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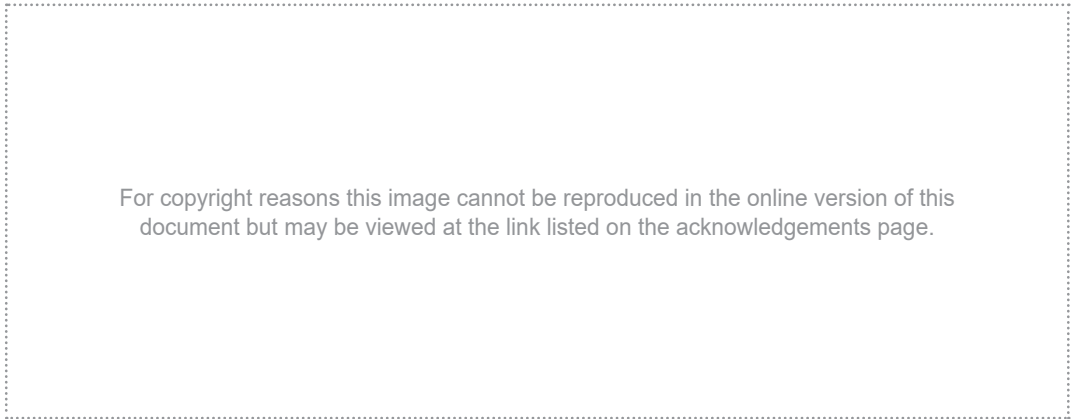
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Question 15

(17 marks)

- (a) (i) Identify the **two** types of metal that have been used in the construction of the kitchen knife shown below. (2 marks)



Blade: \_\_\_\_\_  
\_\_\_\_\_

Collar: \_\_\_\_\_  
\_\_\_\_\_

- (ii) Identify **three** benefits of using the blade material identified in part (a)(i). (3 marks)

One: \_\_\_\_\_  
\_\_\_\_\_

Two: \_\_\_\_\_  
\_\_\_\_\_

Three: \_\_\_\_\_  
\_\_\_\_\_

- (b) Describe the atomic (crystalline/grain) structure of steel. (3 marks)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- (c) Describe how the atomic (crystalline/grain) structure contributes to the properties of steel. (3 marks)

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- (d) Describe the effects of working/forming metals using hot and cold working processes. (6 marks)

Hot working process: \_\_\_\_\_

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Cold working process: \_\_\_\_\_

