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

**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?**