**Substance**

**Chemical substances are often defined as "any material with a definite chemical composition" in most introductory general chemistry textbooks.According to this definition a chemical substance can either be a pure** [**chemical element**](http://en.wikipedia.org/wiki/Chemical_element) **or a pure chemical compound. But, there are exceptions to this definition; a pure substance can also be defined as a form of** [**matter**](http://en.wikipedia.org/wiki/Matter) **that has both definite composition and distinct properties. The** [**concept**](http://en.wikipedia.org/wiki/Concept) **of a "chemical substance" became firmly established in the late eighteenth century. Later with the advancement of methods for** [**chemical synthesis**](http://en.wikipedia.org/wiki/Chemical_synthesis) **particularly in the realm of** [**organic chemistry**](http://en.wikipedia.org/wiki/Organic_chemistry)**; the discovery of many more chemical elements and new techniques in the realm of** [**analytical chemistry**](http://en.wikipedia.org/wiki/Analytical_chemistry) **used for isolation and purification of elements and compounds from chemicals that led to the establishment of modern** [**chemistry**](http://en.wikipedia.org/wiki/Chemistry)**, the concept was defined as is found in most chemistry textbooks.**

**An** [**element**](http://en.wikipedia.org/wiki/Chemical_element) **is a chemical substance that is made up of a particular kind of atoms and hence cannot be broken down or transformed by a chemical reaction into a different element, though it can be transmitted into another element through a** [**nuclear reaction**](http://en.wikipedia.org/wiki/Nuclear_reaction)**. This is so, because all of the atoms in a sample of an element have the same number of protons, though they may be different** [**isotopes**](http://en.wikipedia.org/wiki/Isotope)**, with differing numbers of neutrons. There are about 120 known elements, about 80 of which are stable – that is, they do not change by** [**radioactive decay**](http://en.wikipedia.org/wiki/Radioactive_decay) **into other elements. However, the number of chemical substances that are elements can be more than 120, because some elements can occur as more than a single chemical substance.**

**A pure chemical compound is a chemical substance that is composed of a particular set of** [**molecules**](http://en.wikipedia.org/wiki/Molecule) **or** [**ions**](http://en.wikipedia.org/wiki/Ion)**. Two or more elements combined into one substance through a** [**chemical reaction**](http://en.wikipedia.org/wiki/Chemical_reaction) **form a** [**chemical compound**](http://en.wikipedia.org/wiki/Chemical_compound)**. All compounds are substances, but not all substances are compounds.A chemical compound can be either atoms** [**bonded**](http://en.wikipedia.org/wiki/Chemical_bond) **together in** [**molecules**](http://en.wikipedia.org/wiki/Molecule) **or** [**crystals**](http://en.wikipedia.org/wiki/Crystal) **in which atoms, molecules or ions form a** [**crystalline lattice**](http://en.wikipedia.org/wiki/Crystal_structure)**.**

**(انك- ف/7-31)**

**All matter consists of various elements and chemical compounds, but these are often intimately mixed together. Mixtures contain more than one chemical substance, and they do not have a fixed composition. In principle, they can be separated into the component substances by purely** [**mechanical**](http://en.wikipedia.org/wiki/Mechanics) **processes.**

**Within the chemical industry, manufactured "chemicals" are chemical substances, which can be classified by production volume into bulk chemicals,** [**fine chemicals**](http://en.wikipedia.org/wiki/Fine_chemical) **and chemicals found in research only.**

**Every chemical substance has one or more** [**systematic names**](http://en.wikipedia.org/wiki/Systematic_name)**, usually named according to the** [**IUPAC rules for naming**](http://en.wikipedia.org/wiki/IUPAC_nomenclature)**. An alternative system is used by the** [**Chemical Abstracts Service**](http://en.wikipedia.org/wiki/Chemical_Abstracts_Service) **(CAS).Many compounds are also known by their more common, simpler names, many of which predate the systematic name.**