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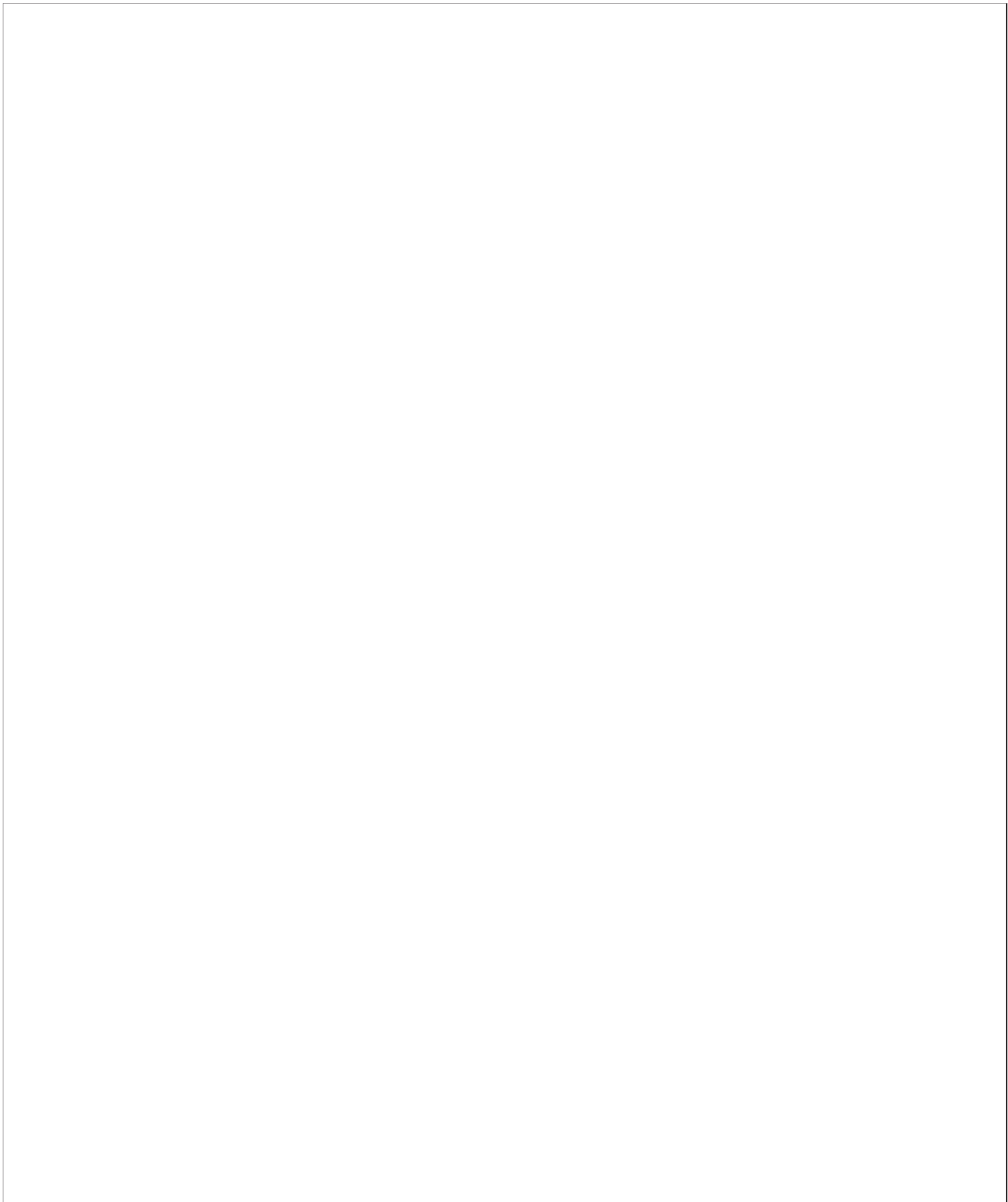
**Question 16**

**(16 marks)**

A client has approached you to design a hall table for the entrance to their new home. The client has set the following requirements:

- table top should be 800 mm × 500 mm
- incorporate mild steel and an alternative material
- have a suitable finish
- have storage for small everyday items
- be a modern style.

- (a) Using the space below draw, render and annotate a 3D presentation drawing that meets your client's needs. (8 marks)



- (b) Identify a suitable joining method for the project and justify its suitability. (4 marks)

Joining method: \_\_\_\_\_

Justification: \_\_\_\_\_

\_\_\_\_\_

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\_\_\_\_\_

- (c) Outline the production steps you would follow to make the join identified in part (b). (4 marks)

