# **LIVESTOCK PRODUCTS TECHNOLOGY**

## **CHAPTER 5: SLAUGHTERHOUSE BY-PRODUCTS TECHNOLOGY**

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**5.1 Refresher Points :**

1. The skin obtained from unborn calf – **Slunk Skin**
2. Rendered fat obtained from pig is – **Suet/ Lard**
3. Enzyme obtained from pig stomach is – **Pepsin**
4. Tanning process involves proteolytic enzymes- **Bating**
5. Enzyme obtained from abomasum calf – **Rennet/Rennin**
6. Collagen of bone is called – **Ossein**
7. Catgut is made from **Submucosa layer of small intestine of sheep.**
8. Fat covering around the scrotum is – **Cod fat.**
9. **Casings** are soft cylindrical structures used to stuff sausage mixes.
10. some terms related to **CASINGS** –
11. **Chitterlings:** casings obtained from large intestines of pigs.
12. **Middles:** casings obtained from large intestine of cattle.
13. **Rounds :** casings obtained from small intestine of sheep, goat, and pigs.
14. **Runner :** casings obtained from small intestine of cattle.
15. **Weasand :** casings obtained from oesophagus.
16. **Maws :** casings obtained from pig stomach.
17. **Bung :** casings obtained from caecum.
18. The process of converting dead animal materials or condemned animal meat into value added products is called **Rendering.**
19. The **Byproduct** is the term which denotes every part and particle of value obtained from the slaughter house.
20. Blood meal has **10-12%** of moisture.
21. Blood meal is rich in protein content which constitutes about **85%.**
22. The yield of bone meal from that of raw bones is **1:3.**
23. **Sliming** the removal of mucous lining of casing.
24. **Kip** is skin obtained from older calf which has not attained its puberty.
25. **Flaying** is the scientifical removal of skin/hides from the animals.
26. the chemical treatment of processing of leather is **Tanning.**
27. The treatment of delimed hides with the action of proteolytic enzymes to make them soft and pliable is **Bating.**

