Government of **Western Australia**
School Curriculum and Standards Authority

ATAR course examination, 2017

Question/Answer booklet

MATERIALS DESIGN AND TECHNOLOGY

Section Three

Please place your student identification label in this box

Student number: In figures | | | | | | | | | |

In words _____

_____

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

Wood ☐

Metal ☐

Textiles ☐

Time recommended 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

Number of additional answer booklets used (if applicable): ☐

Special items: non-programmable calculators approved for use in this examination

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.

Ref: 17-045

2018/1945
Web version of 2017/65157

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	21	15
Section Two Extended answer	4	4	40	31	25
Section Three Candidates to choose **one** of the following contexts: Wood Metal Textiles	5	5	90	82	60
				Total	100

Instructions to candidates

1. The rules for the conduct of the Western Australian external examinations are detailed in the *Year 12 Information Handbook 2017*. Sitting this examination implies that you agree to abide by these rules.

2. Write your answers in this Question/Answer booklet.

3. Answer the questions according to the following instructions.

   Section Three: Answer all of the questions within your specialised field: Wood, Metal or Textiles.

4. 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.

5. Supplementary pages for the use of planning/continuing your answer to a question have been 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.

See next page

Section Three: Sectionalised and extended answer **60% (82 Marks)**

You are required to choose **one (1)** of the following options, according to the context you have studied in 2017.

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

Context	✓	Question	Pages
Wood	☐	8–12	4–15
Metal	☐	13–17	16–27
Textiles	☐	18–22	28–39

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

Section Three: Wood context **60% (82 Marks)**

This section contains **five (5)** questions. Answer **all** questions.

Suggested working time: 90 minutes.

Question 8 **(12 marks)**

(a) With reference to a project you designed this year, outline **three** environmental impacts you had to consider during and following production and give **one** example of how you might have reduced each impact. (6 marks)

See next page

(b) Identify and outline **three** factors that could have affected the sustainability of the materials you have sourced for the project. (6 marks)

Name of material sourced: _____

Factors: _____

See next page

Question 9 **(14 marks)**

(a) Identify **two** timber conversion methods and describe how each alters the characteristics of the timber. (6 marks)

