exponents and powers

10 Chapter

Exercise 10.1

1. Evaluate the following:

i. 3^{-2}

Ans: We have to evaluate $3^{-2} \leq$.

We will apply the identity of indices $a^{-n} = \frac{1}{a^n}$, we get

$$3^{-2} = \frac{1}{3^2}$$

$$\Rightarrow 3^{-2} = \frac{1}{3 \times 3}$$

$$\therefore 3^{-2} = \frac{1}{9}$$

ii. $(-4)^{-2}$

Ans: We have to evaluate $(-4)^{-2}$.

We will apply the identity of indices $a^{-n} = \frac{1}{a^n}$, we get

$$(-4)^{-2} = \frac{1}{(-4)^2}$$

$$\Rightarrow (-4)^{-2} = \frac{1}{-4 \times -4}$$

$$\therefore (-4)^{-2} = \frac{1}{16}$$

iii. $\left(\frac{1}{2}\right)^{-5}$

Ans: We have to evaluate $\left(\frac{1}{2}\right)^{-5}$.

We will apply the identity of indices $\left(\frac{1}{a}\right)^{m}=\frac{1^{m}}{a^{m}}$, we get

$$\left(\frac{1}{2}\right)^{-5}=\frac{1^{-5}}{2^{-5}}$$

$$\Rightarrow\left(\frac{1}{2}\right)^{-5}=\frac{1}{2^{-5}}$$

We can apply the identity $\frac{1}{a^{-n}}=a^{n}$, we get

$$\Rightarrow\left(\frac{1}{2}\right)^{-5}=2^{5}$$

$$\Rightarrow\left(\frac{1}{2}\right)^{-5}=2\times2\times2\times2\times2$$

$$\therefore\left(\frac{1}{2}\right)^{-5}=32$$

2. Simplify and express the result in power notation with positive exponent.

i. $(-4)^{5}\div(-4)^{8}$

Ans: We have to simplify the expression $(-4)^{5}\div(-4)^{8}$.

According to the Quotient of Power rule of exponents when the bases are same in division we can subtract the powers. We get

$$a^{m}\div a^{n}=a^{m-n}$$

Now, applying the above identity to the given expression, we get

$$(-4)^{5}\div(-4)^{8}=4^{5-8}$$

$$\Rightarrow(-4)^{5}\div(-4)^{8}=4^{-3}$$

We have to express the result with positive exponent, we can write

$$a^{-n}=\frac{1}{a^{n}}$$

$$\therefore (-4)^5 \div (-4)^8 = \frac{1}{4^3}$$

ii. $\left(\frac{\mathbf{1}}{\mathbf{2^3}}\right)^{\mathbf{2}}$

Ans: We have to simplify the expression $\left(\frac{1}{2^3}\right)^2$.

We know that we can apply the identity of indices $\left(\frac{1}{a}\right)^m = \frac{1^m}{a^m}$, we get

$$\left(\frac{1}{2^3}\right)^2 = \frac{1^2}{(2^3)^2}$$

Now, by applying the identity power of power $(a^m)^n = a^{mn}$, we get

$$\Rightarrow \left(\frac{1}{2^3}\right)^2 = \frac{1^2}{2^{3\times 2}}$$

$$\therefore \left(\frac{1}{2^3}\right)^2 = \frac{1^2}{2^6}$$

iii. $\mathbf{(-3)^4 \times \left(\frac{5}{3}\right)^4}$

Ans: We have to simplify the expression $(-3)^4 \times \left(\frac{5}{3}\right)^4$.

We can apply the identity of indices $\left(\frac{1}{a}\right)^m = \frac{1^m}{a^m}$, we get

$$(-3)^4 \times \left(\frac{5}{3}\right)^4 = (-3)^4 \times \left(\frac{5^4}{3^4}\right)$$

$$\Rightarrow (-3)^4 \times \left(\frac{5}{3}\right)^4 = (-1)^4 \times 3^4 \times \left(\frac{5^4}{3^4}\right)$$

$$\Rightarrow (-3)^4 \times \left(\frac{5}{3}\right)^4 = (-1)^4 \times 5^4$$

$$\Rightarrow (-3)^4 \times \left(\frac{5}{3}\right)^4 = 1 \times 5^4$$

$$\therefore (-3)^4 \times \left(\frac{5}{3}\right)^4 = 5^4$$

iv. $\mathbf{\left(3^{-7} \div 3^{-10}\right) \times 3^{-5}}$

Ans: We have to simplify the expression $\left(3^{-7} \div 3^{-10}\right) \times 3^{-5}$.

