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UKQF2172-01 ASTRONOMI (ASTRONOMY)

## INDIVIDUAL ASSIGNMENT

TOPIC:
INTRODUCTION TO ASTRONOMY AND SOLAR SYSTEM

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INTRODUCTION TO ASTRONOMY AND SOLAR SYSTEM

This assignment is going to talk about astronomy and the solar system. Here I am going to talk about what is astronomy and solar system. The entire assignment we will discuss the definition of astronomy and explore the solar system.

Mankind has looked up to the heavens since the start of civilization. There are a group of people like the astronomers focus their studies on searching the meaning and understanding the universe that we live. According to The National Aeronautics and Space Administration (NASA), astronomy is the study of stars, planets and space. So basically, astronomy is a [natural science](https://en.wikipedia.org/wiki/Natural_science) that studies [celestial objects](https://en.wikipedia.org/wiki/Astronomical_object) and [phenomena](https://en.wikipedia.org/wiki/Celestial_event). It involves the uses of mathematics, physics, chemistry to explain the origins and evolution of the celestial objects.

ASTRONOMY

The study of astronomy is really important as it has great practical meaning for our lives and it gives a great influence to human's view of nature. Ancient astronomers successfully determined the time, direction, and calendar by observing the changes of the sun, moon, and other celestial bodies and celestial phenomena, which seem to be the beginning of astrometry and it is a great achievement of astronomy. So, through the evidences of humans’ observation on celestial bodies and the record of celestial phenomena, the history of astronomy has been at least five or six thousand years old.

Astronomy occupies a very important position in the early history of human civilization. The pyramids in Egypt and Stonehenge in Europe are all famous prehistoric astronomical sites. Monuments such as the [Great Pyramids of Giza](https://www.independent.co.uk/topic/pyramids) and [Stonehenge](https://www.independent.co.uk/topic/Stonehenge) seem to be aligned with precision to cardinal points or the positions where the moon, sun or stars rise and set on the horizon.

According to Nola Taylor Redd, who is an astronomy lover with a Bachelor’s degree in Astrophysics, astronomy and astrology were historically associated, but [astrology is not a science](https://www.livescience.com/4667-astrological-sign.html) and is no longer recognized as having anything to do with astronomy. So, we will discuss about the history of astronomy and related fields of study.

Early astronomy was focused to the development of bright celestial bodies that were visible from the earth, especially the sun, moon, stars, and planets which are visible through our naked eye. The best example of the achievement during early astronomical research is the annual change in the position of the sun on the horizon in the stars, which can be used to establish agricultural ceremonies or calendars. Besides, astronomical data is used by some cultures for predictions in astrology. Ancient astronomers were able to distinguish between stars and planets in the olden days.

So, historically astronomy has focused on observations of heavenly bodies. It is a close cousin to astrophysics. Succinctly put, astrophysics involves the study of the physics of astronomy and concentrates on the behaviour, properties and motion of objects out there. However, modern astronomy includes many elements of the motions and characteristics of these bodies. Therefore, there are still differences between these two terms.

I have been reading the article from Nola Taylor Redd and there is some information about the modern astronomers. Modern astronomers tend to fall into two fields: the theoretical and the observational.

* Observational astronomers:

focus on direct study of stars, planets, galaxies, and so forth.

* Theoretical astronomers:

Unlike most other fields of science, astronomers are unable to observe a system they want to research entirely from birth to death. Therefore, astronomers must rely on snapshots of bodies in various stages of evolution to determine how they formed, evolved and died. Thus, theoretical and observational astronomy tend to blend together, as theoretical scientists use the information actually collected to create simulations, while the observations serve to confirm the models — or to indicate the need for tweaking them.

With the development of astronomy, the detection range of humans has reached about 10 billion light-years from the stars in the sun, moon, and sky. Astronomy is broken down into a number of subfields, allowing scientists to specialize in particular objects and phenomena. As there are too many subfields and branches of astronomy, so I will just mention a few of them.