**Exercises:**

1. **Answer the following questions:**
2. **What are often chemical substances defined?**
3. **When did the concept of chemical substance become firmly established?**
4. **What did the established of modern chemistry lead to?**
5. **Where is an element?**
6. **What is a pure chemical compound?**
7. **What are mixtures?**
8. **What is the useful of IUPAC?**
9. **Vocabulary:**

**CompositionAnalytical chemistry**

**Element Isotopes**

**Radioactive Lattice**

**Mixtures IUPAC**

**(انك- ف/7-32)**

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

**(**[**isotopes**](http://en.wikipedia.org/wiki/Isotope)**, radioactive,compounds, chemical compound, protons, manufactured,definite composition,systematic, elements,elements,production,substances, research)**

1. **All compounds are ……………, but not all substances are compounds.**
2. **All matter consists of various ………… and chemical compounds, but these are often intimately mixed together.**
3. **Within the chemical industry, …………….."chemicals" are chemical substances, which can be classified by …………. volume into bulk chemicals,** [**fine chemicals**](http://en.wikipedia.org/wiki/Fine_chemical) **and chemicals found in …………… only.**
4. **Many ………… are also known by their more common, simpler names, many of which predate the …………. name.**
5. **According to this definition a chemical substance can either be a pure** [**chemical element**](http://en.wikipedia.org/wiki/Chemical_element) **or a pure …………………...**
6. **This is so, because all of the atoms in a sample of an element have the same number of …………, though they may be different……….., with differing numbers of neutrons.**
7. **There are about 120 known ……….., about 80 of which are stable – that is, they do not change by** [**…………..decay**](http://en.wikipedia.org/wiki/Radioactive_decay) **into other elements.**
8. **A pure substance can also be defined as a form of** [**matter**](http://en.wikipedia.org/wiki/Matter) **that has both ………………….. and distinct properties.**

**PHENOMENA**

**The term came into its modern philosophical usage through** [**Immanuel Kant**](http://en.wikipedia.org/wiki/Immanuel_Kant)**. Phenomenon serves as interrelated technical terms in Kant's philosophy. Nowadays, "phenomena" are often, but not always, understood as 'appearances' or 'experiences'. The same phenomenon is** [**observed**](http://en.wikipedia.org/wiki/Observation) **as appearing differently. The combustion of a** [**match**](http://en.wikipedia.org/wiki/Match) **is an observable occurrence, or event, and therefore a phenomenon. In scientific usage, a phenomenon is any event that is observable, however commonplace it might be, even if it requires the use of instrumentation to observe, record, or compile data concerning it. For example, in** [**physics**](http://en.wikipedia.org/wiki/Physics)**, a phenomenon may be a feature of** [**matter**](http://en.wikipedia.org/wiki/Matter)**,** [**energy**](http://en.wikipedia.org/wiki/Energy)**, or** [**space-time**](http://en.wikipedia.org/wiki/Spacetime)**, such as** [**Isaac Newton**](http://en.wikipedia.org/wiki/Isaac_Newton)**'s observations of the** [**moon**](http://en.wikipedia.org/wiki/Moon)**'s orbit and of** [**gravity**](http://en.wikipedia.org/wiki/Universal_gravitation)**, or Galileo's observations of the motion of a** [**pendulum**](http://en.wikipedia.org/wiki/Pendulum)**.**

**A** [**mechanical phenomenon**](http://en.wikipedia.org/w/index.php?title=Mechanical_phenomenon&action=edit&redlink=1) **is the use of** [**applied mechanics**](http://en.wikipedia.org/wiki/Applied_mechanics) **to study the motion or equilibrium of objects related to a** [**physical phenomenon**](http://en.wikipedia.org/wiki/Physical_phenomenon)**.** [**Biomechanics**](http://en.wikipedia.org/wiki/Biomechanics) **is the study of the mechanics of living organisms; examples of biomechanics include the** [**mechanics of the digestive tract**](http://en.wikipedia.org/wiki/Mechanics_of_the_digestive_tract)**, the mechanics of** [**swallowing**](http://en.wikipedia.org/wiki/Swallowing)**,** [**animal locomotion**](http://en.wikipedia.org/wiki/Animal_locomotion)**.**