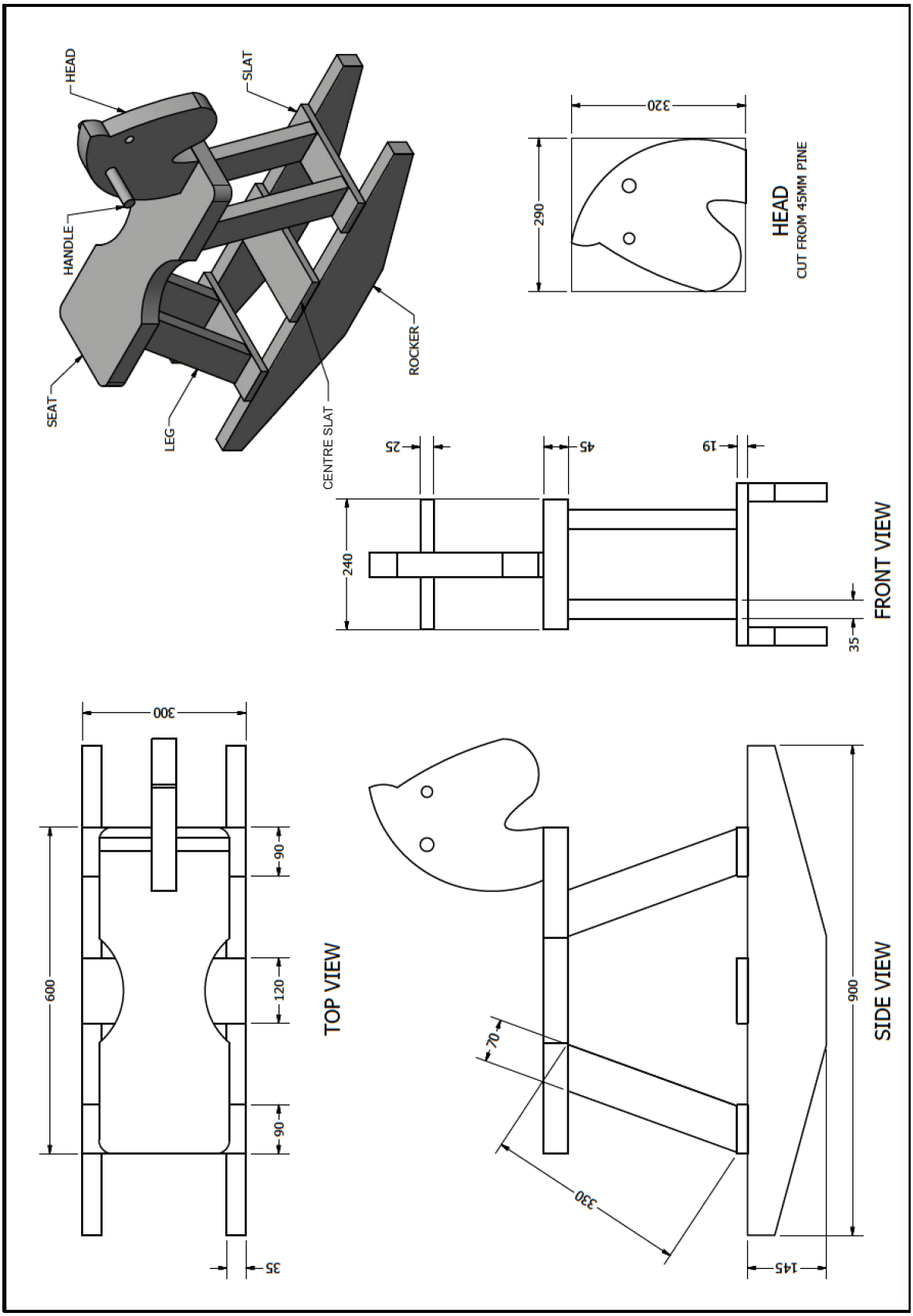
See next page

(b) Identify and discuss the application and use of **two** different adhesives. (8 marks)

See next page

Question 10 **(34 marks)**

Below is an image and a set of plans for a rocking horse.



See next page

D.A.R.	
Size (mm)	**Cost PLM**
19 x 19	$1.56
40 x 19	$1.90
80 x 19	$4.12
90 x 19	$5.40
120 x 19	$6.12
175 x 19	$9.35

D.A.R.	
Size (mm)	**Cost PLM**
210 x 45	$14.97
240 x 45	$16.20
290 x 45	$17.86
300 x 45	$18.25

D.A.R.	
Size (mm)	**Cost PLM**
30 x 35	$1.10
40 x 35	$1.75
60 x 35	$2.10
70 x 35	$2.43
125 x 35	$4.24
145 x 35	$7.40

Dowel	
Size (mm)	**Cost PLM**
18	$4.68
20	$6.32
22	$8.21
25	$9.60
28	$12.20
32	$15.86

(a) Using the image and the information in the tables above, complete each row of the table below and calculate the total cost of producing a single rocking horse. Round the costs to the nearest cent. (8 marks)

Part	Material	Size: (L × W × T)	Number required	Cost/m	Cost
Rocker	pine				
Slats	pine				
Centre slat	pine				
Legs	pine				
Seat	pine				
Head	pine				
Handle	dowel				
				Total cost	$

See next page

Question 10 (continued)

(b) The horse's head was made using a template and router table. Explain in detail, using the correct terminology, how you would undertake this process. (4 marks)

(c) The horse's head will be attached to the seat using screws. Explain how this will be done and identify **three** benefits of this joining method over others. (5 marks)

See next page

(d) Identify a suitable finish and explain how to prepare the material and apply the finish to it. (5 marks)

See next page

Question 10 (continued)

(e) Using the risk assessment table below, outline **two** potential hazards for each tool used during the production process described and **two** control measures that relate to the hazards for each. (12 marks)

Tool	Potential hazards	Control measures
Using a drop saw to cut timber to length.		
Using a router to shape the head piece.		
Using a bandsaw to cut the tapers on each of the rockers, ensuring that the cut is on the waste side of the line.		

See next page

Question 11 **(10 marks)**

(a) Describe the cellular structure of **one** timber. Use an annotated drawing to support your answer. (4 marks)

Drawing space

(b) Describe how the cellular structure contributes to **three** properties of this timber. (6 marks)

See next page

Question 12 **(12 marks)**

Globalisation is defined as

Globalisation is often referred to in discussing such things as trade, travel or large international companies. However, no matter where people live, they can be affected by globalisation on a local, national and international scale.

Discuss the influence that globalisation has on the local, national and international timber industries.

