Bone Cells Lab · Low-write

Name _____

Date _____

Period _____

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Do Now Braces move a tooth through solid jaw bone, about 1 mm a month. No drill. No cut. 2 minutes, before you open the lab

A. How could a tooth move through solid bone?

B. After you stop growing, what do your bones do? ☐ Stay the same ☐ Keep being rebuilt ☐ Slowly die

☐ I can compare osteoblasts, osteocytes and osteoclasts.

☐ I can explain the steps of bone remodeling.

☐ I can use the three cells to explain how braces move a tooth.

Part 1. Meet the cells (Tab 1)

SEP 2 Developing and Using Models · CCC Structure and Function

Pick a cell. Look inside the yellow ring. Answer both questions for that cell.

1. Where does each cell sit? Tick one in each row.

Cell A	☐ in a scooped pit	☐ in a row on the surface	☐ inside the bone
Cell B	☐ in a scooped pit	☐ in a row on the surface	☐ inside the bone
Cell C	☐ in a scooped pit	☐ in a row on the surface	☐ inside the bone

2. How does each cell look? Tick one in each row.

Cell A	☐ huge, many nuclei	☐ small, one nucleus	☐ dark space, thin threads
Cell B	☐ huge, many nuclei	☐ small, one nucleus	☐ dark space, thin threads
Cell C	☐ huge, many nuclei	☐ small, one nucleus	☐ dark space, thin threads

READ FIRST. In the lab, find the green **Learn It** box and read it. Then answer 3 to 5.

Word bank: osteoblast · osteoclast · osteocyte · osteon · cartilage

3. Name each cell. Tick its job.

Cell	Its name	Its job		
A		☐ breaks down bone	☐ builds new bone	☐ senses load
B		☐ breaks down bone	☐ builds new bone	☐ senses load
C		☐ breaks down bone	☐ builds new bone	☐ senses load

4. Word endings. Bank: break, bud, cell, bone. -clast _____ -blast _____ -cyte _____

5. Do the five clues in the lab. Write the cell: blast, clast or cyte.

Clue	Cell
1. Lets out acid that dissolves bone mineral	
2. Walled in, with thin arms	
3. Works in a row, lays down new bone	
4. About 9 out of 10 bone cells	
5. Many nuclei in one big cell	

Part 2. Move the tooth (Tab 2)

SEP 3 Planning and Carrying Out Investigations · CCC Cause and Effect

Set the buttons. Move the slider to 6 months. Press **Record**. Do all three settings.

6. Copy from **Your records** .

Setting	Tooth moved at 6 months (mm)	Gap at 6 months (mm)
A on, B on		
A off, B on		
A on, B off		

7. Plan check. Why change only one cell type at a time?

☐ So only that cell explains the change ☐ So the lab runs faster

READ FIRST. In the lab, find the green **Learn It** box and read it. Then answer 8 to 10.

Word bank: osteoblast · osteoclast · squeezed · stretched · removes bone · adds bone · osteon

8. Cell type A was the _____. Cell type B was the _____.

9. A brace pulls a tooth. Which cell works on each side?

Side	What happens to the ligament	Which cell works here	What it does
Front side			
Back side			

10. Model check. Tab 2 is a model. Tick one thing it leaves out.
☐ real speed changes from person to person ☐ the tooth has a root

Part 3. Run a site (Tab 3)

SEP 5 Using Mathematics · CCC Stability and Change

Pick a site. Move the slider slowly to day 180. Do all three sites.

11. Copy from **Your results** .

Site	Dug out (µm)	Filled back (µm)	Change (µm)
Site 1			
Site 2			
Site 3			

12. Use Site 1. The pit is deepest at day _____. Example, not yours: 30 µm in 10 days is 30 ÷ 10 = 3 µm a day. Digging rate = depth ÷ days = _____ µm a day.

13. Filling starts at day 30 and ends at day 180. That is _____ days. Filling rate = _____ µm a day. Digging is about _____ times as fast as filling.

READ FIRST. In the lab, find the green **Learn It** box and read it. Then answer 14 to 16.

14. Number the steps of remodeling from 1 to 4. ___ Osteoblasts fill the pit. ___ Osteocytes sense load or damage. ___ Some osteoblasts get trapped and become osteocytes. ___ Osteoclasts dig a pit.

15. Do the three cases in the lab. Which site fits?

Case	Site
An adult who walks every day: the bone stays the same	
An astronaut after six months: the hip loses bone	
A tennis player: the racket arm bone gets thicker	

16. One patch of bone has 10 cycles in a row like Site 2. Change each cycle × 10 = _____ µm. **Model check:** real bone may not change the same each cycle because ☐ load and age change ☐ bone has no cells

Explain it

SEP 6 Constructing Explanations · CCC Structure and Function

17. How can a tooth move through solid bone? Explain in three parts.

What I saw	With osteoclasts off, the tooth moved _____ mm.
The science idea	Osteoclasts _____ bone on the squeezed side. Osteoblasts _____ bone on the stretched side.
How it explains the tooth	The tooth moves into the space because ... _____

NYSSLS HS-LS1-2, touching HS-LS1-1. Hole's Essentials, Section 7.4, Bone Development, Growth, and Repair. SEP = Science and Engineering Practice, CCC = Crosscutting Concept. Tooth rate: Wazwaz and others (2023). Times: Clarke (2008). Tab 3 is a model with round numbers.