**المرحلة الثانية / فيزياء المحاضرة الثامنة E-Terminology**

**قسم العلوم**

**The Atom**

**The atom is a basic unit of** [**matter**](http://en.wikipedia.org/wiki/Matter) **that consists of a dense central** [**nucleus**](http://en.wikipedia.org/wiki/Atomic_nucleus) **surrounded by a** [**cloud**](http://en.wikipedia.org/wiki/Electron_cloud) **of** [**negatively charged**](http://en.wikipedia.org/wiki/Electric_charge)[**electrons**](http://en.wikipedia.org/wiki/Electrons)**. The** [**atomic nucleus**](http://en.wikipedia.org/wiki/Atomic_nucleus) **contains a mix of positively charged** [**protons**](http://en.wikipedia.org/wiki/Proton) **and electrically neutral** [**neutrons**](http://en.wikipedia.org/wiki/Neutron) **(except in the case of** [**hydrogen-1**](http://en.wikipedia.org/wiki/Hydrogen-1)**, which is the only stable** [**nuclide**](http://en.wikipedia.org/wiki/Nuclide) **with no neutrons). The electrons of an atom are bound to the nucleus by the** [**electromagnetic force**](http://en.wikipedia.org/wiki/Electromagnetic_force)**. Likewise, a group of atoms can remain bound to each other, forming a** [**molecule**](http://en.wikipedia.org/wiki/Molecule)**. An atom containing an equal number of protons and electrons is electrically neutral, otherwise it has a positive charge if there are fewer electrons (**[**electron deficiency**](http://en.wikipedia.org/wiki/Electron_deficiency)**) or negative charge if there are more electrons (electron excess). A positively or negatively charged atom is known as an** [**ion**](http://en.wikipedia.org/wiki/Ion)**. An atom is** [**classified**](http://en.wikipedia.org/wiki/Periodic_table) **according to the number of protons and neutrons in its nucleus: the** [**number of protons**](http://en.wikipedia.org/wiki/Atomic_number) **determines the** [**chemical element**](http://en.wikipedia.org/wiki/Chemical_element)**, and the** [**number of neutrons**](http://en.wikipedia.org/wiki/Neutron_number) **determines the** [**isotope**](http://en.wikipedia.org/wiki/Isotope) **of the element.**

**The name atom comes from the** [**Greek**](http://en.wikipedia.org/wiki/Greek_language) **(atomos), which means uncuttable, or indivisible, something that cannot be divided further. The concept of an atom as an indivisible component of matter was first proposed by early** [**Indian**](http://en.wikipedia.org/wiki/Indian_philosophy) **and** [**Greek**](http://en.wikipedia.org/wiki/Greek_philosophy) **philosophers. In the 17th and 18th centuries,** [**chemists**](http://en.wikipedia.org/wiki/Chemist) **provided a physical basis for this idea by showing that certain substances could not be further broken down by chemical methods. During the late 19th and early 20th centuries,** [**physicists**](http://en.wikipedia.org/wiki/Physicist) **discovered subatomic components and structure inside the atom, thereby demonstrating that the 'atom' was divisible. The principles of** [**quantum mechanics**](http://en.wikipedia.org/wiki/Quantum_mechanics) **were used to successfully** [**model**](http://en.wikipedia.org/wiki/Scientific_modelling) **the atom.**

**Atoms are minuscule objects with proportionately tiny masses. Atoms can only be observed individually using special instruments such as the** [**scanning tunneling microscope**](http://en.wikipedia.org/wiki/Scanning_tunneling_microscope)**. Over 99.94% of an atom's mass is concentrated in the nucleus, with protons and neutrons having roughly equal mass. Each element has at least one isotope with unstable nuclei that can undergo** [**radioactive decay**](http://en.wikipedia.org/wiki/Radioactive_decay)**. This can result in a** [**transmutation**](http://en.wikipedia.org/wiki/Nuclear_transmutation) **that changes the number of protons or neutrons in a nucleus.**