According to the Quotient of Power rule of exponents when the bases are same in division we can subtract the powers. We get

$$a^m \div a^n = a^{m-n}$$

Now, applying the above identity to the given expression, we get

$$\left(3^{-7} \div 3^{-10}\right) \times 3^{-5} = 3^{-7-(-10)} \times 3^{-5}$$

$$\Rightarrow \left(3^{-7} \div 3^{-10}\right) \times 3^{-5} = 3^{-7+10} \times 3^{-5}$$

$$\Rightarrow \left(3^{-7} \div 3^{-10}\right) \times 3^{-5} = 3^{3} \times 3^{-5}$$

Now, according to the product of power rule of exponents

$$a^m \times a^n = a^{m+n}$$

Now, applying the above identity , we get

$$\Rightarrow \left(3^{-7} \div 3^{-10}\right) \times 3^{-5} = 3^{3+(-5)}$$

$$\Rightarrow \left(3^{-7} \div 3^{-10}\right) \times 3^{-5} = 3^{-2}$$

We have to express the result with positive exponent, we can write

$$a^{-n} = \frac{1}{a^n}$$

$$\therefore \left(3^{-7} \div 3^{-10}\right) \times 3^{-5} = \frac{1}{3^2}$$

v. $\mathbf{2^{-3} \times (-7)^{-3}}$

Ans: We have to simplify the expression $2^{-3} \times (-7)^{-3}$.

We know that $a^n \times b^n = (ab)^n$

Now, applying the above identity to the given expression, we get

$\Rightarrow 2^{-3} \times (-7)^{-3} = (2 \times (-7))^{-3}$

$\Rightarrow 2^{-3} \times (-7)^{-3} = (-14)^{-3}$

We have to express the result with positive exponent, we can write

$a^{-n} = \dfrac{1}{a^n}$

$\therefore 2^{-3} \times (-7)^{-3} = \dfrac{1}{(-14)^3}$

3. Find the value of following:

(i) $\boldsymbol{(3^0 + 4^{-1}) \times 2^2}$

Ans: We have to find the value of $(3^0 + 4^{-1}) \times 2^2$.

We will apply the identity $\left(\dfrac{1}{a}\right)^m = \dfrac{1^m}{a^m}$, we get

$(3^0 + 4^{-1}) \times 2^2 = \left(3^0 + \dfrac{1}{4^1}\right) \times 2^2$

Now, we know that $a^0 = 1$, we get

$\Rightarrow (3^0 + 4^{-1}) \times 2^2 = \left(1 + \dfrac{1}{4}\right) \times 2^2$

$\Rightarrow (3^0 + 4^{-1}) \times 2^2 = \left(\dfrac{4+1}{4}\right) \times 2 \times 2$

$\Rightarrow (3^0 + 4^{-1}) \times 2^2 = \left(\dfrac{5}{4}\right) \times 4$

$\therefore (3^0 + 4^{-1}) \times 2^2 = 5$

(ii) $\boldsymbol{(2^{-1} \times 4^{-1}) \div 2^{-2}}$

Ans: We have to find the value of $(2^{-1} \times 4^{-1}) \div 2^{-2}$.