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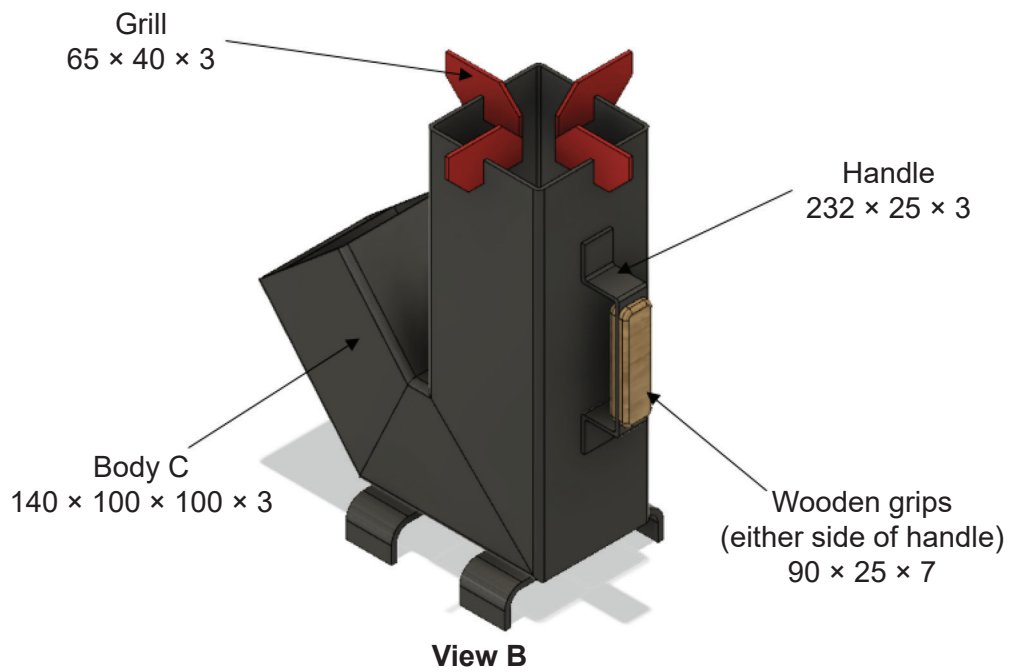
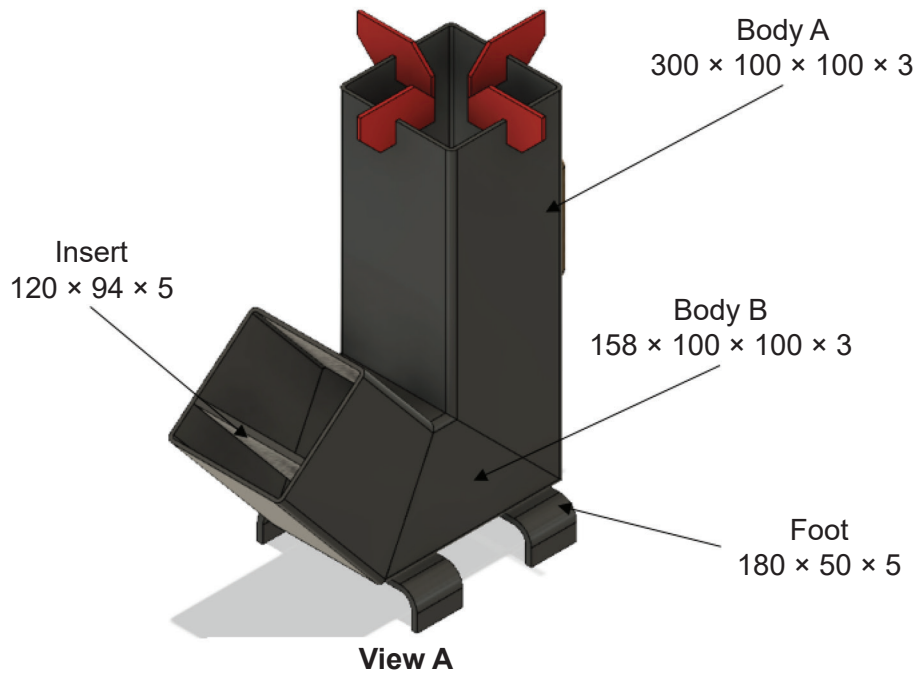
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Question 17

(9 marks)

Using the drawings below, materials list and price list, complete the costing table for making **one** rocket stove. Round costs to the nearest cent. All sizes are in millimetres (mm).



See next page

Mild steel Flat Bar	
Size (mm)	Cost per linear metre
25 × 3	\$3.80
25 × 5	\$5.27
40 × 3	\$6.28
50 × 3	\$7.59
50 × 5	\$10.45
100 × 5	\$20.90

Mild steel Square Hollow section	
Size (mm)	Cost per linear metre
100 × 100 × 3	\$44.50
100 × 100 × 4	\$57.63

Timber	
Size (mm)	Cost per linear metre
20 × 12	\$1.22
25 × 12	\$1.90
42 × 12	\$3.33

Part	Name of material	Material size	Number required	Cost per linear metre	Cost subtotal
Body A					
Body B					
Body C					
Feet					
Insert					
Handle					
Grips					
Grill					
				<b>Total</b>	<b>\$</b>

**Question 18**

**(13 marks)**

(a) Identify **one** innovation in the metal fabrication industry.

