SI A&P - Full Discipline Demo - Fetal Pig

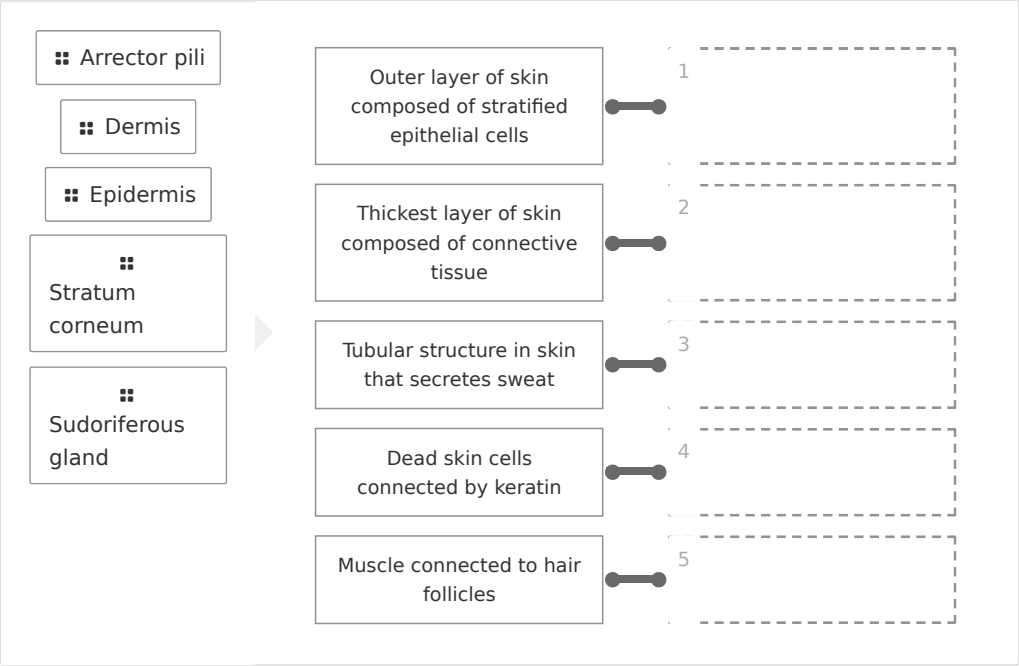
The Integumentary System

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI A&P - Full Discipline Demo - Fetal Pig
Course	SI A&P - Full Discipline Demo - Fetal Pig
Instructor	Sales SI Demo

Test Your Knowledge

Match the illustration of the fingerprint minutiae with the correct term.

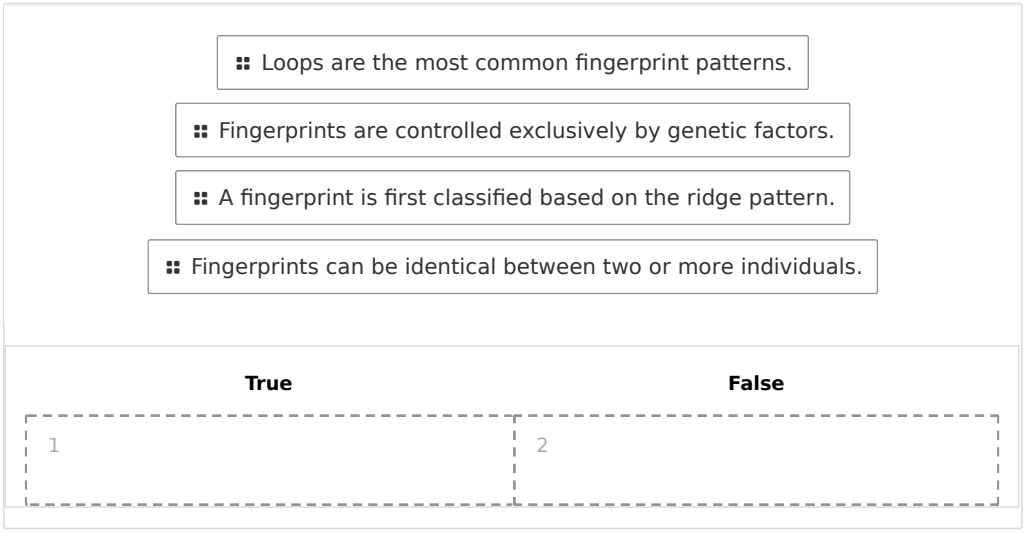


Correct answers:

1 Epidermis 2 Dermis 3 Sudoriferous gland 4 Stratum corneum

5 Arrector pili

Categorize each statement as true or false.



