Patterns in Crystal Structures

STEM: The Math, Science, and Art of Crystals
Using a Salt Lattice Model

Student Handout — Math

1. Look at the model of blue and green spheres. What is its shape?
   _____
   _____

2. Figure out how many spheres there are in this whole shape – without counting **all** of them. (You may count **some** of the spheres.)
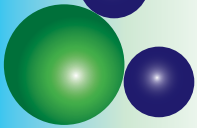
3. How many spheres are there? _____

4. How did you figure this out?
   _____
   _____
   _____

5. Write at least one other way you could have figured out how many spheres there are.
   _____
   _____

6. Predict how many 3x3x3 cubes you can get out of your 4x4x4 cube. Write your prediction here.
   _____

   How did you determine that answer?
   _____
   _____
   _____

Test your prediction – build as many 3x3x3 cubes as you can from your 4x4x4 cube. If you have any remaining spheres, use them to build 2x2x2 cube(s).

7. How many spheres are in a single 3x3x3 cube? _____

8. How many spheres are in a single 2x2x2 cube? _____

9. How many spheres do you have left over? _____

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10. Write the color(s) of the remaining spheres.

_____

_____

11. Do all the groups have the same colored sphere(s) left over?_____

12. Observe the results of several groups. Write a rule that will predict what colored
spheres will be left over.

_____

_____

13. Look at one cube. How many blue spheres are along one edge? _____

14. Do you have the same number of blue spheres along each edge of the cube? _____

15. Now look at your other cube. How many blue spheres are along one edge? _____

16. Look at the cubes of another group that has the two remaining spheres that are
different from yours. How many blue spheres are along the edge of each of their
cubes?

_____

Extensions
Math
17. Predict whether a 5x5x5 cube can produce more than one 4x4x4 cube.

_____

_____

18. Predict how many 3x3x3 cubes can be made from a single 5x5x5 cube. How many
spheres will be left over?

_____

_____

19. Predict how many 2x2x2 cubes can be made from a single 3x3x3 cube. How many
spheres will be left over?

_____

20. Predict how many 2x2x2 cubes can be made from a single 4x4x4 cube. How many
spheres will be left over?

_____

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Modeling as a Practice of Science

21. How are the NaCl models like real salt?

_____
_____
_____

22. How are the NaCl models different from real salt?

_____
_____
_____