(1 mark)

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(b) State **two** advantages and **two** disadvantages of the innovation identified in part (a).

(4 marks)

Advantages

One: \_\_\_\_\_

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Two: \_\_\_\_\_

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Disadvantages

One: \_\_\_\_\_

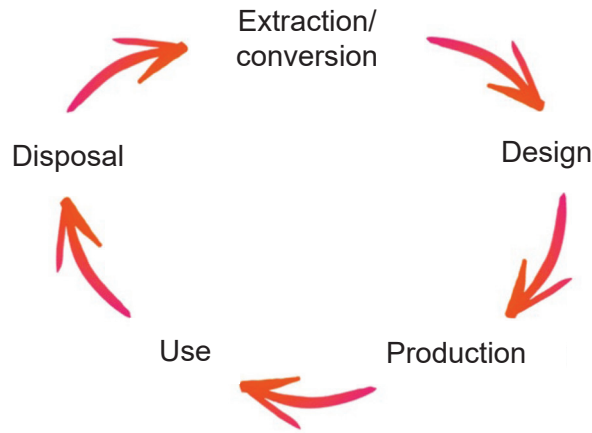
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Two: \_\_\_\_\_

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- (c) Using the diagram below, outline **four** ways in which designers are using innovations in the metal fabrication industry to improve the life cycle of products. (8 marks)



One: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Two: \_\_\_\_\_

\_\_\_\_\_

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Three: \_\_\_\_\_

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\_\_\_\_\_

Four: \_\_\_\_\_

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**Question 19**

**(10 marks)**

It is difficult to calculate the value of metals to humankind. Throughout history the processing and use of metals has shaped all aspects of living in every country and community. Major, game-changing steps in our history are the result of using metals.

Discuss the historical impact that the processing **and** use of metals has had on society.

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**Section Three: Textiles context**

**60% (80 Marks)**

This section contains **six** questions. Answer **all** questions.

Suggested working time: 90 minutes.

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**Question 20**

**(15 marks)**

- (a) Using relevant terminology, identify **three** sources of inspiration that designers might use when designing a product. (3 marks)

One: \_\_\_\_\_

\_\_\_\_\_

Two: \_\_\_\_\_

\_\_\_\_\_

Three: \_\_\_\_\_

\_\_\_\_\_

- (b) Describe how the functional and aesthetic properties of materials influence the selection of materials for a product. (4 marks)

Functional: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Aesthetic: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- (c) Explain how a designer would use anthropometric data to meet the ergonomic requirements of a product. (4 marks)

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- (d) Explain how sustainability issues affect the design and production of products. (4 marks)

Design: \_\_\_\_\_

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Production: \_\_\_\_\_

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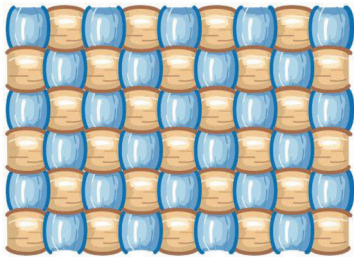
Question 21

(17 marks)

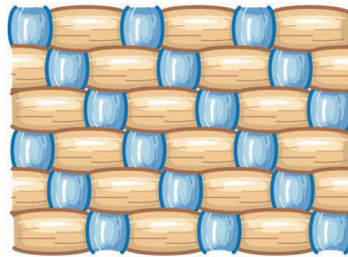
(a) Identify the **three** woven fabrics shown below.

