Summer Examinations 2016

LEA300116N

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 four questions: one from Section A and three from Section B.
- The same material should not constitute a substantial part of more than one question.
- All questions are equally weighted.
- 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 are permitted to take a bilingual dictionary into the examination room, but will not be permitted any extra time.
- The use of a non-programmable calculator is permitted.
- Students are permitted to remove this examination paper at the end of the examination.

<table>
<thead>
<tr>
<th>No. of Pages</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Questions</td>
<td>6</td>
</tr>
</tbody>
</table>
Section A

Answer one out of two questions.

Question 1

a. Discuss a best available technique from either: the beamhouse, tanyard or post-tanning areas; and synthesise a technical strategy that a tanning business could use to exploit this technique (e.g., elimination of waste or marketing).  

(15 marks)

b. Detail and discuss two energy reduction methods that a tannery may utilise in the wet working or drying departments.  

(10 marks)

Total: 25 marks

Question 2

Discuss five business functions of a tannery and explain how they affect production planning.  

(25 marks)

Total: 25 marks

End of Section A

Section B follows overleaf
Section B

Answer three out of four questions.

Question 3

A tannery produces 7500 kg (per day) of unsplit wet-blue from wet-salted hides.

a. According to Buljan et. al. 2000, what would the production manager expect the daily wet-salted batch weight to be if the wet-blue batch weight is 7500 kg? Assume the wet-salted weight does not change from day-to-day. (2 marks)

b. Comment on how accurate you think Buljan et. al. 2000 is in the green/wet-salted weight estimation. (2 marks)

c. Calculate a 20-day chemical forecast for the following list of chemicals (show all working out). Assume the lime weight is 1.4 times pickle/green weight:

<table>
<thead>
<tr>
<th>Chemical</th>
<th>% Offer (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lime (0.5 marks)</td>
<td>2.5%</td>
</tr>
<tr>
<td>Sulfuric acid (0.5 mark)</td>
<td>0.8%</td>
</tr>
<tr>
<td>Chromium sulfate (26% Cr₂O₃)(0.5 mark)</td>
<td>5.2%</td>
</tr>
<tr>
<td>Fungicide (0.5 mark)</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

An extra mark is given for correct weight choices (1 mark)

d. If the production team use a 150% water float for the dirt and main soak, use the answer you obtained in Question 3a to calculate how much water you would need? (3 marks)

e. If the offer of bactericide for both soaks totalled 3 g/L, use the quantity of water calculated in Question 3d to forecast the bactericide needed for a 20-day period? (2 marks)

f. An alternative chemical supplier can provide a chromium sulfate solution at 16% Cr₂O₃ strength. Calculate the % offer you would need, relative to the amount given in Question 3c, to ensure the same tanning concentration. (5 marks)

g. A customer asked for specific information on a batch of leather that failed a boil test. How could you provide the relevant information from your production records to answer this query? Explain how modern tanneries test their chromium uptake and state how they record the results for future reference. (5 marks)

h. Explain how lime splitting would affect the chemical/machinery usage given above in Question 3a. (3 marks)

Total: 25 marks
Question 4

a. Discuss the considerations needed in the design of a new tannery in the country of your origin. Your answer should include details on the following topics:
   - Geographical/access limitations
   - Chemical and machinery supplier limitations
   - Types of local raw materials
   - Building and service requirements
   - Legal and employment restrictions (or lack thereof)  

   (15 marks)

b. Discuss the technology and provide a suggested recipe needed for the CO$_2$ deliming of goatskins. Your answer should include a discussion of the environmental benefits/disadvantages of the technology.

   (10 marks)

Total: 25 marks

Question 5

a. How would you audit your tannery for a looseness problem? Which process operations would you target and how could you remedy problems discovered in those areas?

   (10 marks)

b. Discuss how you would go about negotiating the purchase of a new vacuum drying machine. Describe some of the negotiating techniques you would use, and your strategy for the purchase from deciding if you need it to the installation. Comment on how you could receive discounts.

   (10 marks)

c. Give a brief explanation of why a tannery would need a quality management system (QMS) and what types of QMS a tannery could use?

   (5 marks)

Total: 25 marks
Question 6

a. Explain how tanneries use work or motion studies to monitor and production efficiency and throughput? Give common strategies to increase throughput or productivity? (10 marks)

b. A tannery has discovered the presence of free phenol in their production crust. Give a valid reason why the crust would contain free phenol and how a tannery could eliminate this as a restricted substance from their leather. (5 marks)

c. State the differences between a leather sample department and a research, development and innovation department? You should highlight the differences in function and should explain how a tanneries technical strategy could benefit from having one or both of these departments. (10 marks)

Total: 25 marks