The given expression can be written as

$$\left(2^{-1}\times 4^{-1}\right)\div 2^{-2}=\left(2^{-1}\times\left(2^{2}\right)^{-1}\right)\div 2^{-2}$$

We will apply the identity $\left(a^{m}\right)^{n}=a^{mn}$, we get

$$\Rightarrow\left(2^{-1}\times 4^{-1}\right)\div 2^{-2}=\left(2^{-1}\times 2^{-2}\right)\div 2^{-2}$$

Now, we know that $a^{m}\times a^{n}=a^{m+n}$, we get

$$\Rightarrow\left(2^{-1}\times 4^{-1}\right)\div 2^{-2}=\left(2^{-1+(-2)}\right)\div 2^{-2}$$

$$\Rightarrow\left(2^{-1}\times 4^{-1}\right)\div 2^{-2}=2^{-3}\div 2^{-2}$$

We will apply the identity $a^{m}\div a^{n}=a^{m-n}$, we get

$$\Rightarrow\left(2^{-1}\times 4^{-1}\right)\div 2^{-2}=2^{-3-(-2)}$$

$$\Rightarrow\left(2^{-1}\times 4^{-1}\right)\div 2^{-2}=2^{-3+2}$$

$$\Rightarrow\left(2^{-1}\times 4^{-1}\right)\div 2^{-2}=2^{-1}$$

$$\therefore\left(2^{-1}\times 4^{-1}\right)\div 2^{-2}=\frac{1}{2}$$

(iii) $\left(\frac{1}{2}\right)^{-2}+\left(\frac{1}{3}\right)^{-2}+\left(\frac{1}{4}\right)^{-2}$

Ans: We have to find the value of $\left(\frac{1}{2}\right)^{-2}+\left(\frac{1}{3}\right)^{-2}+\left(\frac{1}{4}\right)^{-2}$.

We will apply the identity $\left(\frac{1}{a}\right)^{m}=\frac{1^{m}}{a^{m}}$, we get

$$\left(\frac{1}{2}\right)^{-2}+\left(\frac{1}{3}\right)^{-2}+\left(\frac{1}{4}\right)^{-2}=\left(\frac{1^{-2}}{2^{-2}}\right)+\left(\frac{1^{-2}}{3^{-2}}\right)+\left(\frac{1^{-2}}{4^{-2}}\right)$$

$$\Rightarrow\left(\frac{1}{2}\right)^{-2}+\left(\frac{1}{3}\right)^{-2}+\left(\frac{1}{4}\right)^{-2}=\left(\frac{1}{2^{-2}}\right)+\left(\frac{1}{3^{-2}}\right)+\left(\frac{1}{4^{-2}}\right)$$

We can apply the identity $\frac{1}{a^{-n}}=a^{n}$, we get

$$\Rightarrow\left(\frac{1}{2}\right)^{-2}+\left(\frac{1}{3}\right)^{-2}+\left(\frac{1}{4}\right)^{-2}=2^{2}+3^{2}+4^{2}$$

$$\Rightarrow\left(\frac{1}{2}\right)^{-2}+\left(\frac{1}{3}\right)^{-2}+\left(\frac{1}{4}\right)^{-2}=2\times 2+3\times 3+4\times 4$$

$$\Rightarrow\left(\frac{1}{2}\right)^{-2}+\left(\frac{1}{3}\right)^{-2}+\left(\frac{1}{4}\right)^{-2}=4+9+16$$

$$\therefore\left(\frac{1}{2}\right)^{-2}+\left(\frac{1}{3}\right)^{-2}+\left(\frac{1}{4}\right)^{-2}=29$$

(iv) $\left(3^{-1}+4^{-1}+5^{-1}\right)^{0}$

Ans: We have to find the value of $\left(3^{-1}+4^{-1}+5^{-1}\right)^{0}$.

We know that $a^{0}=1$, then we get the value of the given expression

$$\therefore\left(3^{-1}+4^{-1}+5^{-1}\right)^{0}=1$$

(v) $\left\{\left(\frac{-2}{3}\right)^{-2}\right\}^{2}$

Ans: We have to find the value of $\left\{\left(\frac{-2}{3}\right)^{-2}\right\}^{2}$.

