Hair, Nails and Glands Lab

Name _____
Date _____
Period _____

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DAY 1 Hair and nails are made the same way: living cells divide, fill with **keratin**, die, and are pushed out.

☐ I can identify the parts of a hair follicle and a nail and explain what each part does.

☐ I can use growth rates to explain how long hairs and nails grow.

Part 1. Build a hair (Tab 1)

SEP 2 Models · SEP 5 Math · CCC Structure and Function · Stability and Change

1. Name each pin in the lab. Then write the letter of each part's job. Two parts share a job.

JOBS A. is the hair (dead cells) · B. makes the hair · C. feeds the bulb · D. the tube it grows in · E. oils hair and skin · F. stands it up

Part	Job
Hair shaft	
Hair root	
Hair follicle	
Hair bulb	

Part	Job
Hair papilla	
Sebaceous gland	
Arrector pili muscle	

2. Watch each hair through a whole growing phase. **Example:** 2 cm a month for 5 months = 2 × 5 = 10 cm.

Hair	cm per month	Growing phase (months)	Longest (cm)	Check: rate × months
Scalp hair				
Eyebrow hair				

3. At month 36.5 the scalp hair is ☐ growing ☐ resting. The resting phase lasts ☐ 3 days ☐ 3 months ☐ 3 years.

4. At month 10 press **Cut it to 1 cm**. At month 12 it is _____ cm. After the cut it grew _____ cm a month.

5. Cold or a scare: the ☐ arrector pili muscle ☐ sebaceous gland contracts and the hair ☐ stands up ☐ falls out.

READ FIRST. In the lab, find the **Learn It** box under the graph and read it. Then answer 6.

6. (a) Cutting ☐ changed ☐ did not change the rate. Hair is made in the _____. **WORD BANK** bulb · shaft · nail

(b) An eyebrow is short: it has a ☐ shorter growing phase ☐ different protein. Scalp _____ mo. Eyebrow _____ mo.

Part 2. Grow a nail (Tab 2)

SEP 4 Data · SEP 5 Math · CCC Scale, Proportion, and Quantity

7. Name all six pins. Then tick what each part is.

Part	Nail plate	Free edge	Lunula	Cuticle	Nail bed	Nail matrix
Living cells that make the plate	☐	☐	☐	☐	☐	☐
Dead, keratin-filled plate	☐	☐	☐	☐	☐	☐
Skin around or under the plate	☐	☐	☐	☐	☐	☐

8. Grow out the blue line. Record the distance from the cuticle. **Example:** 6 mm in 3 months = 6 ÷ 3 = 2 mm a month.

Nail	Month	mm	Month	mm	mm per month	Months to the free edge
Fingernail	2		4			
Big toenail	5		10			

9. Case: grooves after a fever. Click each groove. Fingernail: _____ mm ÷ 3.5 = _____ months. Toenail: _____ mm ÷ 1.6 = _____ months. Same event? ☐ yes ☐ no

Part 3. Hair evidence (Tab 3)

SEP 3 Investigating · SEP 7 Argument · CCC Structure and Function

10. Measure each sample with the blue lines. Medullary index = medulla ÷ hair width.

Example: medulla 30 µm, hair 90 µm: 30 ÷ 90 = 0.33. **CLUE:** under 0.33 = human; over 0.5 = animal; no scales = not a hair.

Sample	Hair width (µm)	Medulla width (µm)	Medullary index	Circle one
Hair from the scene				human · animal · not hair
Person A				human · animal · not hair
Person B				human · animal · not hair
The dog				human · animal · not hair
Car-seat fiber				human · animal · not hair

11. The scene hair's root is ☐ club ☐ pulled, so it fell out in the ☐ resting phase ☐ growing phase.

12. Consistent with ☐ Person A ☐ Person B ☐ the dog. A microscope cannot prove it because ☐ many people have hair like this ☐ hair has no color.

DAY 2 Three kinds of gland sit in the dermis. Two make sweat and one makes oil. Find each one, then test which sweat glands switch on, and when.

☐ I can compare eccrine sweat, apocrine sweat and sebaceous glands by where they open, what they make and what they do.

☐ I can plan a fair sweat-print test and use its counts to explain what switches sweat glands on.

Part 4. Three glands (Tab 4)

SEP 2 Models · CCC Structure and Function · Stability and Change

Start with the **Armpit** at age 16. Click each gland and name it.

13. Fill in the table with the letters.

LOOKS LIKE A. small, tight coil · B. big coil, wide openings · C. pale oily sacs by the hair **MAKES** D. watery sweat · E. thick sweat with proteins and fats · F. oil (sebum)

Gland	Looks like (letter)	Opens onto the skin surface	Opens into a hair follicle	Makes (letter)
Eccrine sweat gland		☐	☐	
Apocrine sweat gland		☐	☐	
Sebaceous gland		☐	☐	

14. Armpit, age 16. Try each setting. Tick every gland that releases something.

What is happening	Eccrine	Apocrine	Sebaceous
Cool and calm	☐	☐	☐
Exercise in a warm room	☐	☐	☐
Stress: giving a speech	☐	☐	☐

READ FIRST. In the lab, find the **Learn It** box and read it. Then answer 15 and 16.

15. Armpit, **Stress**. After **puberty** (age 16) the apocrine glands ☐ switch on ☐ switch off, and the sebaceous glands make ☐ more oil ☐ less oil.

16. On the **Palm**, missing (tick two): ☐ eccrine ☐ apocrine ☐ sebaceous
They are missing because thick skin has no _____, and those glands empty into one.

WORD BANK hair follicles · blood · keratin

Part 5. Sweat-print test (Tab 5)

SEP 3 Investigating · SEP 4 Data · SEP 5 Math · CCC Patterns · Cause and Effect

17. Plan. Question: *is palm sweat for cooling or for grip?* Tick the runs you need.

☐ Palm, exercise ☐ Palm, mental math ☐ Upper back, exercise ☐ Upper back, mental math ☐ Thigh, calm

Kept the same every run (tick two): ☐ 2 minutes ☐ the same window ☐ the site ☐ the condition

18. Run the test. Count the dots in the window. Per cm^2 = dots × 20.

Example: 7 dots × 20 = 140 glands per cm^2. Click each dot as you count it so none is counted twice.

Site	Exercise, warm room: dots	per cm^2	Mental-math test: dots	per cm^2
Palm				
Upper back				

19. Switch to **Which site has the most sweat glands?** and use pilocarpine (every gland on).

Every gland on	Palm	Sole	Forehead	Forearm	Upper back	Thigh
Dots in the window						
Glands per cm^2						

Wrap it up

SEP 6 Explanations · SEP 7 Argument · CCC Cause and Effect

READ FIRST. In the lab, find the **Learn It** box on Tab 5 and read it. Then answer 20.

20. Claim: palm sweat glands are mostly for grip, and back sweat glands are for cooling.

Evidence: under stress the palm had _____ per cm^2 and the back had _____. In exercise the back had _____.

Reasoning: palm sweat is mostly for ☐ grip ☐ cooling, and back sweat is for ☐ grip ☐ cooling. Apocrine glands respond to ☐ stress ☐ heat.

NYSSLS: building toward HS-LS1-2 (DCI LS1.A Structure and Function) and HS-LS1-3 (feedback in temperature control). Anatomy & Physiology, Hole's Essentials 6.3: Accessory Structures of the Skin. Day 1: Hair and Nails (AP.3.6.4). Day 2: Glands of the Skin (AP.3.6.5). Tags: SEP = Science and Engineering Practice, CCC = Crosscutting Concept.