1. Planetary science

The study of planets,moons and planetery systems. focus on the growth and evolution of planets in the planetary system, satellites orbiting the planet, and a large number of small celestial bodies, such as asteroids, comets, meteors, and interplanetary matter.

1. Stellar astronomy

Now that hundreds of millions of stars have been observed, the sun is just a very common one among countless stars. Stellar astronomy is concerned with [Star formation](https://en.wikipedia.org/wiki/Star_formation), physical properties, [main sequence](https://en.wikipedia.org/wiki/Main_sequence) life span, [variability](https://en.wikipedia.org/wiki/Variable_star), [stellar evolution](https://en.wikipedia.org/wiki/Stellar_evolution) and extinction.

1. Galactic astronomy

Galactical astronomy deals with the structure and components of our galaxy and the other galaxies. The solar system where humans live is just a corner of a galaxy made up of countless stars. The Milky Way is just an ordinary galaxy. In addition to the Milky Way, there are many extragalactic galaxies. Galaxies further form larger celestial systems, clusters of galaxies, clusters of galaxies and superclusters.

1. Physical cosmology

An origin and evolution of the universe as a whole. The study of cosmology is theoretical astrophysics at its largest scale.

SOLAR SYSTEM

The Solar System is the [gravitationally](https://en.wikipedia.org/wiki/Gravity) bound system of the [Sun](https://en.wikipedia.org/wiki/Sun) and the objects that orbit it, either directly or indirectly. Of the objects that orbit the Sun directly, the largest are the [eight planets](https://en.wikipedia.org/wiki/List_of_gravitationally_rounded_objects_of_the_Solar_System#Planets), with the remainder being smaller objects, the [dwarf planets](https://en.wikipedia.org/wiki/Dwarf_planet) and [small Solar System bodies](https://en.wikipedia.org/wiki/Small_Solar_System_bodies). Of the objects that orbit the Sun indirectly—the [moons](https://en.wikipedia.org/wiki/Natural_satellite)—two are larger than the smallest planet, [Mercury](https://en.wikipedia.org/wiki/Mercury_%28planet%29). Another definition of solar system is a celestial body system around the surrounding planets, satellites, asteroids, and comets with its massive gravity that maintains its surroundings.

The sun is located about 27,000 light-years away from the centre of the Milky Way and 23,000 light-years away from the edge. The Milky Way is about 100,000 light-years in diameter and contains 150 billion stars. And the Sun is just one of them. The sun moves around the galaxy at a speed of 250 kilometres per second, orbiting the whole circle for about 250 million years, and the earth's climate and the entire natural world also undergo periodic changes of 250 million years.

The solar system includes the sun, 8 planets, 67 satellites, and at least 500,000 asteroids, as well as dwarf planets and a small number of comets. According to NASA, there are more planets than stars in our galaxy. The current count planets are 8. If Neptune is used as the boundary of the solar system, the diameter of the solar system is 60 astronomical units, or about 9 billion kilometres. If the comet's orbit is included, the diameter of the solar system can reach 60-80,000 astronomical units, or 0.9-1.2 trillion kilometres. The 8 planets are such that the inner, rocky planets are [Mercury](https://solarsystem.nasa.gov/planets/mercury/overview/), [Venus](https://solarsystem.nasa.gov/planets/venus/overview/), [Earth](https://solarsystem.nasa.gov/planets/earth/overview/) and [Mars](https://solarsystem.nasa.gov/planets/mars/overview/). The outer planets are gas giants [Jupiter](https://solarsystem.nasa.gov/planets/jupiter/overview/) and [Saturn](https://solarsystem.nasa.gov/planets/saturn/overview/) and ice giants [Uranus](https://solarsystem.nasa.gov/planets/uranus/overview/) and [Neptune](https://solarsystem.nasa.gov/planets/neptune/overview/). Beyond Neptune, a newer class of smaller worlds called dwarf Planets reign, including perennial favourite Pluto.