We can apply the identity $\left(a^{m}\right)^{n}=a^{mn}$, we get

$$\left\{\left(\frac{-2}{3}\right)^{-2}\right\}^{2}=\left(\frac{-2}{3}\right)^{-2\times 2}$$

$$\Rightarrow\left\{\left(\frac{-2}{3}\right)^{-2}\right\}^{2}=\left(\frac{-2}{3}\right)^{-4}$$

Now, applying the identity $\left(\frac{1}{a}\right)^{m}=\frac{1^{m}}{a^{m}}$, we get

$$\Rightarrow\left\{\left(\frac{-2}{3}\right)^{-2}\right\}^{2}=\left(\frac{-2^{-4}}{3^{-4}}\right)$$

Now, we know that $\frac{1}{a^{-n}} = a^n$, we get

$$\Rightarrow \left\{\left(\frac{-2}{3}\right)^{-2}\right\}^2 = \left(\frac{3^4}{-2^4}\right)$$

$$\Rightarrow \left\{\left(\frac{-2}{3}\right)^{-2}\right\}^2 = \left(\frac{3\times3\times3\times3}{-2\times-2\times-2\times-2}\right)$$

$$\therefore \left\{\left(\frac{-2}{3}\right)^{-2}\right\}^2 = \frac{81}{16}$$

4. Evaluate the following:

(i) $\mathbf{\frac{8^{-1}\times 5^3}{2^{-4}}}$

Ans: We have to evaluate the given expression $\frac{8^{-1}\times 5^3}{2^{-4}}$.

We can write the given expression as $\frac{\left(2^3\right)^{-1}\times 5^3}{2^{-4}}$.

$$\Rightarrow \frac{8^{-1}\times 5^3}{2^{-4}} = \frac{2^{-3}\times 5^3}{2^{-4}}$$

Now, we know that $a^m \div a^n = a^{m-n}$, we get

$$\Rightarrow \frac{8^{-1}\times 5^3}{2^{-4}} = 2^{-3-(-4)}\times 5^3$$

$$\Rightarrow \frac{8^{-1}\times 5^3}{2^{-4}} = 2^{-3+4}\times 5^3$$

$$\Rightarrow \frac{8^{-1}\times 5^3}{2^{-4}} = 2^1\times 5^3$$

$$\Rightarrow \frac{8^{-1}\times 5^3}{2^{-4}} = 2\times5\times5\times5$$

$$\therefore \frac{8^{-1}\times 5^3}{2^{-4}} = 250$$

(ii) $\left(5^{-1}\times 2^{-1}\right)\times 6^{-1}$

Ans: We have to evaluate the given expression $\left(5^{-1}\times 2^{-1}\right)\times 6^{-1}$.

We know that $a^{-n}=\frac{1}{a^{n}}$, we get

$$\left(5^{-1}\times 2^{-1}\right)\times 6^{-1}=\left(\frac{1}{5}\times\frac{1}{2}\right)\times\frac{1}{6}$$

$$\Rightarrow\left(5^{-1}\times 2^{-1}\right)\times 6^{-1}=\frac{1}{10}\times\frac{1}{6}$$

$$\therefore\left(5^{-1}\times 2^{-1}\right)\times 6^{-1}=\frac{1}{60}$$

5. Find the value of m for which $5^{m}\div 5^{-3}=5^{5}$.

Ans: The given expression is $5^{m}\div 5^{-3}=5^{5}$.

Now, according to the Quotient of Power rule of exponents when the bases are same in division we can subtract the powers. We get

$a^{m}\div a^{n}=a^{m-n}$

Applying the above identity to the given expression, we get

$5^{m-(-3)}=5^{5}$

$\Rightarrow 5^{m+3}=5^{5}$

Since the bases are same on both sides, therefore the exponents must be equal to each other, we get

$\Rightarrow m+3=5$

$\Rightarrow m=5-3$

$\therefore m=2$

Therefore, we get the value of $m=2$.

6. Evaluate the following:

(i) $\left\{\left(\frac{1}{3}\right)^{-1}-\left(\frac{1}{4}\right)^{-1}\right\}^{-1}$

Ans: Given expression is $\left\{\left(\frac{1}{3}\right)^{-1}-\left(\frac{1}{4}\right)^{-1}\right\}^{-1}$.

