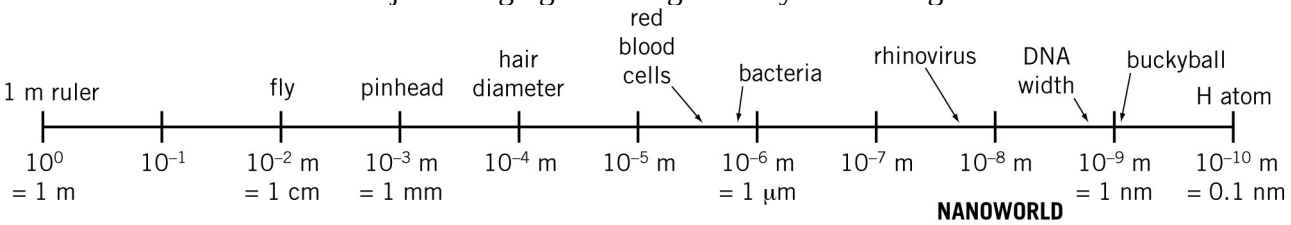
Worksheet 1.1

The size of things

NAME: **CLASS:**

INTRODUCTION

Nano-sized particles are difficult to imagine. This worksheet aims to help you visualise the relative sizes of particles, from the 'everyday' size of 1 m, to the 'nanoworld' size of 10^{-9} m.
The different sizes of some objects ranging from large to very small are given on the chart below.



No.	Question	Answer

1 Complete the table below by listing an object for each size range. For each object listed, state the approximate size, and convert the size to a figure in nanometres. Three examples have been completed for you.

Size range (m)	Object	Object size	Object size (nm)
10^0 to 10^{-1}	1-metre ruler	1.0 m	1 000 000 000
10^{-1} to 10^{-2}			
10^{-2} to 10^{-3}			
10^{-3} to 10^{-4}			
10^{-4} to 10^{-5}			
10^{-5} to 10^{-6}			
10^{-6} to 10^{-7}	Mitochondrion	Length 0.5 μm	500
10^{-7} to 10^{-8}			
10^{-8} to 10^{-9}			
10^{-9} to 10^{-10}	Copper atom	Diameter 260 pm	0.260

2	Nanotechnology deals with particles in the size range between 1 and 100 nm. Which of your listed objects would be studied in nanotechnology?	
3	A flea has a length of approximately 6 mm. In order to be placed in the realm of nanotechnology, by what factor would this size need to be decreased?	
4	The diameter of a hydrogen atom is close to 2.5×10^{-10} m. In order to be placed in the realm of nanotechnology, by what factor would this size need to be increased?	
5	Suppose you were to use a length of paper tape to make a scale on which to represent the relative sizes of objects. If 1 cm of tape represented 1 nm, what length of tape would be required to represent: **a** the 2 μm length of an *E. coli* bacterium? **b** the 330 mm length of a textbook?	