

Chemical Mole – Green Pea Scale Analogy

This student handout compares the number of green peas to the number of atoms/molecules in a mole of a substance

Chemistry 11

Curriculum Connections:

BC Chemistry 11 (2006)

C1 - explain the significance and use of the mole

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Chemistry: The Mole – The Green Pea Analogy

If you selected a hundred (10^2) average-sized peas, you would find that they occupy roughly a volume of 20 cm³. A million (10^6) peas are just enough to fill an ordinary household refrigerator and a billion (10^9) peas will fill a three bedroom house from cellar to attic. A trillion (10^{12}) peas will fill a thousand houses, the number you might find in a medium-sized town. A quadrillion (10^{15}) peas will fill all the buildings in one of our larger cities such as Calgary or Edmonton.

Obviously you will run out of buildings very soon. Let us try a larger measure, for instance the province of Alberta. Suppose that there is a blizzard over Alberta, but instead of snowing snow, it snows peas. Alberta is covered with a blanket of peas about one-metre-deep all the way from Saskatchewan out to British Columbia, and all the way from the United States to the Northwest Territories. This blanket of peas drifts over the roads and banks up against the sides of the houses, and covers all the fields and forests. Think of flying across the province with the blanket of peas extending out as far as you can see. This gives you an idea of our next number. There will be in this blanket about a quintillion (10^{18}) peas.

Imagine that this blizzard of peas falls over the entire land- North America, Africa, South America, Europe, Australia, and Asia. All of the continents are covered with peas one metre deep. This global blanket will contain sextillion (10^{21}) peas. Then imagine that the oceans are frozen over and the blanket of peas covers the entire land and sea area of Earth. Go out among the neighbouring stars and collect 250 planets the size of Earth and cover each of these with a blanket of peas one metre deep.

Then you have a mole of peas.

Furthermore, go out into the farthest reaches of the Milky Way, and collect 250,000 planets, each the size of Earth. Cover each one with a blanket of peas one metre deep. You now have septillion (10^{27}) - a number corresponding to the number of atoms in your body.