We know that $a^{-n} = \frac{1}{a^n}$, applying to the given expression we get

$$\left\{\left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}\right\}^{-1} = \left\{\left(\frac{3}{1}\right)^{1} - \left(\frac{4}{1}\right)^{1}\right\}^{-1}$$

$$\Rightarrow \left\{\left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}\right\}^{-1} = \{3-4\}^{-1}$$

$$\Rightarrow \left\{\left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}\right\}^{-1} = (-1)^{-1}$$

Again applying the identity $a^{-n} = \frac{1}{a^n}$, we get

$$\Rightarrow \left\{\left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}\right\}^{-1} = \frac{1}{-1}$$

$$\therefore \left\{\left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}\right\}^{-1} = -1$$

(ii) $\left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-4}$

Ans: Given expression is $\left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-4}$.

Now, applying the identity $\left(\frac{1}{a}\right)^{m} = \frac{1^m}{a^m}$, we get

$$\left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-4} = \left(\frac{5^{-7}}{8^{-7}}\right) \times \left(\frac{8^{-4}}{5^{-4}}\right)$$

Now, we know that $a^{-n} = \frac{1}{a^n}$, we get

$$\Rightarrow \left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-4} = \frac{8^7}{5^7} \times \frac{5^4}{8^4}$$

Now, applying the identity $a^m \div a^n = a^{m-n}$, we get

$$\Rightarrow \left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-4} = \frac{8^{7-4}}{5^{7-4}}$$

$$\Rightarrow \left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-4} = \frac{8^{3}}{5^{3}}$$

$$\Rightarrow \left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-4} = \frac{8\times8\times8}{5\times5\times5}$$

$$\therefore \left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-4} = \frac{512}{125}$$

7. Simplify the given expressions:

(i) $\mathbf{\dfrac{25\times t^{-4}}{5^{-3}\times10\times t^{-8}}}$

Ans: Given expression $\dfrac{25\times t^{-4}}{5^{-3}\times10\times t^{-8}}$ can be written as

$$\frac{25\times t^{-4}}{5^{-3}\times10\times t^{-8}} = \frac{5^{2}\times t^{-4}}{5^{-3}\times5\times2\times t^{-8}}$$

$$\Rightarrow \frac{25\times t^{-4}}{5^{-3}\times10\times t^{-8}} = \frac{5^{2}\times t^{-4}}{5^{-3+1}\times2\times t^{-8}}$$

Now, applying the identity $a^m \div a^n = a^{m-n}$, we get

$$\Rightarrow \frac{25\times t^{-4}}{5^{-3}\times10\times t^{-8}} = \frac{5^{2-(-2)}\times t^{-4-(-8)}}{2}$$

$$\Rightarrow \frac{25\times t^{-4}}{5^{-3}\times10\times t^{-8}} = \frac{5^{4}\times t^{4}}{2}$$

$$\Rightarrow \frac{25\times t^{-4}}{5^{-3}\times10\times t^{-8}} = \frac{5\times5\times5\times5\times t^{4}}{2}$$

$$\therefore \frac{25\times t^{-4}}{5^{-3}\times10\times t^{-8}} = \frac{625t^{4}}{2}$$

(ii) $\mathbf{\dfrac{3^{-5}\times10^{-5}\times125}{5^{-7}\times6^{-5}}}$

Ans: Given expression $\frac{3^{-5}\times 10^{-5}\times 125}{5^{-7}\times 6^{-5}}$ can be written as

$$\frac{3^{-5}\times 10^{-5}\times 125}{5^{-7}\times 6^{-5}}=\frac{3^{-5}\times\left(2\times 5\right)^{-5}\times 5^{3}}{5^{-7}\times\left(2\times 3\right)^{-5}}$$

$$\Rightarrow\frac{3^{-5}\times 10^{-5}\times 125}{5^{-7}\times 6^{-5}}=\frac{3^{-5}\times 2^{-5}\times 5^{-5}\times 5^{3}}{5^{-7}\times 2^{-5}\times 3^{-5}}$$

Now, applying the identity $a^m\div a^n=a^{m-n}$, we get

$$\Rightarrow\frac{3^{-5}\times 10^{-5}\times 125}{5^{-7}\times 6^{-5}}=3^{-5-(-5)}\times 2^{-5-(-5)}\times 5^{-5+3-(-7)}$$

$$\Rightarrow\frac{3^{-5}\times 10^{-5}\times 125}{5^{-7}\times 6^{-5}}=3^{0}\times 2^{0}\times 5^{5}$$

We know that $a^0=1$, we get

$$\Rightarrow\frac{3^{-5}\times 10^{-5}\times 125}{5^{-7}\times 6^{-5}}=1\times 1\times 5^{2}$$

$$\therefore\frac{3^{-5}\times 10^{-5}\times 125}{5^{-7}\times 6^{-5}}=5^{5}$$

Exercise 10.2

1. Express the following numbers in standard form.

(i) 0.000000000000085

Ans: Given number is 0.000000000000085.