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| **5.2** | **Choose the correct answer** |
| 1. | Trotters are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  | (a) | Cattle feet | (b) | Sheep feet |
|  | (c) | Pig feet | (d) | Rabbit feet |
| 2. | Casings prepared from small intestine of sheep are called\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  | (a) | Weasand | (b) | Bungs |
|  | (c) | Middles | (d) | Rounds |
| 3. | Average protein content of carcass meal\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  | (a) | 50% | (b) | 30% |
|  | (c) | 70% | (d) | 40% |
| 4. | The gelatin is obtained from the bladder of \_\_\_\_\_ is called as Isinglass |
|  | (a) | Beef | (b) | Pork |
|  | (c) | Carabeef | (d) | Fish |
| 5. | The process of tanning sheep skin with fish oil is popularly known as \_\_\_\_\_\_\_\_\_ |
|  | (a) | Shammoying | (b) | Dying |
|  | (c) | Bating | (d) | Desliming |
| 6. | Animal casings are mainly graded based on their\_\_\_\_\_\_\_\_\_\_\_ |
|  | (a) | Length | (b) | Diameter |
|  | (c) | Color | (d) | Moisture content |
| 7. | Omental fat is otherwise called as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  | (a) | Caul fat | (b) | Leaf fat |
|  | (c) | Suet | (d) | Ruffle fat |
| 8. | Intermuscular fat or fat in between the muscles is otherwise called as |
|  | (a) | Marbling | (b) | Cod fat |
|  | (c) | Feathering | (d) | Seam fat |
| 9. | Rendered fat obtained from cattle is called as |
|  | (a) | Suet | (b) | Lard |
|  | (c) | Knob | (d) | Tallow |
| 10. | Pig skin is also known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  | (a) | Pelt | (b) | Hide |
|  | (c) | Kip skin | (d) | Rind |
| 11. | Which amino acid is rich in dried blood |
|  | (a) | Tryptophan | (b) | Methionine |
|  | (c) | Lysine | (d) | Leucine |
| 12. | Black puddings are the edible by-products obtained from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  | (a) | Liver | (b) | Blood |
|  | (c) | Intestine | (d) | Bone marrow |
| 13. | Gelatine is obtained from |
|  | (a) | Collagen | (b) | Glue |
|  | (c) | Gums | (d) | Adhesive |
| 14. | Casings from cleaned pig stomach\_\_\_\_\_\_\_\_\_\_\_\_ |
|  | (a) | Chitterlings | (b) | Maws |
|  | (c) | Rounds | (d) | Middles |
| 15. | Casings obtained from small intestine of cattle is called as |
|  | (a) | Middles | (b) | Rounds |
|  | (c) | Runner | (d) | Bung |
| 16. | Murrain hides are the hides that are flayed from |
|  | (a) | Old animals | (b) | Dead animals |
|  | (c) | Young animals | (d) | Fat animals |
| 17. | The best quality gelatin is obtained at |
|  | (a) | 55-65℃ | (b) | 65-75℃ |
|  | (c) | 75-85℃ | (d) | 100℃ |
| 18. | The gelatin is an odorless solid with a relative density of |
|  | (a) | 1.3-1.4kg/l | (b) | 2.3-2.4kg/l |
|  | (c) | 3.3-3.4kg/l | (d) | 4.3-4.4kg/l |
| 19. | The yield of edible byproducts from meat animals ranges around which percentage of body weight |
|  | (a) | 10-15 % | (b) | 5-10% |
|  | (c) | 20-30% | (d) | 40% |
| 20. | The standard specifications to measure the stability of tallow are |
|  | (a) | Saponification number | (b) | Peroxide value |
|  | (c) | Smoke point | (d) | All the above |
| 21. | The pressure and time specifications in bone digester are |
|  | (a) | 60psi/2hr | (b) | 60psi/1hr |
|  | (c) | 60psi/1/2hr | (d) | 60psi/3hr |
| 22. | The temperature requirement of high quality yielding gelatin during heating of deboned crushed bones is |
|  | (a) | 40°C | (b) | 50°C |
|  | (c) | 60°C | (d) | 70°C |
| 23. | Primary filtration is capable of reducing the BOD2 level up to |
|  | (a) | 20% | (b) | 35% |
|  | (c) | 50% | (d) | 70% |
| 24. | The enzyme prepared from the abomasum of milk fed and un weaned buffalo or cow calf is |
|  | (a) | Trypsin | (b) | Tylosin |
|  | (c) | Rennin | (d) | Amylase |
| 25. | The by-product that is directly harvested from the animals immediately after slaughter is termed as |
|  | (a) | principal by-product | (b) | secondary by- product |
|  | (c) | Blood meal | (d) | Bones |
| 26. | Pale golden yellow oil obtained from the shine bones of cattle is |