THE SUN

The Sun is located in the centre of the solar system. The sun is a hot glowing ball, which a huge thermonuclear reaction is constantly going on in its interior. The surface temperature of the sun is as high as 6000K, and the central temperature is as high as 15 million K. The sun is a medium-sized star with a diameter of about 1.4 million kilometres, which is equivalent to 109 times the diameter of the earth, with a variable area of ​​about 12,000 times the earth, about 1.3 million times of volume of the earth and a mass of about 1.989 × 1027 tons, which is 33,000 times that of the earth! With that much of huge number, it accounts for 99.86% of the mass of the entire solar system! The density of the visible part of the outer layer is about one millionth of the density of water, the density of the central part is 85 times greater than the density of water, and the average density is 1.4g / cm3, which is about one quarter of the density of the earth.

The sun maintains the surrounding planets, moon, asteroids, and comets orbiting with its great gravity. The movement of planets and moon around the sun in the solar system has the following common characteristics:

1. The orbital eccentricity of all planets is very small, almost all the orbitals are close to be a circle.
2. Each planet's orbital surface is approximately on a plane, and it is not inclined to the earth's orbital surface or the ecliptic surface.
3. All planets revolve around the sun from west to east. Except for Venus and Uranus, the directions of rotation of the other planets also go from west to east, that is, the same direction as the revolution.
4. Except for Uranus, the tilt of the planet's equator to the orbital surface is relatively small.
5. The orbits of most satellites are approximately circular, and their orbital surfaces are relatively close to the equatorial plane of the parent star.
6. Most of the satellites, including Saturn's rings, have the same rotation direction as the parent star.

PLANETS

Planets are celestial bodies that move around the solar system and reflect sunlight without emitting light. Since 1930, people have been accustomed to the saying that there are nine planets in the solar system. On August 2006, the 26th General Assembly for the International Astronomical Union held in Prague, Czech Republic. has changed this situation. The conference believes that the planets of the solar system must meet three conditions:

1. Under the premise of orbiting the sun, the planet is able to clear other celestial bodies which near its orbit and become the largest celestial body in its space;
2. A planet must have enough mass to be able to rely on its own gravity to make it into an approximately spherical shape.
3. There is no nuclear fusion reaction inside the planet.

Therefore, the result of the conference was confirmed that the solar system has only eight planets, which include Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.

Among the eight planets, Neptune is the furthest away from the sun, at a distance of about 2.8 billion miles (4.5 billion kilometres), which is about 30 astronomical units (AU). If Neptune is used as the boundary of the solar system, the diameter of the solar system is 60 astronomical units (AU), which is about 9 billion kilometres. If the orbit of a comet is included, the diameter of the solar system can reach 60-80,000 astronomical units, or 0.9-1.2 trillion kilometres.

MERCURY

Mercury has an equatorial radius of 2440 kilometres, a density of 5.43 grams per cubic centimetre, a mass of only 5.53% of the Earth, and a semi-major axis of orbit of 57.91 million kilometres, which is equivalent to 0.38 astronomical units, thus becoming the middle distance of the solar system. Mercury is the closest planet to the Sun, which has an average revolution speed of about 48 kilometres per second. It is the fastest planet in the solar system, with a revolution period of about 88 days. Mercury has a molten iron core with a radius of 1800-1900 kilometres; the surface has a mantle and crust of 500-600 kilometres thick composed of silicate. The surface is covered with craters and craters, and there are also basins with a diameter of 1300 kilometres. The air is extremely thin, mainly composed of hydrogen (42%), sodium (42%) and oxygen (15%). The temperature difference between day and night is extremely large, the day can reach 427 degrees Celsius, and the night can drop to minus 173 degrees Celsius, which is the planet with the largest temperature difference in the solar system. Therefore, human beings can never be live in this planet.

