Thermoregulation Lab low-write

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Name _____
Date _____
Period _____

DAY 1 Your cells make heat all day, yet you stay near **37°C**. Today: how heat **leaves** through the skin.

☐ I can name four ways heat leaves the skin, and show with data that evaporation cools.

☐ I can explain how sweat glands and dermis blood vessels change how fast heat leaves, and why humid heat is dangerous.

Part 1. Wet and dry (Tab 1)

SEP 3 Investigating · SEP 4 Data · CCC Cause and Effect

Humidity **50%**, water **Room temperature**. Change only the thermometer and the air. Press **Run 5 minutes**. Copy from **Your runs**. Every run starts at room temperature.

1. A fair test. (Drop = start – after. Like 20.0 – 17.5 = 2.5.)

Run	Start (°C)	After 5 min (°C)	Drop (°C)
Dry, still air			
Dry, fanned			
Wet, still air			
Wet, fanned			

2. (a) The **control** (no water, no fan) is ☐ Dry, still air ☐ Dry, fanned ☐ Wet, fanned
Dry, fanned did not cool. So the fan by itself ☐ does ☐ does not cool a thermometer.
(b) **Myth check:** "A wet towel cools you because the water is cold." Wet, fanned, **cold water from the fridge**: start _____°C, after 5 min _____°C. It ☐ cooled ☐ warmed. Room-temperature water ended at _____°C. Both end near the same number, so the cooling comes from ☐ evaporation ☐ cold water

3. Wet, fanned, room-temperature water. Change only the humidity.

Humidity	20%	50%	80%	100%
Drop in 5 min (°C)				

READ FIRST. In the lab, find the **Learn It** box under the drawing and read it. Then answer 4.

4. Turning water into vapor takes ☐ energy ☐ cold. The water takes it as heat from ☐ the thermometer ☐ the fan
Fanned dropped _____°C, still air _____°C. Dry air (20%) dropped _____°C, humid air (80%) _____°C.

Part 2. Four ways out (Tab 2)

SEP 4 Data · CCC Energy and Matter · Patterns

5. Read the bars. Pick the main way out. Copy from **Scenes you solved**.

WORDS radiation · conduction · convection · evaporation

Scene	Main way heat leaves	Its watts
1. Sitting in class		
2. By a cold window		
3. Cold metal bench		
4. Windy walk		
5. Cold lake		
6. Run on a hot day		

6. Scene 6: radiation _____ W, convection _____ W. A negative number means heat is ☐ going out ☐ coming in. The way left to lose heat: ☐ radiation ☐ conduction ☐ evaporation

READ FIRST. In the lab, find the **Learn It** box under the drawing and read it. Then answer 7.

7. **WAY OUT** A. conduction · B. radiation · C. convection · D. evaporation Write a letter. Thermal camera _____ · a fan _____ · a cold step _____ · sweat dries _____
The lake wins because water conducts heat about ☐ 2 ☐ 25 ☐ 250 times better than air.

Part 3. Football practice (Tab 3)

SEP 4 Data · SEP 6 Explanations · CCC Cause and Effect · Structure and Function

8. **90°F**, **Shorts and a T-shirt**, water breaks **None**. Change only the humidity. Press **Run practice**.

Humidity	Heat index (°F)	Core at end (°C)	Sweat made (L)	Dripped off (L)	Evaporated (%)
40%					
60%					
80%					

9. 90°F, 80%, **Full pads**, no breaks: core _____°C, danger ☐ safe ☐ heat exhaustion ☐ heat stroke
With water breaks: core _____°C, collapsed at minute _____. Skin, close up: vessel ☐ narrow ☐ wide, face ☐ pale ☐ red

READ FIRST. In the lab, find the **Learn It** box under the drawing and read it. Then answer 10.

10. Reply to the coach. Same 90°F, but the heat index was _____°F at 40% and is _____°F at 80%. His core ended at _____°C then and _____°C now. Then _____% of the sweat could evaporate, now only _____%. In humid air sweat ☐ evaporates ☐ drips off, so it does not cool him.