|  | (a) | Grease | (b) | Lanoline |
|  | (c) | Neats foot oil | (d) | Sebum |
| 27. | The by-product obtained from wool is |
|  | (a) | Lanoline | (b) | Neat’s foot oil |
|  | (c) | Grease | (d) | All the above |
| 28. | Flocculants added to hasten the process of dissolved air flotation are |
|  | (a) | Aluminium sulphate | (b) | sodium carbonate |
|  | (c) | calcium carbonate | (d) | All the above |
| 29. | pH to be maintained in Anaerobic digestion unit is |
|  | (a) | 6.0 - 6.4 | (b) | 6.5– 6.7 |
|  | (c) | 6.8 – 7.0 | (d) | 7.0 – 7.2 |
| 30. | The by-product obtained from animals that is used in treatment of skin injuries where coagulation is delayed is |
|  | (a) | Glue | (b) | Heparin |
|  | (c) | Rennin | (d) | Insulin |
| 31. | Bones obtained from the freshly killed animals are known as |
|  | (a) | Hard bones | (b) | Green bones |
|  | (c) | Desert bones | (d) | Soft bones |
| 32. | Separation of dirt, grease and extraneous matter from wool is called as |
|  | (a) | Scouring | (b) | Skirting |
|  | (c) | Tanning | (d) | Grading |
| 33. | The type of rendering that prevents the loss of nutrients from the carcass |
|  | (a) | Wet rendering | (b) | Dry rendering |
|  | (c) | Both | (d) | None |
| 34. | The secondary by-product from poultry combs |
|  | (a) | Heparin | (b) | Serum |
|  | (c) | Hyaluronidase | (d) | Plasma |
| 35. | The fat obtained from peritoneal lining of pig |
|  | (a) | Leaf fat | (b) | Caul fat |
|  | (c) | Seam fat | (d) | Kidney fat |
| 36. | Ideal ratio of calcium to phosphorus in bone meal is |
|  | (a) | 4:3 | (b) | 3:2 |
|  | (c) | 2:1 | (d) | 1:2 |
| 37. | Central Leather Research Institute is located in |
|  | (a) | Pondicherry | (b) | Cochin |
|  | (c) | Mumbai | (d) | Chennai |
| 38. | Goat skins are more valuable than sheep skins for leather preparation because of |
|  | (a) | Their large size | (b) | Produce better lasting leather |
|  | (c) | Require less time to cool after slaughter | (d) | All the above |
| 39. | Successful method of removing suspended solids, fats and grease is |
|  | (a) | Activated sludge process | (b) | Dissolved air flotation |
|  | (c) | Anaerobic digestion | (d) | Preliminary filtration |
| 40. | Breakdown of complex effluent organic material into volatile fatty acids is done in which of the following method |
|  | (a) | Equilibration tank | (b) | Aerobic digestion |
|  | (c) | Anaerobic digestion | (d) | None of the above |
| 41. | Heparin is extracted from which of the following |
|  | (a) | Liver | (b) | Lungs |
|  | (c) | Mucosa of small intestines | (d) | All the above |
| 42. | Which of the following organ is rich source of vitamin B12 |
|  | (a) | Pancreas | (b) | Liver |
|  | (c) | Lungs | (d) | Bones |
| 43. | The gel forming ability of blood plasma is due to |
|  | (a) | Fibrin | (b) | Heparin |
|  | (c) | Albumin | (d) | None of the above |
| 44. | Industrial uses of blood include which of the following |
|  | (a) | Adhesive | (b) | Plywood |
|  | (c) | Film former in paper | (d) | All the above |
| 45. | Commonly used chemical depilatory agents in the process of leather making |
|  | (a) | calcium hydroxide | (b) | Sodium sulfide |
|  | (c) | Sodium sulfydrate | (d) | All the above |
| 46. | The average total time of the processing of leather from raw skins or hides is |
|  | (a) | 4 weeks | (b) | 3 weeks |
|  | (c) | 2 weeks | (d) | 1 week |
| 47. | The chemical used in the commercial alkaline procedure for processing of collagen to gelatin is |
|  | (a) | Sodium hydroxide | (b) | Sodium bicarbonate |
|  | (c) | Calcium hydroxide | (d) | Calcium bicarbonate |
| 48. | Gelatin is used for |
|  | (a) | Confectionery jellies | (b) | Stabilizer in ice cream |
|  | (c) | Capsule manufacturing | (d) | All the above |
| 49. | Epinephrine and norepinephrine are extracted from |
|  | (a) | Adrenal medulla | (b) | Thymus gland |
|  | (c) | Pancreas | (d) | Adrenal cortex |
| 50. | The hormone melatonin is extracted from |
|  | (a) | Langerhans cells | (b) | Pineal gland |
|  | (c) | Thyroid gland | (d) | Thymus gland |