VENUS

Venus has an equatorial radius of 6073 kilometres, which is 95% of the Earth's equatorial radius; and its mass is about 81.5% of the earth; its semi-major axis is 10.820.9 million kilometres, which is equivalent to 0.72 astronomical units. Venus is the only planet whose rotation direction is opposite to the revolution direction. The revolution period is only 224.701 days, and the rotation period is as long as 243.02 days, it is interesting which means that the "one day" of Venus is longer than "one year". 70% of the surface of Venus is a plain, 20% is a marsh, and about 10% is a highland, but the highest peak can reach 11270 meters, and 85% of the surface is covered by karst (basalt). There are at least 100,000 volcanoes have been found in Venus. The surface atmosphere is absolutely dominated by carbon dioxide (about 97%), the surface temperature exceeds 400 degrees Celsius, the atmospheric density is 100 times the density of the earth ’s atmosphere, and the atmospheric pressure is about 90 times the earth ’s surface, or equivalent to returning the earth ’s ocean to a depth of 1,000 meters pressure. In addition to the dense atmosphere, there is a cloud of concentrated sulfuric acid up to 20 to 30 kilometres thick. There is an iron core with a diameter of 3000 kilometres inside Venus, and a thick and hard shell on the surface. Venus has no magnetic field, no moons, no liquid water on the surface, and of course there can be no life. There are still controversy about whether there has ever been life or even advanced creatures before in this "the hell planet of the solar system".

EARTH

Earth is a spheroid planet. The equatorial radius is 6378 kilometres, and the polar radius is 6357 kilometres. It is the largest and highest density among terrestrial planets, and is also known as the only planet that has life in the universe. Earth has a unique hydrosphere and observed plate structure among terrestrial planets. The atmosphere of the earth is also completely different from other planets. It is transformed by living organisms to contain 21% free oxygen. It has only one natural satellite (the Moon), where the Moon is an astronomical body orbiting Earth as its only natural satellite. The revolution of the earth (the sun) is about 365 days. In early January of each year, the earth and the sun are closest, with a distance of about 147.1 million meters. This position is the perihelion. In early July, the earth was farthest from the sun, with a distance of about 152.1 million meters. This position is the apocalyptic point. The average distance between the sun and the earth is 149.6 million meters, and this number is determined to be an astronomical unit

MARS

Mars has many similarities with the Earth. It is much smaller than the Earth. The equatorial radius is only 3397.2 kilometres, the mass is only 11% of the Earth, and the semi-major axis of the revolution orbit is 1.5237 astronomical units. The revolution period, "one year", is 686.98 days, and the stellar day length is 24 hours and 37 minutes. There are also crusts, mantles, and cores inside Mars, while the surface has deserts, dry river beds, a huge valley (Sailor Canyon) with a length of 4000 kilometres and a depth of about 8 kilometres, and a very large volcano (Olin Mount Pies). The Martian atmosphere is dominated by carbon dioxide, and the atmospheric density is only 1% of the Earth ’s atmospheric density, which makes Mars often in a low temperature state. The average surface temperature is only minus 63 degrees Celsius, and the lowest temperature is minus 123 degrees Celsius.

JUPITER

Jupiter is the largest planet in the solar system. Its equatorial radius is 71492 kilometres, which is 11.2 times that of the earth. Its volume and mass are 1316 times and 318 times that of the earth. Its mass is also the total mass of other planets. 2.5 times. The polar radius is 5,000 kilometres shorter than the equatorial radius, and the star is obviously oblate. Jupiter may have an iron and silicon core with a temperature of up to 30,000 degrees Celsius, but the surface is gaseous, mainly composed of 80% hydrogen, 18% helium, and trace amounts of methane, ammonia, carbon, oxygen, etc. The surface temperature of Jupiter is very low, only minus 148 ℃. The semi-major axis of the orbit is 5.2 astronomical units, and it takes 11.86 years to revolve around the day, but the rotation speed is very fast, and the stellar day length is only 9 hours and 50 minutes. Jupiter has many other striking features. It is second only to Venus in the brightness of the planets of the solar system, while the magnetic field is extremely strong, and the intensity is 10 times that of the earth's magnetic field. The surface is a spot-like structure, and one of the oval-shaped red spots is 30,000 kilometres long and wide 12000 kilometres, and it is huge enough to hold a several earths.

