Exercice 1.

$A = 2^2 \times 3^3 = 4 \times 27 = \underline{108}$

$B = 2^3 \times 3^2 \times 5$
$B = 4 \times 2 \times 9 \times 5$
$B = 36 \times 10$
$B = \underline{360}$

$C = -2^4 \times (-3)^3$
$C = \oplus 16 \times 27$
$C = \underline{432}$

$D = \left(\frac{1}{2}\right)^2 \times 3^3$
$D = \frac{1^2 \times 3^3}{2^2}$
$\boxed{D = \frac{27}{4}}$

$E = \left(\frac{1}{2}\right)^2 \times \left(\frac{2}{3}\right)^3$
$E = \frac{1^2 \times 2^3}{2^2 \times 3^3}$
$E = \frac{\cancel{2^2} \times 2}{\cancel{2^2} \times 3^3}$
$\boxed{E = \frac{2}{27}}$

$F = \left(\frac{1}{2}\right)^3 \times \left(\frac{2}{5}\right)^4$
$F = \frac{1^3 \times 2^4}{2^3 \times 5^4}$
$F = \frac{2}{5^4} = \boxed{\frac{2}{625}}$ fraction irréductible
$F = \underline{0,0032}$ écriture décimale
ou $3,2 \cdot 10^{-3}$

$F = \frac{1^3 \times 2^4}{2^3 \times 5^4}$
$F = \frac{2^5}{2^4 \times 5^4}$
$F = \frac{2^5}{(10)^4}$
$F = 2^5 \times 10^{-4}$
$F = 32 \times 10^{-4}$
$F = 3,2 \times 10^{(1)} \times 10^{-4}$
$\boxed{F = 3,2 \times 10^{-3}}$
écriture scientifique.

$G = 2 \times \frac{1}{3} \times \left(-\frac{3}{2}\right)^2$
$G = \oplus \frac{2}{3} \times \frac{3^2}{2^2}$
$\boxed{G = \frac{3}{2} \text{ ou } 1,5}$

$H = \left(-\frac{1}{2}\right)^2 \times \left(-\frac{1}{3}\right)^3 \times 27^2$
$H = \ominus \frac{1^2 \times 1^3 \times (3^3)^2}{2^2 \times 3^3}$
$H = -\frac{3^6}{2^2 \times 3^3} = -\frac{3^3}{2^2} = \boxed{-\frac{27}{4}}$

$I = -\frac{3}{4} \times \left(\frac{4}{5}\right)^2 \times \left(\frac{-2}{5}\right)^3$
$I = \oplus \frac{3 \times (2^2)^2 \times 2^3}{2^2 \times 5^2 \times 5^3}$
$I = \frac{3 \times 2^4 \times 2^3}{2^2 \times 5^5} = \frac{3 \times 2^7}{2^2 \times 5^5}$
$I = \frac{3 \times 2^5}{5^5} = \boxed{\frac{96}{3125}}$ fraction irréductible

$I = \frac{3 \times 2^5 \times 2^5}{2^5 \times 5^5} = \frac{3 \times 2^{10}}{10^5} = 3 \times 1024 \times 10^{-5}$
$I = 3072 \times 10^{-5} = 3,072 \times 10^3 \times 10^{-5}$
$\boxed{I = 3,072 \times 10^{-2}}$ ou $\boxed{0,03072}$
écriture scientifique écriture décimale.

Exercice 1 (suite) $J = \left(\frac{2}{3}\right)^4 \times \left(\frac{3}{4}\right)^2 \times \left(\frac{-9}{2}\right)^3$

$J = \oplus \dfrac{2^4 \times 3^2 \times (3^2)^3}{3^4 \times (2^2)^2 \times 2^3}$

$J = - \dfrac{2^4 \times 3^2 \times 3^6}{3^4 \times 2^4 \times 2^3}$

$J = - \dfrac{3^8}{3^4 \times 2^3}$

$J = - \dfrac{3^4}{2^3}$ $\quad \boxed{J = -\frac{81}{8}}$

$K = \dfrac{(-2)^3 (-6)^5 (-3)^{10}}{18^4 \times (-12)^4}$

$K = \oplus \dfrac{2^7 \times (3\times 2)^5 \times 3^{10}}{(2\times 3^2)^4 \times (3\times 2^2)^4}$

$K = \dfrac{2^7 \times 3^5 \times 2^5 \times 3^{10}}{2^4 \times 3^8 \times 3^4 \times 2^8}$

$K = \dfrac{2^{12} \times 3^{15}}{2^{12} \times 3^{12}}$

$K = 3^3$ $\quad \boxed{K = 27}$

$L = \dfrac{(-5)^3 \times (-8)^3 \times (-9)^2}{45^2 \times 12^4}$

$L = \oplus \dfrac{5^3 \times (2^3)^3 \times (3^2)^2}{(3\times 5)^2 \times (3\times 2^2)^4}$

$L = + \dfrac{5^3 \times 2^9 \times 3^4}{3^2 \times 5^2 \times 3^4 \times 2^8}$

$L = \dfrac{2 \times 5}{3^2}$ $\quad \boxed{L = \frac{10}{9}}$

Exercice 2. $A = (0,5)^{-3} \times 25^2 \times (0,75)^3 \times (1,25)^{-2}$

$A = (5\times 10^{-1})^{-3} \times (5^2)^2 \times (3\times 5^2 \times 10^{-2})^3 \times (5^3 \times 10^{-2})^{-2}$