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| **5.3** | **Fill in the blanks with suitable words** |
| 1. | Cracklings refer to \_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 2. | The first rendering company was established in USA by \_\_\_\_\_\_\_\_\_\_\_ |
| 3. | The feather meal is a rich source of \_\_\_\_\_\_\_\_\_\_\_ amino acid. |
| 4. | The products made from heart, lungs, and liver of calves and sheep with oatmeal added and cooked in a sheep’s stomach \_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 5. | Bones that belong to fallen animals are referred as \_\_\_\_\_\_\_\_\_\_\_\_ |
| 6. | Demineralisation of bones is done with the help of \_\_\_\_\_\_\_\_\_\_\_ |
| 7. | The casings are measured in terms of \_\_\_\_\_\_\_\_\_ |
| 8. | Continuous low temperature system of rendering also called as \_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 9. | Fibre like material which separates during bone crushing is referred to \_\_\_\_\_\_\_\_\_ |
| 10. | The term BUFFS denotes \_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 11. | The protein constitutes in \_\_\_\_\_\_\_ of hides. |
| 12. | Bones that are obtained directly from slaughter house are called as \_\_\_\_\_\_\_\_\_\_\_ |
| 13. | In order to improve the shelf-life of blood meal \_\_\_\_\_\_\_\_\_\_\_\_\_ is added. |
| 14. | Cocked hat shaped gland is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 15. | The glands should be collected within \_\_\_\_\_\_ of slaughter for byproduct production. |
| 16. | Bone pieces of \_\_\_\_\_\_\_\_\_\_ size constitute Bone meal. |
| 17. | Limed hides are called as \_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 18. | The hides produced from chrome tanning is known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 19. | There is no loss of nutrients in \_\_\_\_\_\_\_ rendering process. |
| 20. | Recovery of fat is better obtained in \_\_\_\_\_\_\_\_\_\_\_\_ rendering process. |
| 21. | The cheapest substitute for fried egg albumen is \_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 22. | Products made from hearts, lungs and livers of calves and sheep with oatmeal added, and are heavily seasoned and cooked in a sheep's stomach are \_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 23. | Rendered fat of cattle and sheep is termed as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 24. | Rendered fat of hog is termed as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 25. | The hardness or softness of the tallow is referred as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 26. | Solid residue remaining after fat had been rendered from animal by-products was called\_\_\_\_\_\_\_\_\_\_\_\_ |
| 27. | The protein percentage of feather meal is around \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 28. | The amino acid rich in blood meal is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 29. | High temperature rendering is operated at the temperature of \_\_\_\_\_\_\_\_\_\_\_°C |
| 30. | The damage caused by melophagus ovinus to leather is known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 31. | Abnormal vertical orientation of corium fibres which leads to weak leather is called as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 32. | The process of removing alkaline unhairing chemicals and non-leather substances from pelt is known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 33. | The process of removing excess moisture, smooth the grain and remove wrinkles from hide is known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 34. | Adjusting the firmness or softness of the leather by lubricating the fibres is called as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 35. | The process of stretching the leather and to compress, squeeze out the excess moisture and grease is known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 36. | The required percentage of moisture in skins after drying process is \_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 37. | Smoothing the grain surface by mechanical sanding to improve the appearance of leathers is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 38. | The tensile strength of traditional leather is around \_\_\_\_\_\_\_\_\_\_\_\_\_psi |
| 39. | Best method of preserving glands to retard autolysis and bacterial growth is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 40. | The standard length for sheep and hog casings is \_\_\_\_\_\_\_\_\_yards per hank. |
| 41. | A casing prepared from the oesophagus of cattle is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 42. | The required temperature of water for fermenting the casings is \_\_\_\_\_\_\_\_\_\_\_°C |
| 43. | Amino acids deficient in the blood meal are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 44. | The permissible limit of BOD for a slaughter house is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mg/litre |
| 45. | Insulin is produced from the specialized cells in the pancreas are called as \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 46. | The moisture percent in feather meal is around \_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 47. | The protein percentage in dried blood is around \_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 48. | The end products in anaerobic digestion of effluent treatment are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 49. | In the processing of hides the tanning by chemical process is termed as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 50. | The measure of oxygen required for the oxidation of organic matter in a known volume of effluent is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| **5.4** | **Match the following** |
| 1. | Hooves | ( ) | Horns |
| 2. | Dried ears | ( ) | Feed |
| 3. | DCP | ( ) | Gelatin |
| 4. | Hoof meal | ( ) | Pet food |
| 5. | Rennin | ( ) | Neats foot oil |
| 6. | Iron | ( ) | Liver |
| 7. | Bacon | ( ) | Lungs |
| 8. | Heparin | ( ) | Fertilizer |
| 9. | Keratin | ( ) | Cattle |
| 10. | Bone grit | ( ) | Stomach |