SATURN

Saturn has an equatorial radius of 60,000 kilometres, 9.5 times the radius of the earth, and 745 times the volume of the earth. Due to its low density (0.7 g / cm3), its mass is only 95.18 times that of the earth. The polar radius is 5280 kilometres shorter than the equatorial radius, which indicates that Saturn is a flat sphere. The semi-major axis of the orbit is 9.539 astronomical units, the stellar day is 10 hours and 14 minutes, and the revolution period is 29.458 years. Inside, there is a rock core with a diameter of 2000 kilometres. From this core, the metal shell and molecular hydrogen with an ice shell of 5000 kilometres thick and hydrogen with a thickness of 8000 kilometres are in turn. Therefore, it is regarded as a liquid planet like Jupiter. The surface temperature of Saturn is about minus 140 degrees Celsius. Because the sun is far away, it is very cold even in summer, but the atmosphere is relatively calm.

URANUS

Uranus has an equatorial radius of 25,559 kilometres, 4 times that of the earth, and 65 times the volume; because the density is only 1.24 grams per cubic centimetre, the mass is only 14.63 times that of the earth, which is the lightest Wood-like planet. The semi-major axis of Uranus' orbit is 19.218 astronomical units, and the revolution period exceeds 84. The inclination of the orbit to the ecliptic plane is only 0 ° 46 ′, the autobiographical axis is also approximately parallel to the ecliptic plane, and the inclination of the equator to the orbit is 97 ° 53 ′. All of these are unique in the solar system planets: the stars are about 16 hours and 48 minutes long, but only the areas between 8 ° north and south latitudes have diurnal changes due to rotation. Areas above 8 ° latitudes take 21 years. It is a cycle and is in a long day or long night state, respectively.

NEPTUNE

Neptune is a typical gaseous planet. Although it has a stony core similar in mass to the earth, it is mainly composed of ice shells and gas. The equatorial radius is 24,766 kilometres, close to 4 times the Earth's equatorial radius, the volume is 57 times that of the Earth, and the mass is 17.22 times that of the Earth. The semi-major axis of the orbit is 30.0579 astronomical units, thus becoming the planet farthest from the Sun. The angle between the track surface and the ecliptic surface is also very small, less than 2 °. The atmosphere is mainly composed of hydrogen and helium, and there is also a small amount of methane. The atmosphere changes frequently, with many cyclones and large storms, and the maximum storm speed can reach 2000 kilometres per hour. The magnetic field deviates from the centre of the star. Because it is too far from the sun, the intensity of sunlight per unit area is only 9% of that of the earth, so the surface temperature is often below minus 200 degrees Celsius.

COMET

Comet is a type of celestial body that moves around the sun under gravitational force and is a member of the solar system. Most comets that can be seen with the naked eye are composed of comet nuclei, coma, Haiyan, and comet tail. The nucleus is near spherical, which is a dense and bright part of the comet's head, composed of ice, methane, ammonia, and dust. There are a lot of misunderstandings about comets, which has long made comets a symbol of some kind of disaster. In modern times, some people worry that comets may collide with the earth, move the earth's pole, change the speed of the earth's movement, and cause huge tides and global flooding. They even thought that the poisonous gas scanned by the nucleus of comet might pollute the atmosphere. In fact, the probability of the comet nucleus colliding with the earth is only once every ten million years, and even if it collides, it is unlikely to cause a catastrophe. As for comet sweeping the earth, it has happened countless times. Its cynide group and carbon monoxide have negligible pollution to the earth ’s upper atmosphere. It is far less than the pollution of factory exhaust and vehicle’s exhaust to the city.

SATELLITE

In the solar system, all planets have natural satellites except Mercury and Venus. Since 2006, Jupiter and Saturn have as many as 69 and 62 satellites respectively, and Uranus and Neptune have 27 and 13 satellites respectively. There are many types of satellites, and the size difference is huge.

 In the above text I have discussed about what astronomy actually is and what components are in a solar system. So, it is important for us to know more about the world we live in. There might be person asking is it important to learn astronomy. The answer is YES! Astronomers persist to seek the answer to satisfy our fundamental curiosity about the world and universe that we live in. And because of their achievements, we can now see further than ever before.

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