Solid or Spongy? Bone Tissue Lab

Name _____

Date _____

Period _____

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Do Now The middle of a long bone is hollow. 2 minutes, before you open the lab

A. Why might a bone be hollow in places instead of solid all the way through?

☐ To be lighter ☐ To hold something inside ☐ Not sure yet

B. The ends of a long bone are full of tiny holes. Do you think the ends are weak? Why?

_____

☐ I can compare where compact and spongy bone are and what each one looks like.

☐ I can explain how the structure of each tissue fits its job.

☐ I can use bone data to explain why osteoporosis breaks some bones first.

Part 1. Cut the bone open (Tab 1)

SEP 3 · SEP 5 · CCC Structure and Function

Pick spot **1**. In the zoomed box, click where the solid wall starts, then where it ends. Press **Check my measurement**. Do spots 1 to 4. Then do the drop test, two tries on each spot.

1. What do you see in each place? Tick one in each row.

Inside the end of the bone	☐ solid and smooth	☐ full of holes	☐ empty space
Center of the shaft	☐ solid and smooth	☐ full of holes	☐ empty space
Wall of the shaft	☐ solid and smooth	☐ full of holes	☐ empty space

2. Write the lab's number for each spot. Average = (try 1 + try 2) ÷ 2.

Solid wall	Try 1 (mm)	Try 2 (mm)	Average (mm)
Middle of the shaft (spots 1, 2)			
Near the end (spots 3, 4)			

Example. A wall is 9.0 mm in the middle and 3.0 mm at the end. 9.0 ÷ 3.0 = 3. The middle is 3 times as thick.

3. Shaft average ÷ end average = _____. The middle wall is about _____ times as thick.

4. Plan check. What job does each one have in the drop test? Tick one in each row.

Seconds for the drop to soak in	☐ changed	☐ measured	☐ kept the same
Where the drop lands (wall or end)	☐ changed	☐ measured	☐ kept the same
One drop, from the same dropper	☐ changed	☐ measured	☐ kept the same
How dry the bone is	☐ changed	☐ measured	☐ kept the same

5. Write the seconds. Write 60+ if the drop is still there at 60 s.

Spot	Try 1 (s)	Try 2 (s)
Solid wall of the shaft		
Spongy inside of the end		

READ FIRST. In the lab, find the green **Learn It** box and read it. Then answer 6 to 7.

Word bank compact · spongy · medullary cavity · cartilage · osteon

6. The solid wall of the shaft is _____ bone. The inside of the end is _____ bone. The empty channel is the _____.

7. In a living bone, the spaces in the end hold: ☐ air ☐ red marrow ☐ water It makes: ☐ blood cells ☐ muscle

Part 2. Under the microscope (Tab 2)

SEP 4 · CCC Scale, Proportion, and Quantity

Pick **Compact**. Click every ring on hard bone. Press **Check my count**. Do **Spongy** too. Then measure **Osteon A** and **Canal A**.

Example. 20 of 25 points on bone. 20 × 4 = 80% bone. 100 − 80 = 20% open space.

8. Copy from **Your results** .

Bone	Points on bone (of 25)	% bone (points × 4)	% open space (100 − % bone)
Compact			
Spongy			

9. Osteon A: _____ µm across. Its central canal: _____ µm across.

10. Spongy open space ÷ compact open space = _____ times as much open space.

READ FIRST. In the lab, find the green **Learn It** box and read it. Then answer 11 to 13.

11. Match each word to its meaning. Write the letter. One meaning is not used.

1. osteon _____	A. a bone cell, in a tiny space in the hard matrix
2. central canal _____	B. a thin plate of bone in spongy bone
3. osteocyte _____	C. the soft cap of cartilage on a joint
4. trabeculae _____	D. rings of hard bone around a tube
	E. the tube that carries blood vessels and nerves

12. "Spongy bone is soft, like a kitchen sponge." ☐ agree ☐ disagree Evidence: ☐ it is the same hard material, built as a lattice ☐ water soaked in

Word bank bending · light · marrow · soft · color

13. Structure and function. Compact bone is a solid tube, so it resists _____. Spongy bone has spaces, so it is _____ and holds _____.

Part 3. Bone loss over a lifetime (Tab 3)

SEP 2 · CCC Systems and System Models

Pick **Woman**. Set age **50**. Press **Record this person**. Do age **90**. Then pick **Man**, age **90**.

14. Copy from **Your records** .

Person	Forearm shaft (5% spongy)	Hip (50% spongy)	Spine (75% spongy)
Woman, 50			
Woman, 90			
Man, 90			

15. Lost the most: ☐ forearm shaft ☐ hip ☐ spine The more spongy bone a site has, the ☐ more ☐ less bone it loses.

READ FIRST. In the lab, find the green **Learn It** box and read it. Then answer 16 to 17.

16. Model check. The model uses: ☐ % spongy at each site ☐ bone lost by each tissue ☐ the person's height (tick two) It leaves out: ☐ exercise and diet ☐ age

Explain it

SEP 6 · CCC Structure and Function

Word bank spongy · compact · thinner · weaker · thicker · lattice

17. Why do osteoporosis breaks happen at the hip, spine and wrist?

What I saw	The end of the bone is full of _____, and water soaked in fast.
The science idea	Those places are mostly _____ bone. Osteoporosis makes its plates _____ .
So	The hip, spine and wrist get _____ first and break.

NYSSLS HS-LS1-2, touching HS-LS1-1. Hole's Essentials, Section 7.2. Data: Clarke (2008); Ott (2018); Riggs and others (2004, 2008).