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| **5.5** | **Match the following** |
| 1. | Heparin | ( ) | Xenograft |
| 2. | Intestines | ( ) | Enterogastrone |
| 3. | Liver | ( ) | Pilobezoar |
| 4. | Hair | ( ) | No commercial value |
| 5. | Gall bladder | ( ) | Corticosteroids |
| 6. | Heart | ( ) | Lung |
| 7. | Duodenum | ( ) | Catgut |
| 8. | Phytobezoars | ( ) | Vitamin B12 |
| 9. | Propionibacterium Shermanii | ( ) | Cholesterol |
| 10. | Adrenal glands | ( ) | Cholic acid |

**KEY**

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| **5.2** | **Choose the correct answer** |
| 1. | C |
| 2. | D |
| 3. | A |
| 4. | D |
| 5. | A |
| 6. | B |
| 7. | A |
| 8. | D |
| 9. | D |
| 10. | D |
| 11. | C |
| 12. | B |
| 13. | B |
| 14. | B |
| 15. | C |
| 16. | B |
| 17. | A |
| 18. | A |
| 19. | C |
| 20. | D |
| 21. | A |
| 22. | C |
| 23. | B |
| 24. | C |
| 25. | A |
| 26. | C |
| 27. | A |
| 28. | D |
| 29. | D |
| 30. | B |
| 31. | B |
| 32. | A |
| 33. | B |
| 34. | C |
| 35. | A |
| 36. | C |
| 37. | D |
| 38. | D |
| 39. | B |
| 40. | C |
| 41. | D |
| 42. | B |
| 43. | C |
| 44. | D |
| 45. | D |
| 46. | A |
| 47. | C |
| 48. | D |
| 49. | A |
| 50. | B |

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| **5.3** | **Fill in the blanks with suitable words** |
| 1. | Cracklings |
| 2. | H W Heaths |
| 3. | Serine |
| 4. | Haggings |
| 5. | Desert bones |
| 6. | 4-10% HCL |
| 7. | Hanks |
| 8. | Dry continuous method |
| 9. | Sinews |
| 10. | Hides of buffalo |
| 11. | 33% |
| 12. | Green bones |
| 13. | Lime (CaO) |
| 14. | Adrenal gland |
| 15. | 15-20 min |
| 16. | Less than 2mm |
| 17. | Pelts |
| 18. | Wet blue hides |
| 19. | Dry |
| 20. | Wet |
| 21. | Dried blood serum/ blood albumen |
| 22. | Haggis |
| 23. | Tallow |
| 24. | Lard |
| 25. | Titre |
| 26. | Tankage |
| 27. | 80% |
| 28. | Lysine |
| 29. | 100 |
| 30. | Cockle defect |
| 31. | Vertical fibre defect |
| 32. | Batting |
| 33. | Setting/wringing/Sammy |
| 34. | Fat liquoring |
| 35. | Setting out |
| 36. | 10-12% |
| 37. | Buffing |
| 38. | 2000-4000 psi |
| 39. | Freezing |
| 40. | 100 |
| 41. | Weasand |
| 42. | 21°C |
| 43. | Tryptophan and isoleucine |
| 44. | 2000 |
| 45. | Islets of Langerhans |
| 46. | 8% |
| 47. | 80% |
| 48. | Methane and CO2 |
| 49. | Chrome tanning |
| 50. | Chemical oxygen demand |

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| **5.4** | **Match the following** |
| 1. | 9 |
| 2. | 3 |
| 3. | 10 |
| 4. | 2 |
| 5. | 1 |
| 6. | 6 |
| 7. | 8 |
| 8. | 4 |
| 9. | 7 |
| 10. | 5 |

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| **5.5** | **Match the following** |
| 1. | 6 |
| 2. | 7 |
| 3. | 4 |
| 4. | 8 |
| 5. | 10 |
| 6. | 1 |
| 7. | 2 |
| 8. | 9 |
| 9. | 3 |
| 10. | 5 |