Burns and Wounds Lab: NYSSLS Alignment

Teacher guide for the student worksheet at mrsajdak.com/burns (two pages, 23 questions: burns on the front, wounds on the back; a low-write version has the same numbers). Anatomy & Physiology, Hole's Essentials Section 6.4 (skin functions, wound healing) and its feature on burns. The answer key is kept off the website; write to rsajdak@buffaloschools.org for it. © 2026 Ryan Sajdak. Free to use, share and change under CC BY-NC-SA 4.0 (creativecommons.org/licenses/by-nc-sa/4.0): give credit, do not sell it, share your version the same way.

The model

Five tabs and a bonus game in one page, no login. Every run gives the same numbers, so the key is exact. **What is real:** Tab 1 solves heat conduction through the skin every twentieth of a millimeter and adds up cell damage at each depth. The damage rates are fitted to the scald measurements of Moritz and Henriques (1947), the source of the figures on every water heater label: a second-degree burn on adult skin after about 5 minutes at 120°F, 30 seconds at 130°F and 5 seconds at 140°F. The slice in Tab 1 is drawn to scale. Cool running water for 20 minutes is the first aid burn centers teach; ice and butter are not. The burn signs in Tab 2 (blanching, pain, hair that slides out), the rule of nines, and the fluid formula in Tab 3 (4 mL for each kilogram for each percent, half in the first 8 hours) are the ones used in emergency rooms. Covered, moist wounds close about twice as fast as scabbed ones, and a scar tops out near 80% of the strength of unbroken skin. **What is made up to show a pattern:** the “two days later” depth is a simple rule for the hurt zone under a burn; the cell counts, the days and the scar widths in Tab 5 are not medical values. The note at the foot of the lab page and the worksheet footer say so.

Hole's calls the three depths superficial partial-thickness, deep partial-thickness and full-thickness. The lab uses first, second and third degree because students already know those words; say both. Real photos sit under each tab. The burn and wound photos are blurred until a student taps one, and none shows a face. Preview them, and Tab 2's house-fire case, if a student in the room has lived through a fire or a bad burn.

Objectives

The same four statements are printed on the worksheet, two at the top of each side, with a box to tick. They match the lesson objective AP.3.6.7: classify burns by depth and describe the stages of wound healing.

Side	I can	Questions
Burns	use data to explain how the temperature and the time of contact decide how deep a burn goes.	1 to 6
Burns	tell a first-, second- and third-degree burn apart from its signs, and measure a burn with the rule of nines.	7 to 13
Wounds	name six kinds of wounds from how they were made and how they look.	14 to 17
Wounds	put the four stages of healing in order and tell what the cells do in each one.	18 to 23

Performance expectations: building toward

HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. **HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. **HS-LS1-4** Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

Worksheet link: students tie what is in each layer of the skin (vessels, nerve endings, hair follicles) to what a burn of that depth looks and feels like, and to whether it can heal (Q7 to Q9, Q22, Q23, HS-LS1-2). They run fair tests on first aid and on wound care, and watch clotting, where platelets that stick call in more platelets, a textbook positive feedback loop (Q5, Q6, Q18 to Q20, a step toward HS-LS1-3). Healing is cells dividing and specializing to rebuild a tissue (Q18, Q21, Q22, HS-LS1-4). This is practice toward all three, not a full assessment of any. **DCI LS1.A:** Structure and Function. **LS1.B:** Growth and Development of Organisms.

Part by part

Part	SEP	CCC	What students do

1. Heat and time Tab 1, Q1 to 6	SEP 3 Planning and carrying out investigations SEP 4 Analyzing and interpreting data SEP 5 Using mathematics and computational thinking	Cause and Effect	Run six water temperatures and read when each burn begins. Turning a heater from 140°F down to 120°F buys 60 times as long. Then a fair test of four kinds of first aid on the same burn.
2. Read the burn Tab 2, Q7 to 9	SEP 4 Analyzing and interpreting data SEP 6 Constructing explanations and designing solutions	Patterns Structure and Function	Examine six burns with four tools: look, press, pin, hair. The pattern that surprises students: the deepest burn hurts the least, because its nerve endings are dead.
3. Rule of nines Tab 3, Q10 to 13	SEP 2 Developing and using models SEP 5 Using mathematics and computational thinking	Scale, Proportion and Quantity	Paint four patients, total the burned skin, and work out the fluid each one needs. A first-degree burn counts for nothing. A small child's head is 18% of the body.
4. Six wounds Tab 4, Q14 to 17	SEP 2 Developing and using models SEP 4 Analyzing and interpreting data	Cause and Effect Structure and Function	Make an abrasion, incision, laceration, puncture, avulsion and contusion, classify six mystery wounds from their stories, and date a bruise by its color.
5. Heal it Tab 5, Q18 to 22	SEP 3 Planning and carrying out investigations SEP 4 Analyzing and interpreting data	Stability and Change Cause and Effect	Watch platelets, neutrophils, macrophages and fibroblasts take their turns, then test care (covered, dry, dirty), stitches against left open, and a scrape against a third-degree burn.
Wrap it up Q23	SEP 6, SEP 7 Engaging in argument from evidence	Structure and Function	Claim, evidence and reasoning: depth decides healing, because new skin grows from what is left alive in the dermis.

Running it

One long period or two short ones, one device per student or pair. The front (Tabs 1 to 3) is burns. The back (Tabs 4 and 5) is wounds. Each side stands alone. For a single 40-minute period, do Parts 1, 2 and 5 and run Part 3 on the board. A link can open a tab directly: mrsajdak.com/burns/#heat (also #exam, #nines, #wounds, #heal, #shift).

Explore, then explain, then apply. Each part starts with data questions (Q1 to 5, Q7, Q10 to 12, Q14, Q17 to 22). A READ FIRST line then sends students to the **Learn It** box under the lab drawing, which opens once they have the data, before Q6 (conduction; a burn keeps going after the water stops), Q13 (burns that reach the dermis leak; a child's body grows unevenly), Q15 and 16 (sharp against blunt; bleeding washes a wound, a deep narrow hole traps germs) and Q23 (new skin grows from living cells in the epidermis, hair follicles and glands). Part 2 needs no box; the lab teaches the layers as each burn is classified. The slideshow has a matching Learn It slide at each point.

Where students get stuck: Q1 (a 10-minute run takes a second to work out, and the two cool waters take the longest to play); Q2 (5.0 min has to become 300 s before dividing); Q5 (the “dead after 2 min” column differs a little between rows because the first aid is already working during those two minutes); Q7 case 6 (the edge is second degree and the middle is third; the lab asks for the deepest part); Q11 (the painting has to match the story exactly, front or back, before it is recorded); Q19 (keep Left open and change only the care).

Bonus tab: Burn unit shift. Eight patients, three questions each (how deep, how much, where to send them). It is not on the worksheet. It makes a good early-finisher task or a whole-class review on the board.

Going further. An engineering question for HS-ETS1-3: water heaters ship set to 120°F to prevent scalds, but water stored below about 120°F can grow *Legionella* bacteria. Students can weigh the two risks and look up how a mixing valve at the tap solves both.