A number can be expressed in standard decimal form of $a\times 10^{b}$.

Where, a is any number between 1.0 and 10.0. Value of b can be positive or negative.

When we shift the decimal to the right the exponent is negative and when we shift the decimal to the left the exponent is positive.

Now, expressing the given number in standard form, we get

$$\therefore 0.000000000000085=8.5\times 10^{-12}$$

(ii) 0.00000000000942

Ans: Given number is 0.00000000000942.

A number can be expressed in standard decimal form of $a\times 10^{b}$.

Where, a is any number between 1.0 and 10.0. Value of b can be positive or negative.
When we shift the decimal to the right the exponent is negative and when we shift the decimal to the left the exponent is positive.
Now, expressing the given number in standard form, we get
$\therefore 0.00000000000942 = 9.42 \times 10^{-12}$

(iii) 6020000000000000
Ans: Given number is 6020000000000000.
A number can be expressed in standard decimal form of $a \times 10^{b}$.
Where, a is any number between 1.0 and 10.0. Value of b can be positive or negative.
When we shift the decimal to the right the exponent is negative and when we shift the decimal to the left the exponent is positive.
Now, expressing the given number in standard form, we get
$\therefore 6020000000000000 = 6.02 \times 10^{15}$

(iv) 0.00000000837
Ans: Given number is 0.00000000837.
A number can be expressed in standard decimal form of $a \times 10^{b}$.
Where, a is any number between 1.0 and 10.0. Value of b can be positive or negative.
When we shift the decimal to the right the exponent is negative and when we shift the decimal to the left the exponent is positive.
Now, expressing the given number in standard form, we get
$\therefore 0.00000000837 = 8.37 \times 10^{-9}$

(v) 31860000000
Ans: Given number is 31860000000.
A number can be expressed in standard decimal form of $a \times 10^{b}$.
Where, a is any number between 1.0 and 10.0. Value of b can be positive or negative.
When we shift the decimal to the right the exponent is negative and when we shift the decimal to the left the exponent is positive.
Now, expressing the given number in standard form, we get
$\therefore 31860000000 = 3.186 \times 10^{10}$

2. Express the following numbers in usual form.

(i) 3.02×10^{-6}

Ans: Given number is 3.02×10^{-6}.

To write the given number in usual form we will add number of zeros equal to the exponent number.

We will add zeros before the number to remove the negative exponent.

We get

$3.02\times10^{-6}=.00000302$

$\therefore 3.02\times10^{-6}=0.00000302$

(ii) 4.5×10^{4}

Ans: Given number is 4.5×10^{4}.

To write the given number in usual form we will add number of zeros equal to the exponent number.

We will add zeros after the number to remove the positive exponent.

We get

$4.5\times10^{4}=4.5\times10000$

$\therefore 4.5\times10^{4}=45000$

(iii) 3×10^{-8}

Ans: Given number is 3×10^{-8}.

To write the given number in usual form we will add number of zeros equal to the exponent number.

We will add zeros before the number to remove the negative exponent.

We get

$3\times10^{-8}=.00000003$

$\therefore 3\times10^{-8}=0.00000003$

(iv) 1.0001×10^{9}

Ans: Given number is 1.0001×10^{9}.

To write the given number in usual form we will add number of zeros equal to the exponent number.

We will add zeros after the number to remove the positive exponent.

We get

$1.0001\times10^{9}=1.0001\times1000000000$

$\therefore 1.0001 \times 10^9 = 1000100000$

(v) 5.8×10^{12}

Ans: Given number is 5.8×10^{12}.