Correct answers:

1 Loops are the most common fingerprint patterns.

A fingerprint is first classified based on the ridge pattern.

2 Fingerprints can be identical between two or more individuals.

Fingerprints are controlled exclusively by genetic factors.

Exploration

The integumentary system is composed of the _____.

- skin
- hair
- nails
- All of the above ✔

Melanocytes and Merkel cells are present in the _____ .

- [x] stratum basale
- [ ] stratum corneum
- [ ] stratum lucidum
- [ ] stratum granulosum

The _____ form ridges on the palms of the hands and the soles of the feet.

- [ ] melanocytes
- [x] dermal papillae
- [ ] arrector pili
- [ ] hair follicles

Arch patterns can be further classified as plain or tented.

- [x] True
- [ ] False

When examining a fingerprint for focal points, each minutia is examined to determine the angle, size, shape, and general position relative to other ridges and minutia in the print.

- [x] True
- [ ] False

Exercise 1

What are the functions of each epidermis labeled in Photo 2 of this exercise?

The stratum corneum prevents dehydration and provides resilience of the skin.

The stratum lucidum functions to reduce friction between the stratum corneum and stratum granulosum.

The stratum granulosum functions to prevent fluid loss from the body.

The stratum spinosum functions to remove damaged cells and foreign particles from the skin and to produce keratin and glycolipids that migrate into the stratum granulosum.

The stratum basale contains melanocytes which produce the pigment melanin, and Merkel cells which facilitate the sense of touch.

What are three key features (glands and follicles) of the dermis that were not labeled in Photo 1 and what are their functions?

Three key unlabeled structures that reside within the dermis are sudoriferous glands, sebaceous glands, and hair follicles. Sudoriferous glands secrete sweat to cool the body. Sebaceous glands secrete sebum (oil) into hair follicles to lubricate and soften hair and skin, prevent water loss, and kill bacteria. Hair follicles are tubular structures surrounding hair roots and strands that function to grow and maintain hair.

Photo 1: Skin Layers
(SAMPLE ANSWER BELOW)

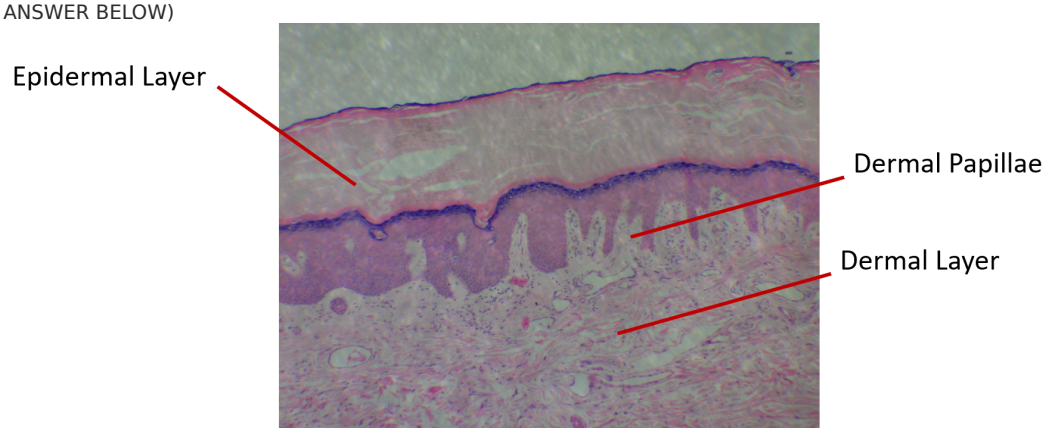
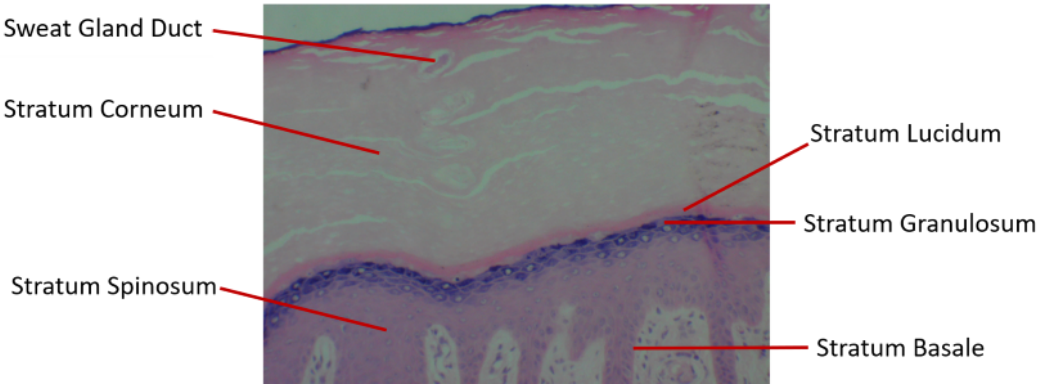