**(انك- ف/8-33)**

**Electrons that are bound to atoms possess a set of stable** [**energy levels**](http://en.wikipedia.org/wiki/Energy_level)**, or** [**orbital's**](http://en.wikipedia.org/wiki/Atomic_orbital)**, and can undergo transitions between them by absorbing or emitting** [**photons**](http://en.wikipedia.org/wiki/Photon) **that match the energy differences between the levels. The electrons determine the chemical properties of an element, and strongly influence an atom's** [**magnetic**](http://en.wikipedia.org/wiki/Magnetism) **properties.**

**Various atoms and molecules as depicted in** [**John Dalton**](http://en.wikipedia.org/wiki/John_Dalton)**'s A New System of Chemical Philosophy (1808), one of the earliest scientific works on atomic theory. Further progress in the understanding of atoms did not occur until the science of** [**chemistry**](http://en.wikipedia.org/wiki/Chemistry) **began to develop. In 1789, French nobleman and scientific researcher** [**Antoine Lavoisier**](http://en.wikipedia.org/wiki/Antoine_Lavoisier) **discovered the** [**law of conservation of mass**](http://en.wikipedia.org/wiki/Law_of_conservation_of_mass) **and defined an** [**element**](http://en.wikipedia.org/wiki/Chemical_element) **as a basic substance that could not be further broken down by the methods of chemistry. In 1805, English instructor and natural philosopher** [**John Dalton**](http://en.wikipedia.org/wiki/John_Dalton) **used the concept of atoms to explain why elements always react in ratios of small** [**whole numbers**](http://en.wikipedia.org/wiki/Natural_number) **(the** [**law of multiple proportions**](http://en.wikipedia.org/wiki/Law_of_multiple_proportions)**) and why certain gases dissolved better in water than others. He proposed that each element consists of atoms of a single, unique type, and that these atoms can join together to form chemical compounds. Dalton is considered the originator of modern** [**atomic theory**](http://en.wikipedia.org/wiki/Atomic_theory)**. Dalton's atomic hypothesis did not specify the size of atoms. Common sense indicated they must be very small, but nobody knew how small.**

**Exercises:**

1. **Answer the following questions:**
2. **What is the atom?**
3. **What does the atomic nucleus contain?**
4. **What is the name of positively or negatively charged atom known?**
5. **How does an atom classified?**
6. **Where does the name atom come from, and what does it mean?**
7. **What are electrons?**
8. **What did John Dalton use the concept of atom?**

**(انك- ف/8-34)**

1. **Vocabulary:**

**Electron deficiency indivisible**

**Cloud of negatively charged emitting photons**

**Absorbing magnetic properties**

**Atomic hypothesis nobleman**

1. **Fill in the blanks with the most correct words from the list below:**

**(basic substance. Chemical Philosophy, French nobleman, isotope, chemical properties, very small, equal number, subatomic components, join together, negative charge,)**

1. **During the late 19th and early 20th centuries,** [**physicists**](http://en.wikipedia.org/wiki/Physicist) **discovered …………………….. and structure inside the atom, thereby demonstrating that the 'atom' was divisible.**
2. **An atom containing an ……………….. of protons and electrons is electrically neutral; otherwise it has a positive charge if there are fewer electrons or …………………… if there are more electrons.**
3. **Each element has at least one ……….. with unstable nuclei that can undergo** [**radioactive decay**](http://en.wikipedia.org/wiki/Radioactive_decay)**.**
4. **The electrons determine the …………………. of an element, and strongly influence an atom's** [**magnetic**](http://en.wikipedia.org/wiki/Magnetism) **properties.**
5. **Various atoms and molecules as depicted in** [**John Dalton**](http://en.wikipedia.org/wiki/John_Dalton)**'s A New System of …………………. (1808), one of the earliest scientific works on atomic theory.**
6. **In 1789, ……………….. and scientific researcher** [**Antoine Lavoisier**](http://en.wikipedia.org/wiki/Antoine_Lavoisier) **discovered the** [**law of conservation of mass**](http://en.wikipedia.org/wiki/Law_of_conservation_of_mass) **and defined an** [**element**](http://en.wikipedia.org/wiki/Chemical_element) **as a ……………….. that could not be further broken down by the methods of chemistry.**
7. **He proposed that each element consists of atoms of a single, unique type, and that these atoms can ………………. to form chemical compounds.**
8. **Common sense indicated they must be …………….., but nobody knew how small.**

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