$A = 5^{-3} \times 10^3 \times 5^4 \times 3^3 \times 5^6 \times 10^{-6} \times 5^{-6} \times 10^4$

$A = 5 \times 3^3 \times 10$ $\quad A = 5 \times 3^3 \times 2 \times 5$

$\boxed{A = 2 \times 3^3 \times 5^2}$ $\quad (A = 1350)$

$B = 64^2 \times (0,125)^3 \times (0,243)^4$

$B = (2^6)^2 \times (5^3 \times 10^{-3})^3 \times (3^5 \times 10^{-3})^4$

$B = 2^{12} \times 5^9 \times 10^{-9} \times 3^{20} \times 10^{-12}$

$B = 2^{12} \times 3^{20} \times 5^9 \times 10^{-21}$

$B = 2^{12} \times 3^{20} \times 5^9 \times (2\times 5)^{-21}$

$\boxed{B = 2^{-9} \times 3^{20} \times 5^{-12}}$

Exercice 3

$$\frac{2^4 \times (-2)^3}{(-2)^{11}} = \oplus \frac{2^{13}}{2^{11}} = \boxed{2^2 (= 4)}$$

$$\frac{7^{-2} \times (-7)^5}{7^3 \times 7^{-4}} = \ominus \frac{7^3}{7^{-1}} = \boxed{-7^4}$$

Exercice 4

$$K = \frac{7 \times 10^{-12} \times 4 \times 10^5}{2 \times 10^{-4}}$$

$$K = \frac{7 \times 2 \times 2}{2} \times \frac{10^{-7}}{10^{-4}}$$

$$K = 14 \times 10^{-3}$$

$$K = 1{,}4 \times 10 \times 10^{-3}$$

$$\boxed{K = 1{,}4 \times 10^{-2}}$$

$$L = \frac{0{,}08 \times 10^{-14} \times 10^6}{2 \times (10^3)^7}$$

$$L = \frac{2^3 \times 10^{-2} \times 10^{-8}}{2 \times 10^{21}}$$

$$L = 2^2 \times \frac{10^{-10}}{10^{21}}$$

$$\boxed{L = 4 \times 10^{-31}}$$

$$M = \frac{-2{,}4 \times 10^3 \times 8 \times 10^{-9}}{3 \times 10^{-3}}$$

$$M = \ominus \frac{24 \times 10^{-1} \times 8 \times 10^{-2}}{3 \times 10^{-3}}$$

$$M = -\frac{3 \times 8 \times 8}{3} \times \frac{10^{-3}}{10^{-3}}$$

$$M = -64$$

$$\boxed{M = -6{,}4 \times 10^1}$$

Exercice 5.

$$N = \frac{5 \times 10^5 \times (2 \times 10^{-1})^3}{24 \times 10^2}$$

$$N = \frac{5 \times 10^5 \times 2^3 \times 10^{-3}}{3 \times 2^3 \times 10^2}$$

$$N = \frac{5 \times 10^2}{10^2} \qquad \boxed{N = \frac{5}{3}}$$

$$O = \frac{13 \times 10^{14} \times 10^6}{2 \times (10^3)^7} \qquad O = \frac{13 \times 10^{20}}{2 \times 10^{21}}$$

$$\boxed{O = \frac{13}{20}}$$

$$P = \frac{5 \times 10^8 \times 6 \times 10^3}{2 \times (10^4)^3} \qquad P = \frac{5 \times 3 \times 2}{2} \times \frac{10^{11}}{10^{12}}$$

$$P = \frac{15}{10} = \boxed{\frac{3}{2}}$$

$$Q = \frac{4 \times 10^{-10} \times 3 \times 10^{5} \times 10^{-1}}{6 \times (10^{-2})^{-5} \times 2^{2} \times 10^{4}}$$

$$Q = \frac{3 \times 10^{-6}}{3 \times 2 \times 10^{10} \times 10^{4}} = \frac{10^{-6}}{2 \times 10^{14}} = \frac{1}{2 \times 10^{20}}$$

$$Q = \frac{1}{200000000000000000000}$$

Exercice 6. 1) $1\ \text{Å} = 10^{-10}\ m$

$1\ \mu = 10^{-6}\ m$

donc $1\ \text{Å} = 10^{-10}\ m = 10^{-4} \times 10^{-6}\ m = 10^{-4}\ \mu$

diamètre atomique Mn : $2 \times 1{,}17\ \text{Å} = 2{,}34\ \text{Å}$

$= 2{,}34 \times 10^{-4}\ \mu$

$= 0{,}000234\ \mu$

diamètre atomique He : $2 \times 0{,}31\ \text{Å} = 0{,}62\ \text{Å}$

$= 0{,}62 \times 10^{-4}\ \mu$

$= 0{,}000062\ \mu$

2) Volume d'une sphère $= \frac{4}{3} \times \text{rayon}^3$

Rayon de l'atome de Mn : $1{,}17 \times 10^{-10}\ m$

Volume de l'atome de Mn : $\frac{4}{3} \times (1{,}17 \times 10^{-10})^3\ m^3$

soit $2{,}13548 \times 10^{-30}\ m^3$

Volume de l'atome d'He : $\frac{4}{3} \times (0{,}31 \times 10^{-10})^3 \approx 3{,}97213 \times 10^{-32}$