Significant Figures Chemistry Questions with Solutions

Q1: What are Significant Figures?

Answer:

In Chemistry, Significant figures are the digits of a number that have meaning for the measurement's resolution. It is the number of digits used to express a quantity that has been measured or calculated.

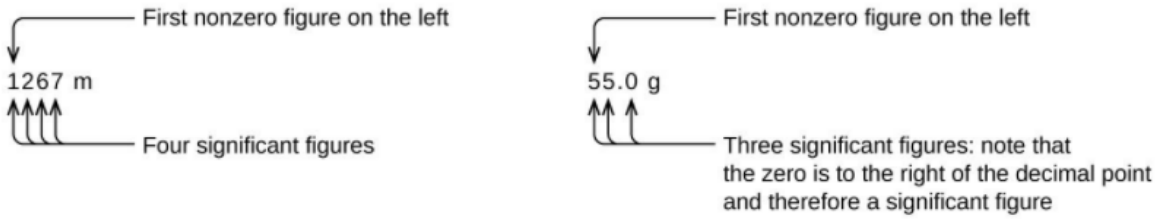
We may illustrate how exact a number is by using significant figures. We risk the integrity of what this number represents by expressing it outside the location we have actually measured (and hence are sure of). It is critical to employ significant figures correctly throughout our scientific careers after studying and understanding them.

Q2: Give examples of Significant Figures.

Answer:

Significant Figures examples are as follows:

- 4308 – 4 significant figures
- 40.05 – 4 significant figures
- 470,000 – 2 significant figures
- 4.00 – 3 significant figures
- 0.00500 – 3 significant figures



Example of Significant Figures

Q3: Give the number of significant figures in each measurement.

a) 36.7 m
b) 0.006606 s
c) 2,002 kg
d) 306,490,000 people

Answer:

a) This measurement has three significant numbers since all nonzero digits are significant.
b) The first three zeros are insignificant, but the zero between the sixes is; hence this number has four significant figures.
c) This measurement includes four significant figures because the two zeros between the two are significant.
d) The four trailing zeros in the number aren't significant, but the other five are, making this a five-figure number.

Q4: Express the final answer to the correct number of significant figures.
a) 101.2 + 18.702 = ?
b) 202.88 − 1.013 = ?

Answer:

a) If we add these two figures together with a calculator, we get 119.902. However, because most calculators do not recognise significant figures, we'll have to round up to tenths place. As a result, we eliminated the 02 and gave a final score of 119.9. (rounding off).

b) A calculator would come up with the number 201.867. We must, however, limit our final response to the hundredths place. We round up and return a definitive answer of 201.87 because the first number dropped is 7, greater than 5.

Q5: Calculate the correct number of significant figures for the final solution:
a) 76.4 × 180.4 = ?
b) 934.9 ÷ 0.00455 = ?

Answer:

a) There are three significant figures in the first number and four significant figures in the second. As a result, we only use three significant figures in our final answer: 76.4 180.4 = 13,782.56 = 13,800.
b) The first number has four significant figures, whereas the second number only has three. As a result, we chose to keep our final answer to three major figures: 934.9 ÷ 0.00455 = 205,472.5275… = 205,000.

Q6: Exercises of rounding to the correct number of significant figures with a 5 as the first non-significant figure:
a) Round 4.7475 to 4 significant figures
b) Round 4.7465 to 4 significant figures

Answer:

a) Because the first non-significant digit is 5, and we round the last significant figure up to 6 to make it even, 4.747̲5 becomes 4.748.
b) Because the first non-significant figure is 5, and the last significant figure is even, 4.746̲5 becomes 4.746.

Q7: How many significant figures are in the measurement 0.0082 L?

Answer:

There are five digits in the number provided in the question: three zero digits and two nonzero digits. Two zero digits appear after the decimal, while one appears before the decimal. There are no nonzero digits between the three zero digits; they are not regarded as significant figures. As a result, only the first two nonzero numbers are significant. As a result, **there are only two significant figures in this measurement, 82**.