See next page

End of questions: Wood

See next page

Section Three: Metal context **60% (82 Marks)**

This section contains **five (5)** questions. Answer **all** questions.

Suggested working time: 90 minutes.

Question 13 **(12 marks)**

(a) With reference to a project you designed this year, outline **three** environmental impacts you had to consider during and following production and give **one** example of how you might have reduced each impact. (6 marks)

See next page

(b) Identify and outline **three** factors that could have affected the sustainability of the materials you have sourced for the project. (6 marks)

Name of material sourced: _____

Factors: _____

See next page

Question 14 **(14 marks)**

(a) Identify **two** types of heat treatments and describe how each alters the structure of a metal. (6 marks)

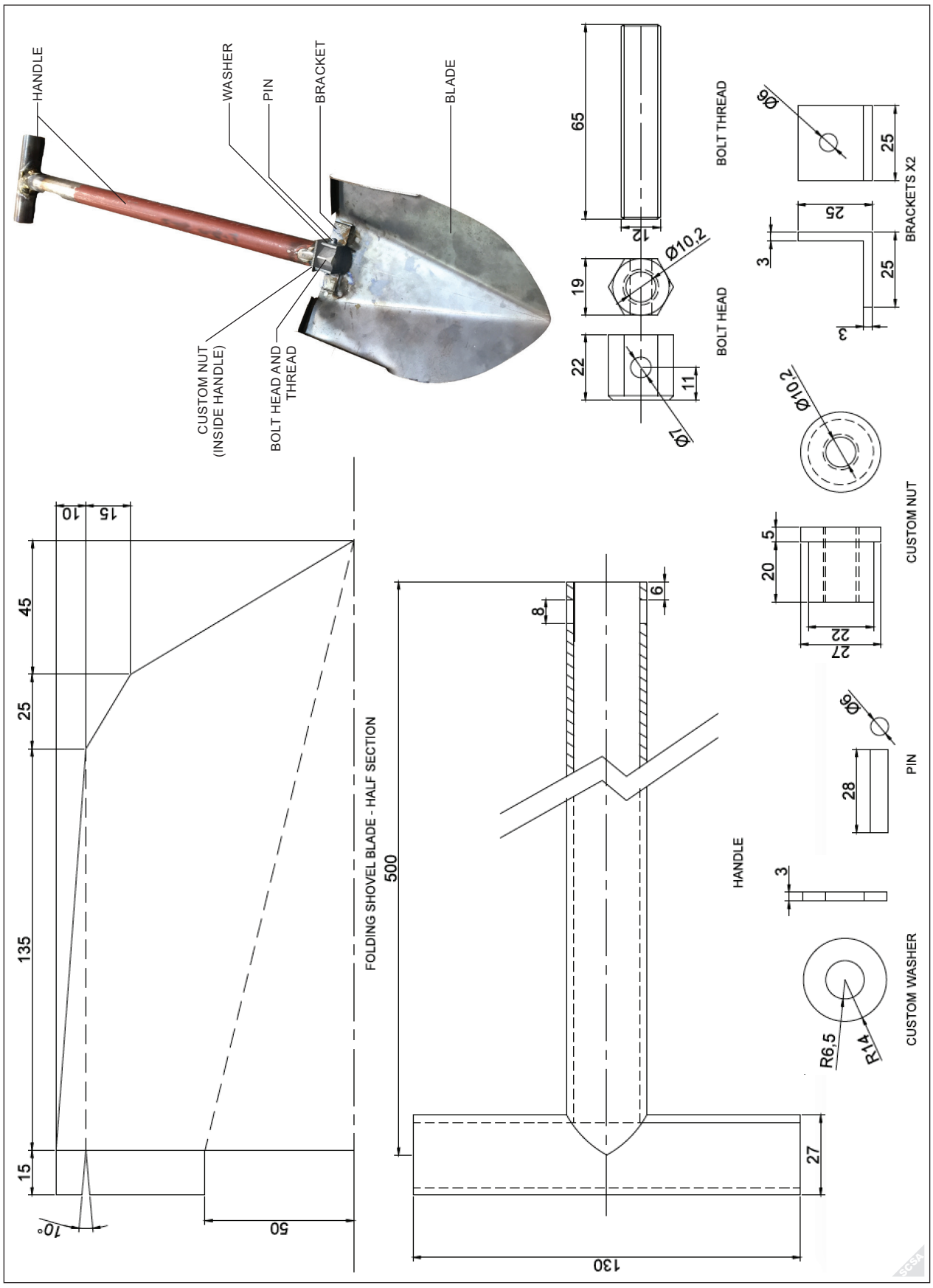
See next page

(b) Discuss how hot and cold working processes affect the working/forming of metals.
(8 marks)

See next page

Question 15 **(34 marks)**

Below is an image and a set of plans for a camping shovel.



