Summer Examinations 2015

LEA300115N

Module Title: Leather Technology 3
Level: Six
Time Allowed: Three Hours

Instructions to students:

- Enter your student number not your name on all answer books.
- Answer one question from Section A and three questions from Section B.
- Do not use the same material for more than one question.
- All questions carry equal marks.
- Begin each question in a separate answer book; label each answer book clearly with the number of the question you are answering.
- Only work recorded in the answer books will be assessed.
- Erasmus/overseas students can use a bilingual dictionary.
- Erasmus/overseas students are not permitted any extra time.
- The use of a non-programmable calculator is permitted.
- The examination paper can be removed at the end of the exam.

<table>
<thead>
<tr>
<th>No. of Page</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Questions</td>
<td>7</td>
</tr>
</tbody>
</table>

Page 1 of 5
Section A

Answer one out of two questions.

Question 1

Environmental factors are a major driver of modern leather processing techniques.

a. Discuss one example of best practice from three of the following chemical process steps using a salted domestic cow hide as the raw material for an International automotive end use.

- Soaking,
- Liming,
- Deliming and bating,
- Pickling & chromium tanning
- Retanning.

(15 marks)

b. Detail and discuss two energy reduction methods that a tannery may utilise, either for specific or general processing techniques.

(10 marks)

Total: 25 marks

Question 2

Discuss five innovative mechanical handling processes which could improve;

- Environmental impact,
- Yield,
- Cutting value and
- Productivity.

(25 marks)

End of Section A
Section B follows overleaf
Section B

Answer three out of five questions.

Question 3

Using shoe upper leather as an example, the following table gives a relationship between weights of raw hide and wet blue to square feet of grain leather produced.

<table>
<thead>
<tr>
<th>Leather area</th>
<th>40</th>
<th>sq ft</th>
<th>Leather</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw hide</td>
<td>25</td>
<td>kg</td>
<td>Green weight</td>
</tr>
<tr>
<td>Raw hide</td>
<td>22.5</td>
<td>kg</td>
<td>Salted weight</td>
</tr>
<tr>
<td>Unsplit pelt</td>
<td>25</td>
<td>kg</td>
<td>Soaked, trimmed weight</td>
</tr>
<tr>
<td>Split pelt</td>
<td>15</td>
<td>kg</td>
<td>Grain split</td>
</tr>
<tr>
<td>Split pelt</td>
<td>6</td>
<td>kg</td>
<td>Flesh split trimmed</td>
</tr>
<tr>
<td>Wet blue grain</td>
<td>7.5</td>
<td>kg</td>
<td>Shaved weight</td>
</tr>
<tr>
<td>Wet blue flesh split</td>
<td>2.5</td>
<td>kg</td>
<td>Shaved weight</td>
</tr>
</tbody>
</table>

a. Explain the causes of differences between green, salted and soaked weights. (6 marks)

b. Explain the differences between unsplit and split pelt weights. (3 marks)

For unsplit hides – the weights used to calculate the weights of tanning salts are often based on the green weight.

c. Make assumptions from your answers to part (a) and explain the use of this knowledge for your calculation.

Using a green weight of 1000 kg, calculate the amount of BCS, chromium sulfate powder (33% basicity and 26% Cr₂O₃) needed to obtain a wet blue with 3% Cr₂O₃ content (dry weight). Assume 75% efficiency. (6 marks)

d. Give three examples of how the efficiencies of chromium sulfate conversion can be improved? (6 marks)

e. Discuss the uses of waste products from fleshing, splitting and shaving operations. (4 marks)

Total: 25 marks
Question 4

Footwear manufacturers have specific leather needs for their end use of footwear upper leather; this may be for the shoe maker and for consumer wearing.

Discuss the problems of poor break, grain crack, tear and tensile strength in bovine side leather specifically for use in upper footwear leathers.

Suggested topics for discussion can include (but not exclusively)

- Description of the problems (with leather specifications),
- Possible raw material influences,
- Specific process causes,
- **Not just generic Leather making information,**
- Minimisation of problems in leather manufacture,
- How the footwear manufacturer can reduce weakness problems in both shoe manufacture and consumer wear.

(25 marks)

Question 5

Design a modern finishing process for **full-grain**, resin-based, **soft aniline** footwear upper leather. Highlight any differences (processing and chemical) to those needed from a finishing process for **smooth pigmented formal corrected** grain footwear upper leather.

The answer needs to demonstrate an understanding of requirements, (aesthetics and performance), crust preparation, machine applications and the parameters involved.

(25 marks)

Question 6

a. List **five** benefits of using a quality specification for leather.

(5 marks)

b. Using the template on the next page, compile a simple specification that could be used commercially between your tannery (that produces garment leather) and a leather buyer from a leading manufacturer. You should choose the most important tests for each section.

(15 marks)

c. Name **one** specific concern for **five** of the restricted substances.

(5 marks)

Total: 25 marks
Template for Question 6b

<table>
<thead>
<tr>
<th>Leather Benchmarking / Fingerprinting:</th>
<th>Suggested requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Test Title</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td></td>
</tr>
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<td>2.</td>
<td></td>
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<td>3.</td>
<td></td>
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<tr>
<td>4.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
</tr>
</tbody>
</table>

| Performance Tests:                    |                        |
| **Test Title**                        |                        |
| 1.                                    |                        |
| 2.                                    |                        |
| 3.                                    |                        |
| 4.                                    |                        |
| 5.                                    |                        |
| 6.                                    |                        |

| Restricted Substances:                |                        |
| **Test Title**                        |                        |
| 1.                                    |                        |
| 2.                                    |                        |
| 3.                                    |                        |
| 4.                                    |                        |
| 5.                                    |                        |
| 6.                                    |                        |

**Question 7**

a. Explain the step-wise mechanism by which a reagent becomes fixed to solid collagen in leather making processes.  
   
   (15 marks)

b. Give two examples of how an understanding of the fixation mechanism can be exploited for the tanner’s benefit. Explain how your examples work.

   (10 marks)

Total: 25 marks