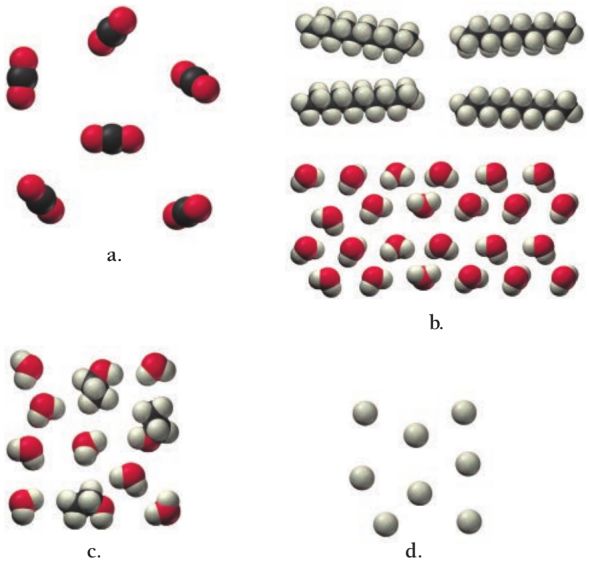
Matter, Relative Atomic Mass, and Periodic Table

Aug 31, 2022

Matter Classification

1) Determine whether each molecular diagram represents a pure substance or a mixture. If it represents a pure substance, classify the substance as an element or compound. If it represents a mixture, classify the mixture as homogeneous or heterogeneous.



Scientific Method

2) Classify each statement as an observation, a law, or a theory.

a) All matter is made of tiny, indestructible particles called atoms.

b) When iron rusts in a closed container, the mass of the container and its contents do not change.

c) In chemical reactions, matter is neither created nor destroyed

d) When a match burns, heat is released.

e) Chlorine is a highly reactive gas.

f) Neon is an inert (or nonreactive) gas.

g) The reactivity of elements depends on the arrangement of their electrons.

Relative Sizes

3) The single proton that forms the nucleus of the hydrogen atom has a readius of approximately 1.0×10^{-13} cm. The hydrogen atom itself has a radius of approximately 52.9 pm. What fraction of the space within the atom is occupied by the nucleus?

Atoms

4) Determine the number of protons and the number of neutrons in each isotope: ${}^{14}_{7}\mathrm{N}$, ${}^{226}_{88}\mathrm{Ra}$, ${}^{33}_{15}\mathrm{P}$, and ${}^{99}_{43}\mathrm{Tc}$.

5) Determine the number of protons and electrons in each ion: Al^{3+}, Se^{2-}, Ga^{3+}, and Sr^{2+}.

6) Describe Rutherford's gold foil experiment. How did the experiment prove that the plum-pudding model of the atom was wrong? What model did Rutherford replace it with?

Relative Atomic Mass

7) Explain how a mass spectrometer works. What kind of information can be determined from a mass spectrum?

8) Lead has the following natural isotopes Pb-204, Pb-205, Pb-206, and Pb-207. Their relative abundances are 1.5%, 24%, 22%, and 52.5%, respectively. Estimate the relative atomic mass unit and report to 3 significant figures.