

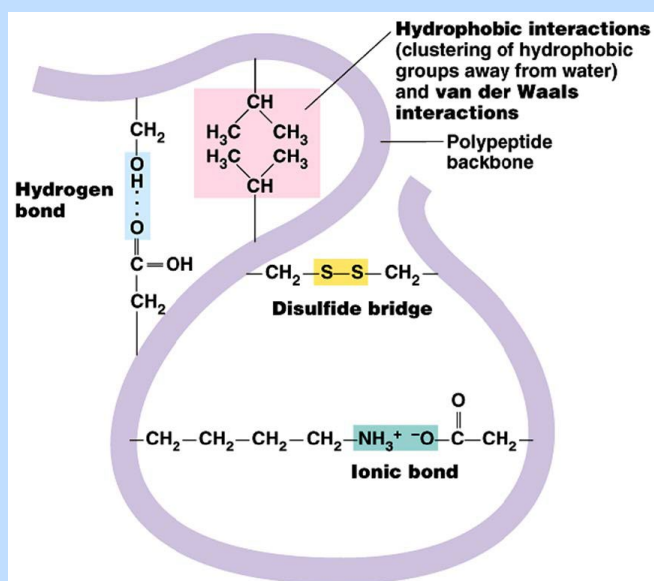
## Extract value from wool waste: keratin and the circular economy

# Student Worksheet 1

### Activity 1: Keratin extraction

#### The chemistry of keratin

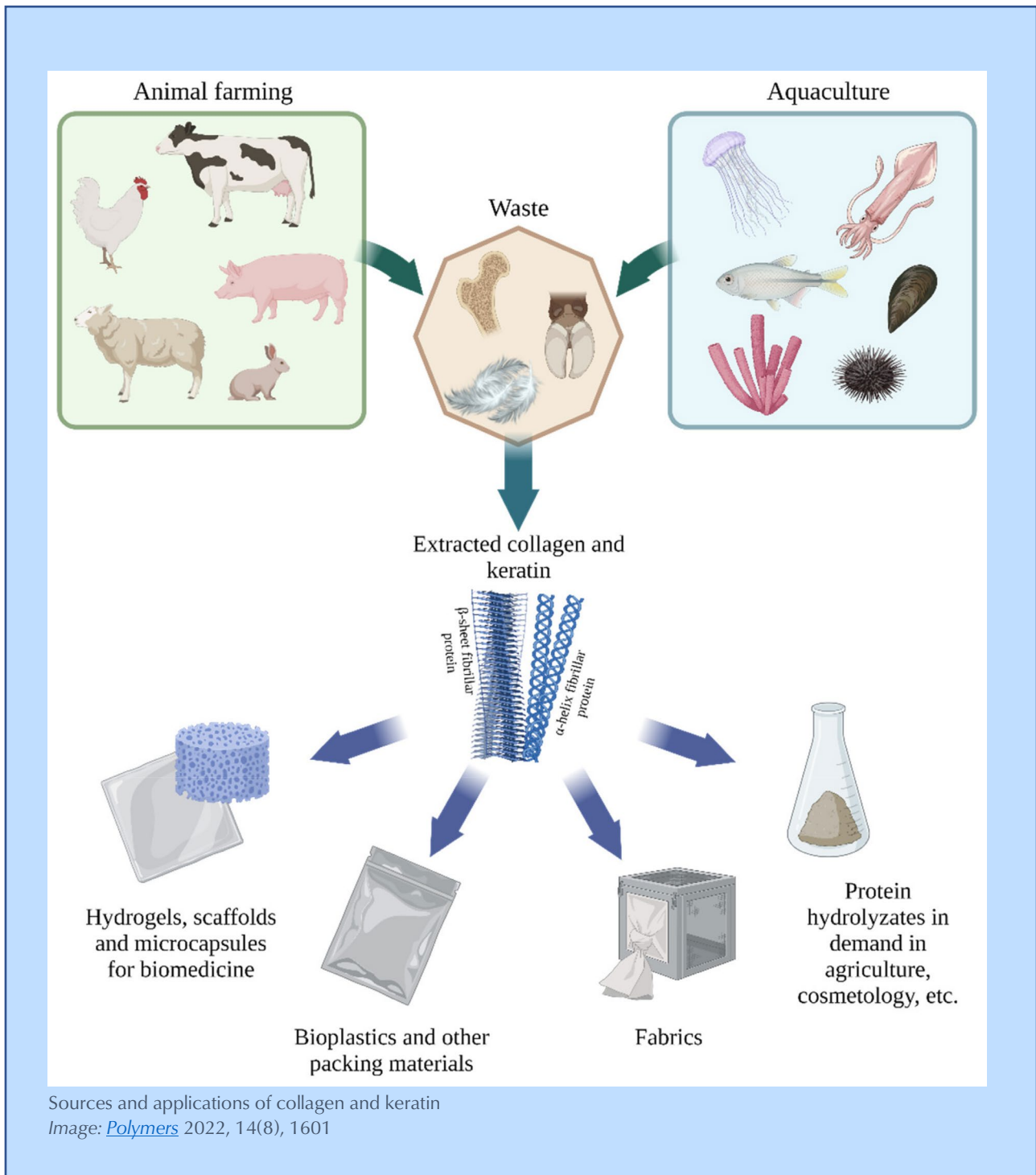
Keratin is a fibrous protein that, in terms of secondary structure, can be organized as an alpha helix or beta sheet. The high content of cysteine residues promotes the formation of disulfide bridges that add to hydrogen bonds, and ionic and hydrophobic interactions contribute to the three-dimensional (3D) organization of the protein. Depending on the origin of keratin, the 3D structure and specific amino acid content changes, but the main inter- and intramolecular bonds remain the cystine disulfide bridges.



Intramolecular bonding in keratin

Image: [Materials](#) 2021, 14(16), 4696

Keratin extraction depends on breaking of the abovementioned interactions. Depending on the extracting agent, different amino acid compositions of the extracted keratin and different chemical and physical characteristics will be obtained. For this reason, different fields of research have been developed to explore the use of keratin in the production of new biomaterials. In recent years, with the aim of developing increasingly effective extraction techniques and production methods for hydrolyzed keratin, which vary according to the characteristics of the product required and its use, several new keratin-based products have been developed: films, adsorbent sponges, polymeric fibres, particular applications in the field of biomaterials.





Answer the following questions:

- What does the wool look like before extraction?

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- What does the wool look like after the extraction period?

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- What does the extraction solution look like at the end of the experiment?

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- Do you think a chemical reaction occurred that changed the wool in some way?

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