**Group phenomena concern the behavior of a particular group of individual entities, usually organisms and most especially people. The behavior of individuals often changes in a group setting in various ways, and a group may have its own behaviors not possible to an individual. Social Phenomena apply especially to organisms and people in that subjective state are implicit in the term. Attitudes and events particular to a group may have effects beyond the group, and either is adapted by the larger society, or seen as aberrant, being punished or shunned.**

**(انك- ف/6-28)**

**Paranormal is a general term that designates experiences that lie outside "the range of normal** [**experience**](http://en.wikipedia.org/wiki/Experience) **or** [**scientific explanation**](http://en.wikipedia.org/wiki/Scientific_explanation)**" or that indicates phenomena that are understood to be outside of science's current ability to explain or measure.Paranormal phenomena are distinct from certain hypothetical entities, such as** [**dark matter**](http://en.wikipedia.org/wiki/Dark_matter) **and** [**dark energy**](http://en.wikipedia.org/wiki/Dark_energy)**, only insofar as paranormal phenomena are inconsistent with the world as already understood through** [**empirical**](http://en.wikipedia.org/wiki/Empiricism) **observation coupled with** [**scientific methodology**](http://en.wikipedia.org/wiki/Scientific_method)**.**

**Thousands of stories relating to paranormal phenomena are found in** [**popular culture**](http://en.wikipedia.org/wiki/Popular_culture)**,** [**folklore**](http://en.wikipedia.org/wiki/Folklore)**, and the recollections of individual** [**subjects**](http://en.wikipedia.org/wiki/Subject_(philosophy))**. In contrast, the** [**scientific community**](http://en.wikipedia.org/wiki/Scientific_community)**, as referenced in statements made by organizations such as the** [**United States**](http://en.wikipedia.org/wiki/United_States)[**National Science Foundation**](http://en.wikipedia.org/wiki/National_Science_Foundation)**, maintains that scientific evidence does not support a variety of beliefs that have been characterized as paranormal.**

**Exercises:**

1. **Answer the following questions:**
2. **By whom did phenomena come?**
3. **Who can interpret the combustion of match?**
4. **What is a mechanical phenomenon?**
5. **Where is group and social phenomena?**
6. **What is paranormal?**
7. **Vocabulary:**

**paranormal**[**pendulum**](http://en.wikipedia.org/wiki/Pendulum)

**Social phenomena**[**folklore**](http://en.wikipedia.org/wiki/Folklore)

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

**(**[**Isaac Newton**](http://en.wikipedia.org/wiki/Isaac_Newton)**'s observations, mechanics,** [**popular culture**](http://en.wikipedia.org/wiki/Popular_culture)**,** [**swallowing**](http://en.wikipedia.org/wiki/Swallowing)**, differently,a group setting, distinct)**

1. **The same phenomenon is** [**observed**](http://en.wikipedia.org/wiki/Observation) **as appearing---------------.**
2. **For example, in** [**physics**](http://en.wikipedia.org/wiki/Physics)**, a phenomenon may be a feature of** [**matter**](http://en.wikipedia.org/wiki/Matter)**,** [**energy**](http://en.wikipedia.org/wiki/Energy)**, or** [**space-time**](http://en.wikipedia.org/wiki/Spacetime)**, such as ------------------------- of**

**(انك- ف/6-29)**

**the**[**moon**](http://en.wikipedia.org/wiki/Moon)**'s orbit and of** [**gravity**](http://en.wikipedia.org/wiki/Universal_gravitation)**, or Galileo's observations of the motion of a** [**pendulum**](http://en.wikipedia.org/wiki/Pendulum)**.**

