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 Planning and Carrying Out Investigations · SEP 5 Math · CCC Structure and Function

Look at both photos. Pick yellow spot **1**. In the zoomed box, click where the solid wall starts, then where it ends. Press **Check my measurement**. Do all four spots. 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 measurement for each spot. Then find each average.

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

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

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

In the test	Changed	Measured	Kept the same
Seconds for the drop to soak in	☐ changed	☐ measured	☐ same
Where the drop lands (wall or spongy end)	☐ changed	☐ measured	☐ same
One drop, from the same dropper	☐ changed	☐ measured	☐ same
How dry the bone is	☐ changed	☐ measured	☐ same

5. The drop test. 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.

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

7. The water soaked into the end in seconds. In a living bone, what fills those spaces, and what does it make?

_____

Part 2. Under the microscope (Tab 2)

SEP 4 Analyzing and Interpreting Data · CCC Scale, Proportion, and Quantity

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

8. Copy from **Your results** . Each point is worth 4%, because 100 ÷ 25 = 4.

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

9. The lab's measurements: Osteon A is _____ µm across. Its central canal is _____ µm across. (1,000 µm = 1 mm.)

10. Spongy open space ÷ compact open space = _____. Spongy bone has about _____ 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. Write what each word means, in your own words.

Word	What it is
osteon	
central canal	
osteocyte	
trabeculae	

12. A friend says, "Spongy bone is soft, like a kitchen sponge." ☐ agree ☐ disagree Give one piece of evidence from the lab.

13. Structure and function. Why is compact bone in the shaft, and spongy bone in the ends? Name one job for each.

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

SEP 2 Developing and Using Models · CCC Systems and System Models

Pick **Woman**. Set the age to **50** and press **Record this person**. Do the same at **90**. Then pick **Man** and record age **90**.

14. Copy from **Your records** : bone left at each site.

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

15. Which site lost the most bone? ☐ forearm shaft ☐ hip ☐ spine What pattern do you see between spongy bone and bone loss?

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

16. Model check. The lab's model uses two real numbers for each site. Name them. Then name one thing about real people that the model leaves out.

Explain it

SEP 6 Constructing Explanations · CCC Structure and Function

17. Osteoporosis breaks happen most at the hip, the spine and the wrist. Explain why, in three parts.

What I saw or measured	
The science idea	
How it explains the breaks	

NYSSLS HS-LS1-2, touching HS-LS1-1. Hole's Essentials, Section 7.2, Bone Structure. SEP = Science and Engineering Practice, CCC = Crosscutting Concept. Data: Clarke (2008); Ott (2018); Riggs and others (2004, 2008).