2.1 Scientific Notation

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2.1 Scientific Notation

- The realm of physics spans from the smallest of particles to the universe itself.

Figure: Our home galaxy, the Milky Way (image © NASA).

2.1 Scientific Notation

- To express very small and very large values in physics, we use the scientific notation of numbers.
- Go to http://micro.magnet.fsu.edu/primer/java/scienceopticsu/powersof10/
- Study 2.1 Realm of Physics: Scientific notation. Answer the questions 2-1, 2-2, 2-4 and 2-5 on page 34.
- Set the simulation to manual, and start from the first frame (Milky Way 10 ly (light years) from the Earth).
- One light year is the distance light travels in a year. Using the Internet, find the distance to the nearest star.
- The speed of light is $c = 3.00 \times 10^8\,\mathrm{m\,s^{-1}}$. Calculate the light year in meters with explanations. Check the result from the Internet.

2.1 Order of Magnitude

- What is the Milky Way? Express the number of stars in the Milky Way in scientific notation.
- Study subsection 2.1.2 Order of magnitude. Take a look at the Solar System 100 billion kilometres away (simulation). Express 100 billion kilometres in scientific notation. State the order of magnitude of the result.
- State the diameter of the Solar System in scientific notation, and as an order of magnitude.
- State the diameter of the Earth in scientific notation, and as an order of magnitude. Calculate the ratio (diameter of Solar System)/(diameter of the Earth). Express the result in the correct number of significant figures, and as an order of magnitude.

2.1 Negative Exponents

- State the size of a cell in decimal form, in scientific notation and as an order of magnitude.
- State the size of a nucleus of a leaf cell in decimal form, in scientific notation and as an order of magnitude.
- State the size of a carbon electron cloud in decimal form, in scientific notation and as an order of magnitude. What does an electron cloud mean?
- State the size of a nucleus of an carbon atom in decimal form, in scientific notation and as an order of magnitude. Describe the structure of an atomic nucleus and a carbon atom.
- Calculate the ratio (diameter of carbon electron cloud)/(diameter of an carbon nucleus). Express the result in the correct number of significant figures, and as an order of magnitude.

2.1 Scientific Notation and Structure of Atom

- Describe the structure of an atom. State the electric charge of a proton, a neutron and an electron in Coulombs using scientific notation. Explain how an atom stays together.
- Describe the structure of a proton, a neutron and an electron.
- What are quarks. List the types of quark.
- State the size of a quark in decimal form, in scientific notation and as an order of magnitude.