Scientific Notation: Multiplying and Dividing

Multiplying Scientific Notations
When multiplying scientific notations, we multiply the decimal numbers and then multiply the powers of 10. Remember that when multiplying powers of 10, we add the exponents. Example:

\[(3.1 \times 10^3) \cdot (2.3 \times 10^5) = 3.1 \times 2.3 \times 10^3 \times 10^5 = 7.13 \times 10^{3+5} = 7.13 \times 10^8\]

If when multiplying the decimal numbers, we get a number that is greater than or equal to 10, then we need to convert that number to scientific notation and then multiply by the powers of 10. Example:

\[(4.5 \times 10^4) \cdot (5.1 \times 10^3) = 4.5 \times 5.1 \times 10^4 \times 10^3 = 22.95 \times 10^{4+3} = 22.95 \times 10^7 = (2.295 \times 10^1) \times 10^7 = 2.295 \times 10^{1+7} = 2.295 \times 10^8\]

Dividing Scientific Notations
When dividing scientific notations, we divide the decimal numbers and then divide the powers of 10. Remember that when dividing powers of 10, we subtract the exponents. The final answer will be written as the product of the two quotients. Example:

\[\frac{(3.41 \times 10^5)}{(1.1 \times 10^{-3})} = \frac{3.41 \times 10^5}{1.1 \times 10^{-3}} = \frac{3.41}{1.1} \times \frac{10^5}{10^{-3}} = 3.1 \times 10^{5-(-3)} = 3.1 \times 10^8\]

If when dividing the decimal numbers, we get a number that is less than 1, then we need to convert that number to scientific notation and then multiply the powers of 10. Example:

\[\frac{(7.2 \times 10^{-7})}{(8.0 \times 10^6)} = \frac{7.2 \times 10^{-7}}{8.0 \times 10^6} = \frac{7.2}{8.0} \times \frac{10^{-7}}{10^6} = 0.9 \times 10^{-7-6} = 0.9 \times 10^{-13} = 9.0 \times 10^{-1} \times 10^{-13} = 9.0 \times 10^{-14}\]