See next page

Hexagonal bar	
Size (mm)	**Cost PLM**
16 mm	$25.78
19 mm	$37.14
22 mm	$50.56

MS round bar	
Size (mm)	**Cost PLM**
6 mm	$2.22
12 mm	$3.43
20 mm	$7.90
22 mm	$9.55
27 mm	$11.39

ERW tube	
Size (mm)	**Cost PLM**
16 mm	$6.32
18 mm	$7.62
20 mm	$9.11
23 mm	$11.50
27 mm	$14.50

Threaded rod	
Size (mm)	**Cost PLM**
M10	$7.10
M12	$9.92
M16	$15.90

MS angle	
Size (mm)	**Cost PLM**
25 x 25 x 3	$3.06
25 x 25 x 5	$4.52
25 x 25 x 6	$5.69
30 x 30 x 3	$3.69
30 x 30 x 5	$5.50

MS flat bar	
Size (mm)	**Cost PLM**
25 x 3	$2.53
25 x 5	$3.03
28 x 3	$6.07
28 x 5	$7.10
32 x 3	$6.44

(a) Using the image and the information in the tables above, complete each row of the table below and calculate the total cost of producing a single camping shovel. Round the costs to the nearest cent. (8 marks)

Part	Material	Size: (L × W × T)	Number required	Cost/m	Cost
Blade	MS plate	220 x 200 x 3	1	N/A	$7.50
Handle	ERW tube				
Bolt head	hexagonal bar				
Bolt thread	threaded bar				
Brackets	angle bar				
Custom nut	round bar				
Custom washer	flat bar				
Pin	round bar				
				Total cost	$

See next page

Question 15 (continued)

(b) The custom nut was made from one piece of round bar on the metalwork lathe. Explain in detail, using the correct terminology, how you would shape a roughly-cut piece of round bar to the finished size in preparation for the hole being threaded by hand. (4 marks)

(c) The MIG welding process will be used to attach the brackets to the blade. Explain the MIG welding process and identify **three** benefits of this joining method over others. (5 marks)

(d) Identify a suitable finish and explain how to prepare the material and apply the finish to it. (5 marks)

See next page

Question 15 (continued)

(e) Using the risk assessment table below, outline **two** potential hazards for each tool used during the production process described and **two** control measures that relate to the hazards for each. (12 marks)

Tool	Potential hazards	Control measures
Using bench shears remove the excess material from the shovel blade.		
Using the MIG welder to attach the angle brackets to the blade.		
Using the drill press to drill the 6 mm hole in the centre of the bracket.		

See next page

Question 16 **(10 marks)**

(a) Describe the atomic (crystalline/grain) structure of steel. Use an annotated drawing to support your answer. (4 marks)

Drawing space

(b) Describe how the atomic (crystalline/grain) structure of steel contributes to **three** physical properties. (6 marks)

See next page

Question 17 **(12 marks)**

Globalisation is defined as

For copyright reasons this text cannot be reproduced in the online version of this document, but may be viewed at www.businessdictionary.com/definition/globalization.html

Globalisation is often referred to in discussing such things as trade, travel or large international companies. However, no matter where people live, they can be affected by globalisation on a local, national and international scale.

Discuss the influence that globalisation has on the local, national and international metal industries.

End of questions: Metal

See next page

Section Three: Textiles context **60% (82 Marks)**

This section contains five **(5)** questions. Answer **all** questions.

Suggested working time: 90 minutes.