DAY 2 A **feedback loop** in the brain turns sweat, blood vessels and shivering on and off to hold the **set point**.

☐ I can name the parts of a negative feedback loop and find them in my own data.

☐ I can explain why a fever makes you shiver at a normal temperature and sweat when it breaks.

Part 4. The loop (Tab 4)

SEP 3 Investigating · SEP 4 Data · CCC Stability and Change

11. Hot: exercise, **Medium**. Press **Record this time** at each time. Write yes or no for sweat.

When	Pulse (per min)	Cheek color (1 to 4)	Palm (°C)	Sweat?	Vessels
At rest, before					
Right after					
After 2 min of rest					
After 4 min of rest					

12. Cold: bus stop, **Just a T-shirt**. Record each time.

When	Cheek skin (°C)	Color	Shivering?	Goosebumps?	Core (°C)
Indoors, before					
5 min outside					
10 min outside					
5 min back inside					

13. Build the loop. Place all eight cards. Then write a letter in each box for **too hot**.

PARTS A. temperature rises above 37°C · B. thermoreceptors in the skin and brain · C. the hypothalamus · D. sweat glands · E. temperature falls back to 37°C

Stimulus	Receptor	Control center	Effector	Response

READ FIRST. In the lab, find the **Learn It** box under the drawing and read it. Then answer 14 and 15.

14. Sweat right after: _____ After 4 min: _____ The sweat cooled the body back near ☐ 37°C ☐ 40°C, so the receptors ☐ stop ☐ start signaling and the hypothalamus switches the sweat glands off.
Negative feedback means the response goes ☐ against the change ☐ with the change ☐ badly

15. Cheek dropped _____°C (33.5 – 10-minute reading). Core dropped _____°C. The loop is ☐ failing ☐ working.
Vasoconstriction: vessels ☐ narrow ☐ widen, so warm blood stays ☐ deep ☐ at the skin. **Shivering:** muscles make ☐ heat ☐ sweat

Part 5. Fever (Tab 5)

SEP 4 Data · SEP 6 Explanations · CCC Stability and Change

16. Set point **39°C**, medicine **None**. Press **Next hour** and fill in these hours. Write yes or no.

Hour	0	1	2	6	7	8
Set point (°C)						
Body (°C)						
Shivering?						
Sweating?						

17. Try **40°C**: hours of shivering ☐ 1 ☐ 2 ☐ 3 ☐ 6. **Fever medicine at hour 3** (39°C): at hour 3 the set point drops to _____°C.

READ FIRST. In the lab, find the **Learn It** box under the drawing and read it. Then answer 18 and 19.

18. (a) At hour 0 the set point is _____°C, so a body at 37°C is ☐ too cold ☐ too hot for the loop, and it shivers.
(b) Body at hours 6, 7, 8: _____ _____ _____ °C. It is ☐ rising ☐ falling, so the fever is ☐ getting worse ☐ breaking

Wrap it up

SEP 6 Explanations · SEP 7 Argument · CCC Stability and Change

19. Claim: one negative feedback loop holds body temperature near its set point, whether you are too hot or too cold.
Evidence: too hot, sweat right after _____, at 4 min _____. Too cold, the core stayed at _____°C or above while the cheek fell to _____°C. Fever: the body went 37 → _____ → 37°C.
Reasoning: receptor _____ · control center _____ · two effectors _____ and _____

NYSSLS: building toward HS-LS1-2 and HS-LS1-3. Hole's Essentials 6.4 (skin functions: body temperature) (AP.3.6.8). Heat index: National Weather Service. Wet-bulb temperatures: Stull (2011). The pulse, colors and hours in Parts 4 and 5 are from a model made to match typical results; they are not measurements. SEP = Science and Engineering Practice, CCC = Crosscutting Concept.