Photo 2: Epidermis Layers
(SAMPLE ANSWER BELOW)



Exercise 2

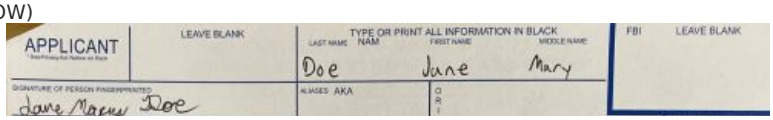
How did your individual fingerprints compare on each hand? Reference Photo 3 and Data Table 1 in your explanation.

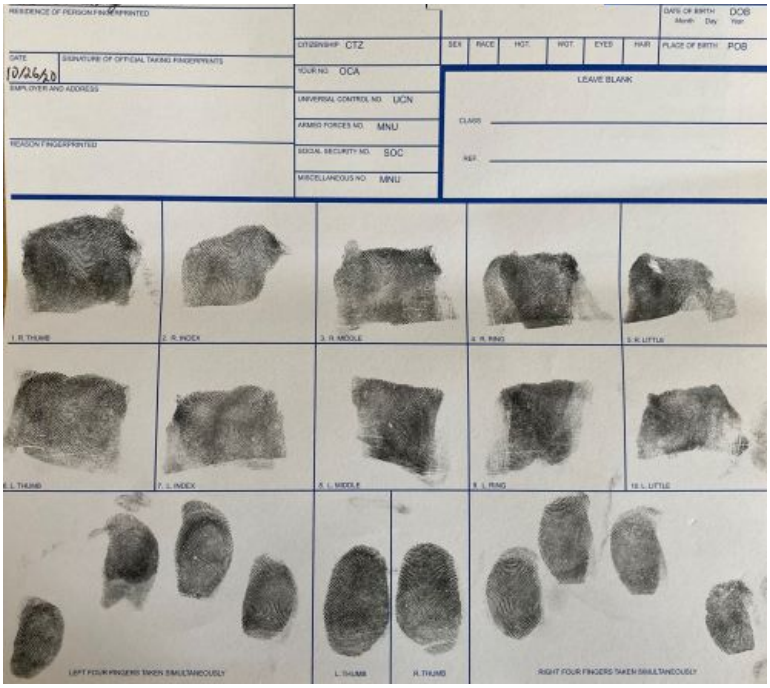
Students should state that each fingerprint was unique in respect to a single hand and between each hand. Students should provide an example from Photo 3 and Data Table 1. For example, no single fingerprint on the sample image in Photo 3 had the same pattern and minutiae combination of any other fingerprint in the image.

Why are individual fingerprints unique? Provide a description of how fingerprints develop in your explanation.

Everyone has a unique set of fingerprints due to genetic and environmental factors. Fingerprints form in the 12^{th} to 16^{th} week of fetal development through a combination of genetic and environmental factors. While an individual's genetic makeup dictates how ridges will form, random events, such as the fetus's position at a particular moment or the composition and density of the surrounding amniotic fluid, can influence the distinctive patterns.

Photo 3: Completed Fingerprint Card
(SAMPLE ANSWER BELOW)





Data Table 1: Fingerprint Observations

(SAMPLE ANSWER BELOW)

Finger	Observations
Right Thumb	Each observation should list both a whirl pattern and minutiae characteristics consistent with each print present in Photo 3.
Right Forefinger	Each observation should list both a whirl pattern and minutiae characteristics consistent with each print present in Photo 3.