1. [**Biomechanics**](http://en.wikipedia.org/wiki/Biomechanics) **is the study of the ------------ of living organisms; examples of biomechanics include the** [**mechanics of the digestive tract**](http://en.wikipedia.org/wiki/Mechanics_of_the_digestive_tract)**, the mechanics of -----------,** [**animal locomotion**](http://en.wikipedia.org/wiki/Animal_locomotion)**.**
2. **The behavior of individuals often changes in --------------------- in various ways, and a group may have its own behaviors not possible to an individual.**
3. **Paranormal phenomena are ---------- from certain hypothetical entities.**
4. **Thousands of stories relating to paranormal phenomena are found in-------------,** [**folklore**](http://en.wikipedia.org/wiki/Folklore)**, and the recollections of individual** [**subjects**](http://en.wikipedia.org/wiki/Subject_(philosophy))**.**

**THE UNIVERSE**

**The universe is commonly defined as everything that** [**exists**](http://simple.wikipedia.org/wiki/Existence)**. It includes all kinds of physical** [**matter**](http://simple.wikipedia.org/wiki/Matter) **and** [**energy**](http://simple.wikipedia.org/wiki/Energy)**, the** [**planets**](http://simple.wikipedia.org/wiki/Planet)**,** [**stars**](http://simple.wikipedia.org/wiki/Star)**,** [**galaxies**](http://simple.wikipedia.org/wiki/Galaxies)**, and all the contents of** [**space**](http://simple.wikipedia.org/wiki/Space)**. Earlier stages in the development of the universe can be seen at great distances.** [**Observations**](http://simple.wikipedia.org/wiki/Observation) **suggest that the universe has been governed by the same** [**physical laws**](http://simple.wikipedia.org/wiki/Physical_law) **and** [**constants**](http://simple.wikipedia.org/wiki/Constant) **throughout most of its extent and history.**

**In recorded history, various** [**cosmologies**](http://simple.wikipedia.org/wiki/Cosmology) **have been proposed to account for what people saw in the sky. Most early** [**models**](http://simple.wiktionary.org/wiki/model) **thought the Earth was the centre of the Universe. Some** [**ancient Greeks**](http://simple.wikipedia.org/wiki/Ancient_Greece) **thought that the Universe has infinite space and has existed forever. They thought it had a set of** [**spheres**](http://simple.wikipedia.org/wiki/Sphere) **which corresponded to the fixed stars, the** [**Sun**](http://simple.wikipedia.org/wiki/Sun) **and various** [**planets**](http://simple.wikipedia.org/wiki/Planet)**. The spheres circled about a spherical but unmoving** [**Earth**](http://simple.wikipedia.org/wiki/Earth)**.**

**The invention of the** [**telescope**](http://simple.wikipedia.org/wiki/Telescope) **in the** [**Netherlands**](http://simple.wikipedia.org/wiki/Netherlands)**, 1608, was a milestone in astronomy. By the mid-19th century they were good enough for other galaxies to be distinguished. The modern optical (uses visible light) telescope is still more advanced. Meanwhile, the** [**Newtonian**](http://simple.wikipedia.org/wiki/Isaac_Newton)[**dynamics**](http://simple.wikipedia.org/w/index.php?title=Dynamics&action=edit&redlink=1) **(**[**equations**](http://simple.wikipedia.org/wiki/Equation)**) showed how the** [**Solar System**](http://simple.wikipedia.org/wiki/Solar_System) **worked.**

**The word Universe comes from the** [**Old French**](http://simple.wikipedia.org/wiki/Old_French) **word Univers, which comes from the** [**Latin**](http://simple.wikipedia.org/wiki/Latin) **word universum. The Latin word was used by** [**Cicero**](http://simple.wikipedia.org/wiki/Cicero) **and later Latin authors in many of the same senses as the modern** [**English**](http://simple.wikipedia.org/wiki/English_language) **word are used.A different** [**interpretation**](http://simple.wiktionary.org/wiki/interpretation) **(way to interpret) of unvorsum is "everything rotated as one" or "everything rotated by one". This refers to an early Greek model of the Universe. In that model, all matter was in rotating spheres centered on the Earth; according to** [**Aristotle**](http://simple.wikipedia.org/wiki/Aristotle)**, the rotation of the outermost sphere was** [**responsible**](http://simple.wiktionary.org/wiki/responsible) **for the motion and change of everything within. It was natural for the Greeks to assume that the Earth was stationary and that the heavens rotated about the** [**Earth**](http://simple.wikipedia.org/wiki/Earth)**, because careful** [**astronomical**](http://simple.wikipedia.org/wiki/Astronomy) **and physical measurements (such as the** [**Foucault pendulum**](http://simple.wikipedia.org/wiki/Foucault_pendulum)**) are required to prove otherwise.**