(3 marks)

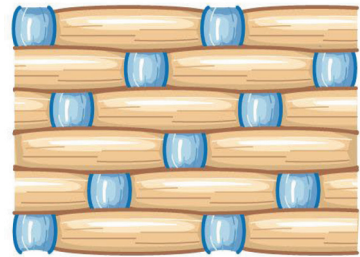
Fabric One:



Fabric Two:



Fabric Three:



Fabric One: \_\_\_\_\_

Fabric Two: \_\_\_\_\_

Fabric Three: \_\_\_\_\_

(b) (i) Describe why the straight grain of a woven fabric is important when laying out pattern pieces. (3 marks)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

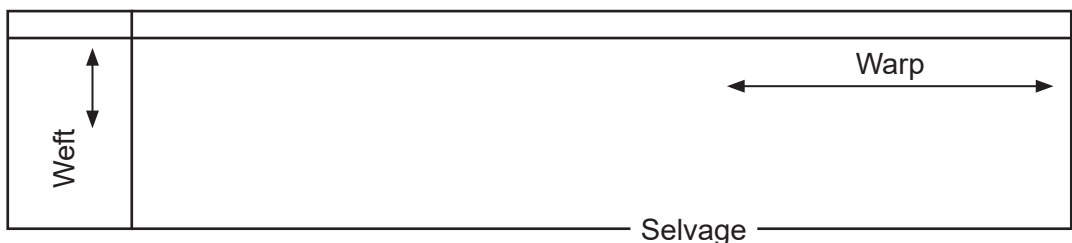
\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(ii) Using an arrow, draw the straight grain of the woven fabric below. (1 mark)

(1 mark)



- (c) (i) Explain the difference between crystalline and amorphous structures of fibres. (4 marks)

Crystalline: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Amorphous: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- (ii) Wool has a high percentage of amorphous regions. Identify **two** properties of wool that result from this. (2 marks)

One: \_\_\_\_\_  
\_\_\_\_\_

Two: \_\_\_\_\_  
\_\_\_\_\_

- (d) Describe **two** chemical properties of fabric. (4 marks)

One: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Two: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