Question 18 **(12 marks)**

(a) With reference to a project you designed this year, outline **three** environmental impacts you had to consider during and following production and give **one** example of how you might have reduced each impact. (6 marks)

See next page

(b) Identify and outline **three** factors that could have affected the sustainability of the materials you have sourced for the project. (6 marks)

Name of material sourced: _____

Factors: _____

See next page

Question 19 **(14 marks)**

(a) Identify and describe the characteristics of **two** different yarn structures that are available. (6 marks)

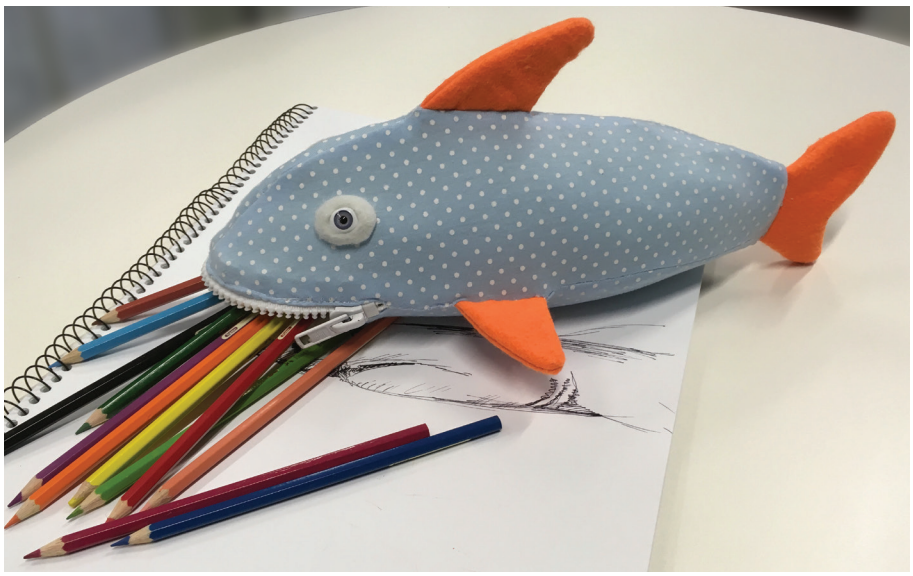
See next page

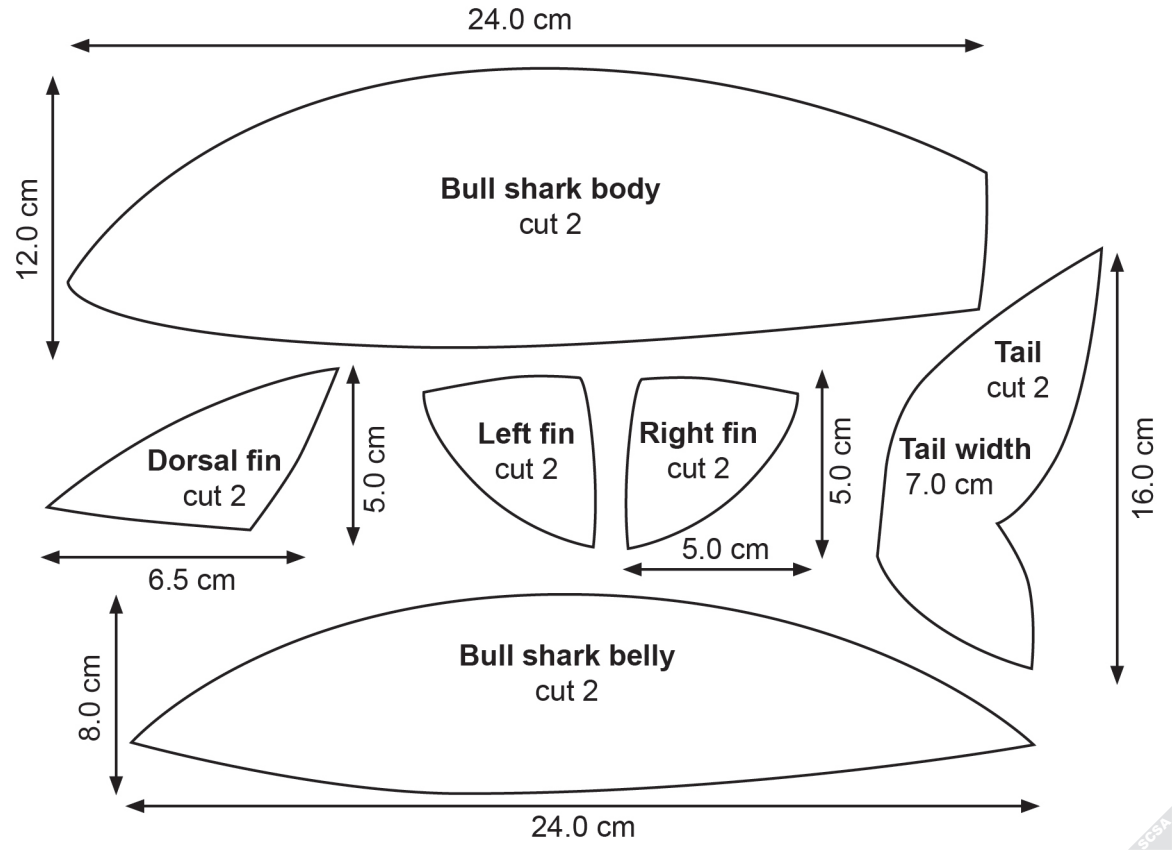
(b) Identify **two** fabric types, outline the structure of each type and compare both by describing their physical characteristics and uses. (8 marks)

