Standard form

When you are using numbers that are very small, such as dimensions of molecules and organelles, it is useful to use standard form to express them more easily.

Standard form is essentially expressing numbers in powers of ten. For example, 10 raised to the power 10 mean 10 x 10, i.e. 100. This may be written as 10×10^1 or 1×10^2. To get to 1000 you use 10 x 10 x 10, which would be written as 1×10^3.

An easy way to look at this is to imagine the decimal point moving one place per power of ten. For example, to write down **58 900 000 000** as standard form, you would follow these steps below.

Step 1: write down the smallest number between 1 and 10 that can be derived from the number to be converted. In this case it would be **5.89**

Write the number of times the decimal place will have to shift to expand this to the original number as powers of ten. On paper this could be done by hopping the decimal over each number like this

Until the end of the number is reached. In this example, that requires 10 shifts, so the standard form should be written as 5.89×10^{10}

Standard form practice questions

1. Convert the following from standard form into full numbers:

a. 1.6×10^5 _____ (*1 mark*)

b. 1.7×10^{-5} _____ (*1 mark*)

c. 4.7×10^{-3} _____ (*1 mark*)

d. 7.4×10^7 _____ (*1 mark*)

Write the following numbers in standard form:

e. 450,000 _____ (*1 mark*)

f. 120,000,000 _____ (*1 mark)*

g. 0.002 _____ (*1 mark)*

h. 0.00000000025 _____ (*1 mark)*

Standard Form Additional Questions

1 (a) Write these numbers in standard form

i) 9 170 000 _____

(*1 mark*)

(ii) 0.000 048 _____

(1 mark)

(b) Find the value of $(1.8 \times 10^{12}) \div (2 \times 10^{8})$

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(2 marks)

2 (a) Work out $(3 \times 10^{2}) \times (4 \times 10^{5})$ ***Give your answer in standard form***.

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(2 marks)

(b) Work out $(3 \times 10^{2}) \div (4 \times 10^{5})$ ***Give your answer in standard form***.

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(2 marks)

3. Here are six numbers written in standard form.

2.6×10^{5} 1.75×10^{6} 5.84×10^{0} 8.2×10^{-3} 3.5×10^{-1} 4.9×10^{-2}

(a) Write down the largest number.

_____

(1 mark)

(b) Write down the smallest number.

_____

(1 mark)

(c) Write 4.9×10^{-2} as an ordinary number.

(1 mark)

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(d) Work out $2.6 \times 10^{5} \div 0.1$ Give your answer in standard form.

_____

(1 mark)

4. The Earth is approximately a sphere of radius 6400 km. The surface area of a sphere is given by the formula $A = 4\pi r^{2}$. Calculate the approximate surface area of the Earth. Give your answer in standard form.

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(2 marks)