Q8: How many significant figures should the answer to this calculation contain?
[latex]\frac{1.014 + 0.07}{5.11}[/latex]

a) 2
b) 3
c) 4
d) 1

Answer: d) 1

Explanation: The term in the equation with the fewest significant figures will ultimately decide the number of significant figures in the final result. Let's look at the parts of the expression we've been given.

1.014 → 4 significant figures
0.07 → 1 significant figure
5.11 → 3 significant figures

Because the expression's least precise term includes only one significant figure, our final answer will also have only one.

Q9: How many significant figures are in the number 0.00150?
a) 5
b) 3
c) 6
d) 2

Answer: b) 3

Explanation: It's important to remember that all leading zeros aren't significant.

As a result, we calculate significant figures where the 1 is for 0.00150. Because it is a trailing zero discovered after the decimal point, the last 0 is significant. Thus, there are 3 significant figures in the given number.

Q10: Calculate and answer using the correct number of significant figures: **1.02 + 8.2 + 3.33 + 9.781**

a) 22.3
b) 22.33
c) 22.331
d) 22

Answer: a) 22.3

Explanation: To begin, add up the numbers.

1.02 + 8.2 + 3.33 + 9.781 = 22.331

Because this is an addition, the outcome must have the same number of decimal places as the value with the fewest decimal places. Because 8.2 has the smallest number of decimal places, the solution must only contain one digit after the decimal point.

Q11: Calculate and answer using the correct number of significant figures.
[latex]\frac{(3.4 + 100.33)}{(2.5 - 0.11)}[/latex]

a) 43
b) 40
c) 43.4
d) 43.40

Answer: a) 43

Explanation: Keep track of the number of significant figures after each step in multistep calculations, so we know how many significant figures to round to at the end of the entire calculation. Round intermediate steps to ensure precision. In the parenthesis, do the addition and subtraction first.

3.4+ 100.33 = 103.73

Remember that the result for addition must have the same number of digits after the decimal point as the number in the question with the fewest decimal points. The result of our addition should only have

four significant figures. The last significant digit will be underlined to remind us that the solution should only have four significant figures: 103.7̲3

Next, do the subtraction.

2.5 − 0.11 = 2.39

Because the rules for significant numbers in addition and subtraction are the same, we only need two significant figures in our answer. This step's last significant figure will be underlined as well: 2.3̲9

Now, divide these two numbers:

[latex]\frac{103.73}{2.39}[/latex] = 43.40167364

This is when the importance of underlining significant digits in the previous steps comes into play. Remember that the result of multiplication and division has the same number of significant figures as the factor with the smallest number.

To reflect the least amount of significant figures found in the division, round the final answer to 2 significant figures. As a result, 43.40167364 equals 43.

Q12: Calculate and provide the correct number of significant figures.
[latex]\frac{566.11 \cdot 12.333}{3.45}[/latex]

a) 2023
b) 2000
c) 2020
d) 2023.7

Answer: c) 2020

Explanation: First, complete the calculation.

[latex]\frac{566.11 \cdot 12.333}{3.45}[/latex] = 2023.720183

Remember that the solution for multiplication and division utilises the least number of significant numbers in the question. 3.45 has the least number of significant figures (3 in this case). After that, the final answer should be rounded up to only three significant figures. 2023.720183 rounded to three significant figures is 2020.

Q13: Calculate and give the answer with the correct number of significant figures.
(0.05 + 0.123) x (1.02 + 0.9)

a) 0.3321
b) 0.332
c) 0.3
d) 0.33

Answer: d) 0.33

Explanation: Keep track of the number of significant figures at the end of each step in multistep calculations so we know how many significant figures to round to at the end of the entire calculation. To maintain accuracy, you must round intermediate steps.

Begin by solving the two addition problems in the parenthesis.