Right Middle Finger	Each observation should list both a whirl pattern and minutiae characteristics consistent with each print present in Photo 3.
Right Ring Finger	Each observation should list both a whirl pattern and minutiae characteristics consistent with each print present in Photo 3.
Right Little Finger	Each observation should list both a whirl pattern and minutiae characteristics consistent with each print present in Photo 3.
Left Thumb	Each observation should list both a whirl pattern and minutiae characteristics consistent with each print present in Photo 3.
Left Forefinger	Each observation should list both a whirl pattern and minutiae characteristics consistent with each print present in Photo 3.
Left Middle Finger	Each observation should list both a whirl pattern and minutiae characteristics consistent with each print present in Photo 3.
Left Ring Finger	Each observation should list both a whirl pattern and minutiae characteristics consistent with each print present in Photo 3.
Left Little Finger	Each observation should list both a whirl pattern and minutiae characteristics consistent with each print present in Photo 3.

Competency Review

Skin is composed primarily of connective and epithelial tissues.

- ◉ True ✔
- ○ False

The epidermis is composed of five layers of _____ cells.

- ○ adipose
- ○ secretory
- ○ cuboidal epithelial
- ◉ stratified epithelial ✔

The stratum basale is the deepest layer of the dermis.

- ○ True
- ◉ False ✔

The dermis contains ____.

- sudoriferous glands
- sebaceous glands
- hair follicles
- All of the above ✔

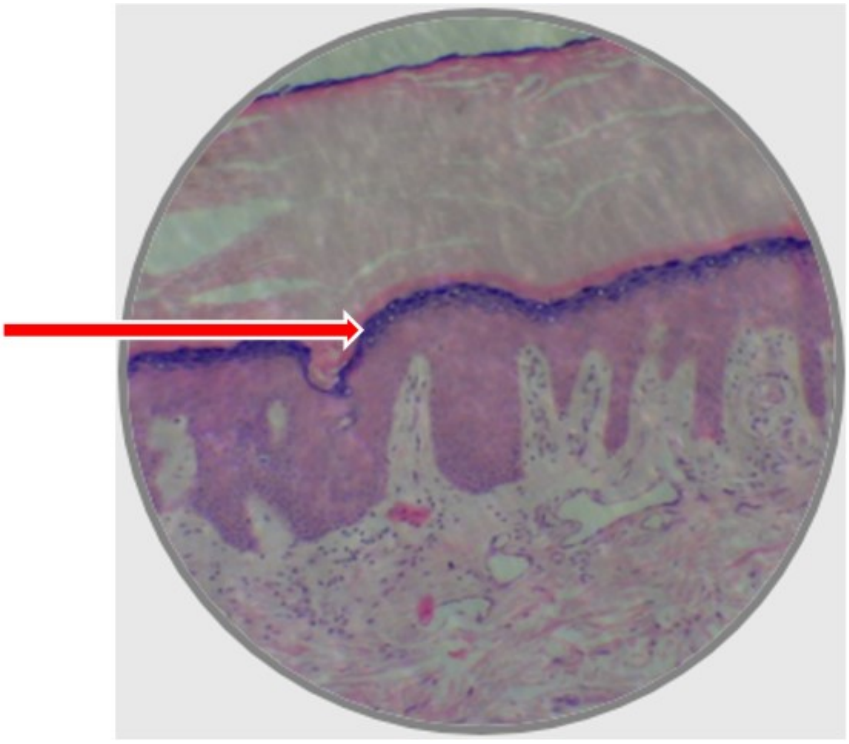
Fingerprints form through a combination of genetic and environmental factors.

- True ✔
- False

Whorls, loops, and arches are the three common fingerprint ____.

- minutiae
- ridge patterns ✔
- focal points
- bifurcations

The _____ is indicated by the red arrow in the human skin micrograph below.



- dermal papillae
- subcutaneous layer
- arrector pili
- stratum granulosum ✔

Inked fingers should be rolled from left to right in the correctly labeled boxes when completing a fingerprint identification card.

- True ✔
- False

The fingerprint in the image below should be classified as a(n) _____ ridge pattern.

- arch
- loop
- whorl ✔
- trifurcation

Extension Questions

Criminals have attempted to remove or alter their fingerprints by filing or cutting away the surface layer of skin. Apply your knowledge of fingerprints and the integumentary system to explain why fingerprint mutilation is not typically successful. (SAMPLE ANSWER BELOW)

The dermal papillae that produce the ridges that form the fingerprints are in the dermis, six tissue layers below the surface of the skin. Removal of superficial skin layers by filing or cutting would likely not remove the dermal papillae and the fingerprint would persist.