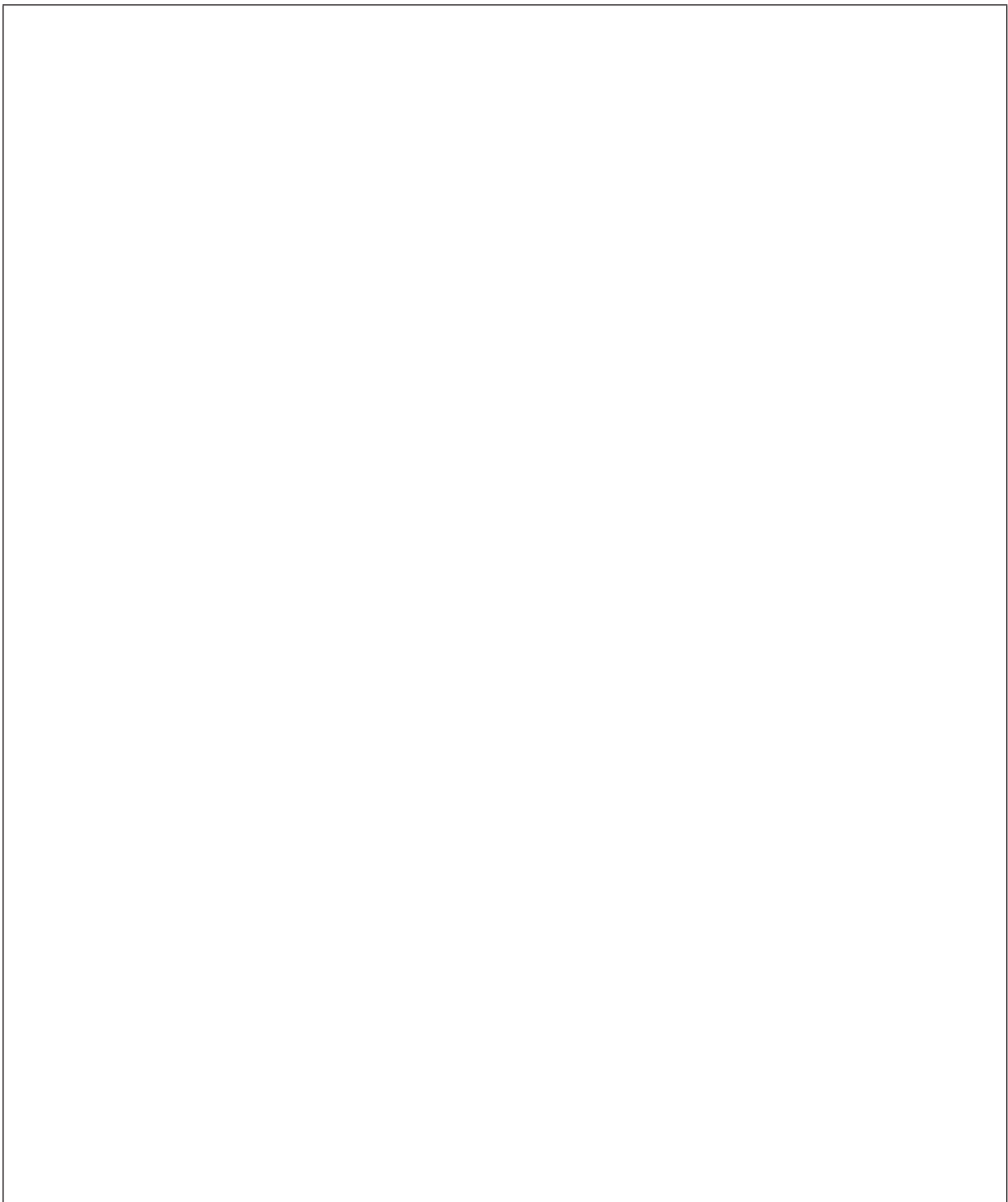
**Question 22**

**(16 marks)**

A client has approached you to design a formal gown for the Wildlife Conservation Gala in 2023. The client has set the following requirements:

- the event theme is Earth and Sky
- the event is held indoors
- the gown should incorporate eco-friendly materials
- the gown must have one pocket for carrying a phone
- the gown must be multi-use to increase sustainability.

- (a) Using the space below draw, render and annotate a 3D presentation drawing which meets your client's needs. (8 marks)





- (b) Identify a suitable joining method for the garment seams and justify its suitability. (4 marks)

Joining method: \_\_\_\_\_

Justification: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

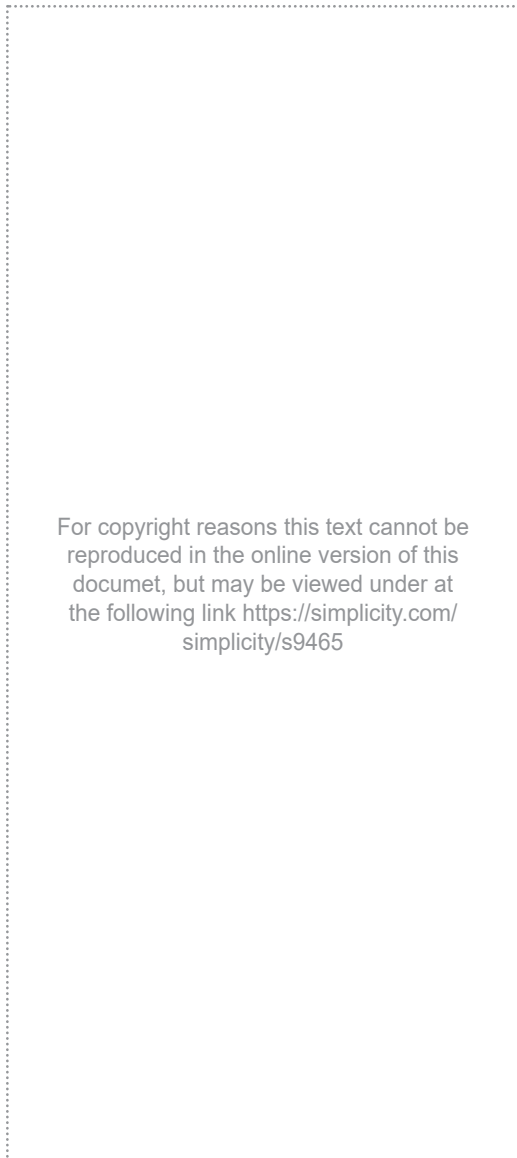
- (c) Outline the production steps you would follow to make the join identified in part (b). (4 marks)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Question 23**

**(9 marks)**

Using the drawing, materials list and price list, complete the costing table for making the dress below. Round costs to the nearest cent.