See next page

Question 20 **(34 marks)**

Below is a photograph and a pattern for a bull shark pencil case.





See next page

(a) Using the photograph, pattern and information in the tables below, complete each row of the table and calculate the total cost of producing a single shark pencil case. Select a zipper type and enter the type in the shaded area. Round the costs to the nearest cent.

(8 marks)

Fabric	Cost
Orange felt 112 cm wide	$5.60/m
Blue poly-cotton 112 cm wide	$2.99/m
Wadding 150 cm wide	$6.00/m

Zipper	Cost
Invisible zip 12 cm	$3.99
Standard zip 12 cm	$1.99

Item	Quantity	Cost/m	Cost
Body fabric			
Fin and tail fabric			
Polyester iron on wadding liner (for body, tail, mouth and fins)			
Thread	1	$2.99	$2.99
Zipper type:	1		
Eyes (2 pk)	1	$1.99	$1.99
		Total cost	$

(b) To add a zipper to any product, the sewing machine must first be prepared. Explain in detail, using the correct terminology, the steps in the process followed to prepare the machine and the placement of the fabric and zipper in the machine before you begin.

(4 marks)

See next page

Question 20 (continued)

(c) The belly of the shark must be attached to the body using a joining technique that can be integrated with a zipper. Identify this technique and explain how it works, giving reasons why you would use it over another technique. (5 marks)

(d) Identify a decorative technique that could be added to the pencil case. Describe what materials and equipment would be needed and how the technique would be applied. (5 marks)

See next page

(e) Using the risk assessment table below, outline **two** potential hazards for each tool used during the production process described and **two** control measures that relate to the hazards for each. (12 marks)

Tool	Potential hazards	Control measures
Using the sewing machine to attach the zipper.		
Using the overlocker.		
Ironing on the wadding.		

See next page

Question 21 **(10 marks)**

(a) Describe the molecular and morphological structure of **one** fibre. Use an annotated drawing to support your answer. (4 marks)

Drawing space

See next page

(b) Describe how the molecular and morphological structure contributes to **three** properties of this fibre. (6 marks)

See next page

Question 22 **(12 marks)**

Globalisation is defined as

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Discuss the influence that globalisation has on the local, national and international textile industries.

See next page

End of questions: Textiles

Supplementary page

Question number: _____

Supplementary page

Question number: _____

Supplementary page

Question number: _____

Supplementary page

Question number: _____

ACKNOWLEDGEMENTS

Question 3	Image: Fitbit, Inc. (n.d.). *Fitbit charge* . Retrieved July, 2017, from www.amazon.co.uk/Fitbit-Wireless-Activity-Tracker-Wristband/dp/B00PU6QMGA
Question 4	Image one: Probus. (n.d.). *Stab can opener*. Retrieved July, 2017, from www.amazon.co.uk/stab-opener-FASHIONED-PUSH-OPENERS/dp/B004AFELB0/ref=pd_bxgy_201_img_2?_encoding=UTF8&psc=1&refRID=AS6GPQDTNGG2P9MBCJ8M Image two: Zyliss. (n.d.). *Zyliss lock n' lift can opener with lid lifter magnet, green* [Image]. Retrieved July, 2017, from www.wisdomberry.com/book.php?asin=B00421ATQS
Question 5	[Trunki luggage advertisement images]. (n.d.). Retrieved July, 2017, from www.babybg.com/popup_image.php/pID/1514
Questions 12, 17 & 22	Definition from: Globalization. (2017). In *BusinessDictionary*. Retrieved July, 2017, from www.businessdictionary.com/definition/globalization.html
Question 15	Image of camping shovel by courtesy of the examining panel.

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