0.05 + 0.123 = 0.173

Remember that the result for addition must have the same number of digits after the decimal point as the number in the question with the fewest decimal points. The result of our addition should only have two significant figures. The last significant digit will be underlined to remind you that the solution should only have two significant figures: 0.1$\underline{7}$3

1.02 + 0.9 = 1.92

Using the same logic as before, perform the second addition. The last significant number will be underlined to remind you that the solution should only have two significant figures: 1.$\underline{9}$2

Now, multiply:

0.1$\underline{7}$3 × 1.$\underline{9}$2 = 0.33216

Because both factors have two significant figures, we should only have two significant figures in our final answer. The fraction 0.33216 is rounded to 0.33.

Q14: State the number of significant figures in the following:
a) 0.007 m^2
b) $2.64x10^{24}$ kg
c) 0.2370 $g.cm^{-3}$
d) 6.320J
e) 6.032 Nm^{-2}
f) 0.0006032 m^2

Answer:

a) 0.007 = 7 x 10^{-3}. Significant digit = 7. Thus, only one significant digit.

b) Number of significant figures = 3

c) Numbers that are not zero are always significant. Before a non-zero number, all zeros are insignificant. Significant are all zeroes to the right of the decimal point and at the end of the number.
The zero before the decimal point is the only non-significant digit here. As a result, the number of significant digits is four.

d) Numbers that are not zero are always significant. Significant are all zeroes to the right of the decimal point and at the end of the number. As a result, the number of significant digits is 4.

e) All of the digits are significant. (there is no leading zero or trailing zero)
The number of significant digits is equal to 4.

f) Significant digits = 6032
No. of significant digits = 4

Q15: Briefly describe Significant Figures Rules.

Answer:

When measuring the significant figures of a determined measurement, certain rules must be followed.

The following are the fundamentals of the law:

- All non-zero digits are important.
- Zeroes between non-zero digits are important.
- Only the last zero or the trailing zero in the decimal section are significant.

The following are the significant figures rules governing significant figure determination:

- The non-zero digits are the ones that count.
- For example, there are four significant digits in 6575 cm and three significant figures in 0.543.
- If there is a zero before the non-zero digit, it is not relevant. The position of the decimal point is indicated by the previous zero; there is only one figure in 0.005 and three in 0.00232.
- It's also a significant figure if there's a zero between two non-zero digits.
- 4.5006 has five major figures, for example.
- A number with zeroes at the end or on the right side is also significant.
- 0.500, for instance, contains three significant digits.
- Because these are inexact numbers, counting the number of objects, such as 5 bananas and 10 oranges, yields endless figures.

Practise Questions on Significant Figures

Q1: What is the purpose of Significant Figures?

Answer:

Significant figures (also known as significant numbers) are used in statistical and mathematical calculations that need numerical precision and accuracy. It's critical to estimate ambiguity regarding the eventual result, and this is where important personalities come into play.

Q2: How many Significant figures in each term?

a) 34.6209
b) 0.003048
c) 5010.0
d) 4032.090

Answer:

a) 6
b) 4
c) 5
d) 7

Q3: How many significant figures in each term?

a) 1.40×10^3
b) 6.01
c) 02947.1
d) 583.02

Answer:

a) 3
b) 3
c) 5
d) 5

Q4: Calculate and give the answer using the correct number of significant figures.
1.2 + 3 + 9.65 + 10.881

a) 25
b) 24.7
c) 24.73
d) 24

Answer: a) 25

Explanation: First, do the calculation: 1.2 + 3 + 9.65 + 10.881 = 24.731

Because this is an addition, the outcome must have the same number of decimal places as the value with the fewest decimal places. The solution must not contain any decimal points because 3 has the smallest number of places after the decimal point. The answer will round up to 25.

Q5: How many significant figures are in the number 0.50210?

a) 2
b) 4
c) 3
d) 5

Answer: d) 5

Explanation: 0.50210

Because this is a leading zero, the digit underlined has no significance. All of the numbers that aren't underlined are significant. Since it is sandwiched between two non-zero digits, the first 0 is significant. As it is a trailing zero following a decimal point, the last 0 is also significant. As a result, there are five significant figures.