**(انك- ف/5-25)**

**The Universe is huge and possibly infinite in volume. The matter which can be seen is spread over a space at least 93 billion** [**light years**](http://simple.wikipedia.org/wiki/Light_years) **across. For comparison, the diameter of a typical** [**galaxy**](http://simple.wikipedia.org/wiki/Galaxy) **is only 30,000 light-years, and the typical distance between two neighboring galaxies is only 3 million** [**light-years**](http://simple.wikipedia.org/wiki/Light-years)**. As an example, our** [**Milky Way**](http://simple.wikipedia.org/wiki/Milky_Way) **Galaxy is roughly 100,000 light years in diameter, and our nearest sister galaxy, the** [**Andromeda Galaxy**](http://simple.wikipedia.org/wiki/Andromeda_Galaxy)**, is located roughly 2.5 million light years away. There are probably more than 100 billion (1011)** [**galaxies**](http://simple.wikipedia.org/wiki/Galaxy) **in the observable universe. Typical galaxies range from dwarf galaxies with as few as ten million (107)** [**stars**](http://simple.wikipedia.org/wiki/Star) **up to giants with one** [**trillion**](http://simple.wikipedia.org/wiki/Trillion) **(1012) stars, all orbiting the galaxy's center of mass. Thus, a very rough estimate from these numbers would suggest there are around one sextillion (1021) stars in the observable universe; though a 2003 study by Australian National University astronomers resulted in a figure of 70 sextillion (7 x 1022). The universe is thought to be mostly made of** [**dark energy**](http://simple.wikipedia.org/wiki/Dark_energy) **and** [**dark matter**](http://simple.wikipedia.org/wiki/Dark_matter)**, both of which are not understood right now. Less than 5% of the universe is ordinary matter.The matter that can be seen is spread throughout the universe, when averaged over distances longer than 300 million light-years. However, on smaller length-scales, matter is observed to form 'clumps', many** [**atoms**](http://simple.wikipedia.org/wiki/Atoms) **are condensed into** [**stars**](http://simple.wikipedia.org/wiki/Star)**, most stars into galaxies, most galaxies into galaxy groups and clusters and, lastly, the largest-scale structures such as the** [**Great Wall of galaxies**](http://simple.wikipedia.org/w/index.php?title=Great_Wall_of_galaxies&action=edit&redlink=1)**.**

**Exercises:**

1. **Answer the following questions:**
2. **What is the Universe?**
3. **What are the observations suggest?**
4. **What was the ancient Greeks think about Universe?**
5. **Where the name of Universe came from?**
6. **What was the important invention in astronomy?**
7. **How much the diameter of our Milky Way galaxy is?**

**(انك- ف/5-26)**

1. **Vocabulary:**

**Planets Newtonian dynamics (equation)**

**Galaxy Solar System**

**Telescope Dwarf Galaxy**

**Astronomy**

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

**(astronomy, observations, telescope, energy, typical galaxy, dark energy, Cicero, infinite)**

1. **It includes all kinds of physical matters and ---------?**
2. **---------- suggest that the Universe has been governed by the same physical laws?**
3. **The invention of the ----------- in the Netherlands was a milestone in ----------?**
4. **The Universe is huge and possibly ----------- in volume?**
5. **The Latin word was used by ----------- and later Latin authors in many of the same senses as the modern English word are used?**
6. **The Universe is thought to be mostly mad of ---------- and dark matter?**
7. **The diameter of a ------------ is only 30,000 light years?**

**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 chargedemitting photons**

**Absorbing magnetic properties**

**Atomic hypothesisnobleman**

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.**