A Mole of Pennies

**Question:** What would be the height and mass of a mole of pennies?

**Background:** The mole is convenient and useful for counting very large quantities of things. You know that 1 mole of pennies is 6.02 x 1023 pennies but can you picture just how many that really is? Suppose you stacked 1 mole of pennies, how tall do you think that stack would be? How much would it weigh? Just for fun, try guessing by completing the tables below before you do the necessary calculations.

**Procedure:**

1. Make a stack of 10 pennies.
2. Measure and record the stack’s height in cm: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Measure and record the stack’s mass in g: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Results and Discussion:**

1. Calculate the height in km of a stack of 1 mol of pennies (show your work).

Find: km pennies

Given: 6.02 x 1023 pennies

Relationships: 10 pennies = \_\_\_\_\_ cm

1 cm = \_\_\_\_\_\_ m

1 km = \_\_\_\_\_\_ m

|  |  |  |  |
| --- | --- | --- | --- |
| Would the stack reach: | Distance (km) | Prediction | Actual |
| Our moon | 3.9 x 105 |  |  |
| Pluto | 5.9 x 109 |  |  |
| Proxima Centauri (nearest star) | 4.1 x 1013 |  |  |
| Andromeda (nearest galaxy) | 1.9 x 1019 |  |  |

1. Calculate the mass in kg of 1 mol of pennies (show your work).

Find: kg pennies

Given: 6.02 x 1023 pennies

Relationships: 10 pennies = \_\_\_\_\_ g

1 kg = \_\_\_\_\_\_ g

|  |  |  |  |
| --- | --- | --- | --- |
| Would the stack weigh as much as: | Mass (kg) | Prediction | Actual |
| The USS Ronald Regan (the world’s heaviest aircraft carrier) | 2.1 x 107 |  |  |
| The total of all living things on Earth | 2 x 1015 |  |  |
| our moon | 7.4 x 1022 |  |  |
| Earth | 6.0 x 1024 |  |  |

**Follow Up Questions:**

1. Did you guess correctly?
2. Were you surprised by the results?