To write the given number in usual form we will add number of zeros equal to the exponent number.

We will add zeros after the number to remove the positive exponent.

We get

$5.8 \times 10^{12} = 5.8 \times 1000000000000$

$\therefore 5.8 \times 10^{12} = 5800000000000$

(vi) 3.61492×10^6

Ans: Given number is 3.61492×10^6.

To write the given number in usual form we will add number of zeros equal to the exponent number.

We will add zeros after the number to remove the positive exponent.

We get

$3.61492 \times 10^6 = 3.61492 \times 1000000$

$\therefore 3.61492 \times 10^6 = 3614920$

3. Express the number appearing in the following statements in standard form.

(i) 1 micron is equal to $\frac{1}{1000000}$ m.

Ans: Here, the given number is $\frac{1}{1000000}$ m.

A number can be expressed in standard decimal form of $a \times 10^b$.

Where, a is any number between 1.0 and 10.0. Value of b can be positive or negative.

The number of zeros in denominator is 6 in the number $\frac{1}{1000000}$ m.

Now, expressing the given number in standard form, we get

$\therefore \frac{1}{1000000}\,\text{m} = 1 \times 10^{-6}$.

(ii) Charge of an electron is $0.000,000,000,000,000,000,16$ coulomb.

Ans: Here, the given number is $0.000,000,000,000,000,000,16$.

A number can be expressed in standard decimal form of $a \times 10^{b}$.

Where, a is any number between 1.0 and 10.0. Value of b can be positive or negative.

When we shift the decimal to the right the exponent is negative and when we shift the decimal to the left the exponent is positive.

Now, expressing the given number in standard form, we get

$\therefore 0.000,000,000,000,000,000,16 = 1.6 \times 10^{-19}$.

(iii) Size of a bacteria is 0.0000005 m.

Ans: Here the given number is 0.0000005 m.

A number can be expressed in standard decimal form of $a \times 10^{b}$.

Where, a is any number between 1.0 and 10.0. Value of b can be positive or negative.

When we shift the decimal to the right the exponent is negative and when we shift the decimal to the left the exponent is positive.

Now, expressing the given number in standard form, we get

$\therefore 0.0000005 \text{ m} = 5 \times 10^{-7} \text{ m}$.

(iv) Size of a plant cell is 0.00001275 m.

Ans: Here the number is 0.00001275 m.

A number can be expressed in standard decimal form of $a \times 10^{b}$.

Where, a is any number between 1.0 and 10.0. Value of b can be positive or negative.

When we shift the decimal to the right the exponent is negative and when we shift the decimal to the left the exponent is positive.

Now, expressing the given number in standard form, we get

$\therefore 0.00001275 \text{ m} = 1.275 \times 10^{-5} \text{ m}$.

(v) Thickness of a thick paper is 0.07 mm.

Ans: Here, the number is 0.07 mm.

A number can be expressed in standard decimal form of $a \times 10^{b}$.

Where, a is any number between 1.0 and 10.0. Value of b can be positive or negative.

When we shift the decimal to the right the exponent is negative and when we shift the decimal to the left the exponent is positive.
Now, expressing the given number in standard form, we get
$\therefore 0.07 \text{ mm} = 7 \times 10^{-2} \text{ mm}$.

4. In a stack there are 5 books each of thickness 20 mm and 5 paper sheets each of thickness 0.016 mm. What is the total thickness of the stack?

Ans: Given that there are 5 books each of thickness 20 mm and 5 paper sheets each of thickness 0.016 mm in a stack.
We have to find the total thickness of the stack.
Total thickness of the stack will be the sum of thickness of 5 books and thickness of 5 paper sheets.
Thickness of 5 books is $= 5 \times 20 = 100$ mm.
Thickness of 5 paper sheets is $= 5 \times 0.016 = 0.080$ mm
Now,
Total thickness of stack is
$\Rightarrow 100 + 0.080$
$\Rightarrow 100.08$ mm
$\therefore \text{total thickness} = 1.0008 \times 10^2 \text{mm}$
Therefore, the total thickness of the stack is 1.0008×10^2 mm.