<b>Materials list</b>		
<b>Materials</b>	<b>Width</b>	<b>Quantity required</b>
Green rayon bodice	114 cm	0.6 m
Green rayon sleeves	114 cm	0.95 m
Green rayon skirt	114 cm	2.2 m
Green rayon collar and belt	114 cm	0.5 m
Green acetate lining bodice	150 cm	0.6 m
Green acetate lining sleeves	150 cm	0.7 m
Green acetate lining skirt	150 cm	1.1 m
Interfacing dress	90 cm	50 cm
Interfacing belt	90 cm	40 cm
Buttons	10 mm	6
Buttons	6 mm	6
50 cm nylon zip centre back	–	1
Thread	–	4 cones
Belt buckle	–	1

<b>Price list</b>	
Green rayon fabric	\$15.60 per metre
Green polyester fabric	\$12.30 per metre
Green acetate lining	\$10.75 per metre
Interfacing	\$2.85 per metre
Buttons 20 mm	\$1.50 each
Buttons 10 mm	\$1.20 each
Buttons 6 mm	90c each
Buttons 5 mm	75c each
50 cm nylon zip	\$5.25 each
25 cm nylon zip	\$2.75 each
50 mm nylon zip	\$2.25 each
Thread cones	\$3.40 each
Belt buckle	\$6.20 each

Materials	Quantity required	Price per metre or each	Cost subtotal
<b>Total</b>			<b>\$</b>

**Question 24**

**(13 marks)**

(a) Identify **one** innovation in the textile industry.

(1 mark)

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(b) State **two** advantages and **two** disadvantages of the innovation identified in part (a).

(4 marks)

Advantages

One: \_\_\_\_\_

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Two: \_\_\_\_\_

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Disadvantages

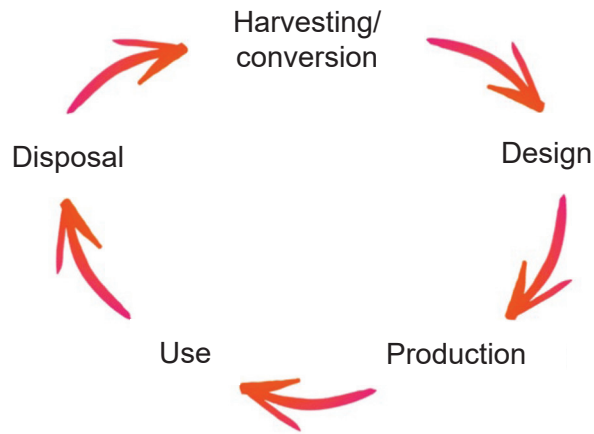
One: \_\_\_\_\_

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Two: \_\_\_\_\_

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- (c) Using the diagram below, outline **four** ways in which designers are using innovations in the textile industry to improve the life cycle of products. (8 marks)



One: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Two: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Three: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Four: \_\_\_\_\_

\_\_\_\_\_

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\_\_\_\_\_















## ACKNOWLEDGEMENTS

- Question 9(a)** Harrison, S. (2016). [Graphic of the cellular structure of softwood]. Retrieved April, 2022, from [https://www.furniturelinkca.com/images/softwood\\_1.png](https://www.furniturelinkca.com/images/softwood_1.png)
- Question 15(a)** Koivu Knives. (n.d.). [Photograph of a Koivu Knife]. Retrieved April, 2022, from [https://koivuknives.com/wp-content/uploads/2019/02/DSC\\_0131-1024x662.jpg](https://koivuknives.com/wp-content/uploads/2019/02/DSC_0131-1024x662.jpg)
- Question 21(a)** The Editors of Encyclopaedia Britannica. (n.d.). *Three types of weaves: ...* [Image]. Retrieved April, 2022, from <https://www.britannica.com/technology/weaving>
- Question 23** Simplicity. (n.d.). *Simplicity sewing pattern misses' dress S9465* [Image]. Retrieved April, 2022, from <https://simplicity.com/simplicity/s9465>

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