**المرحلة الثانية / فيزياء المحاضرة السابعة E-Terminology قسم العلوم**

**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:**

**Composition Analytical 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.**

