

Please note that although suggested answers are provided here, they may not be fully accurate. Sorry for the troubles

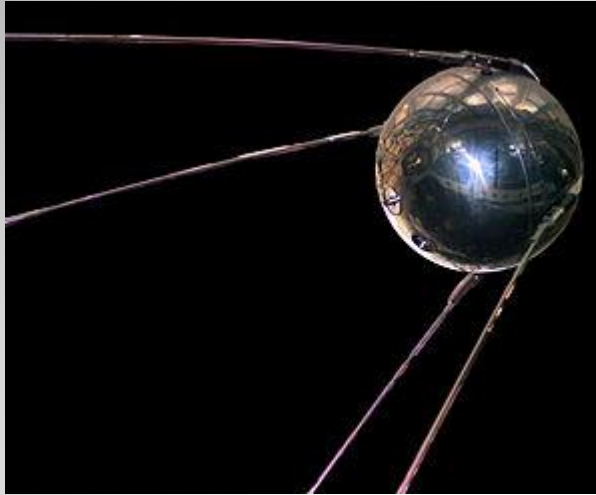
GAL **A** **C** **S** 4

Buzzer Round



Rules

- A school will choose a question
- The question will be read out.
- Teams can buzz in after the buzzer has sounded.
- The question is opened for any team to answer.
- Any team that buzzes in for the question will be assessed on a scale of +40 and -20
- Judges discretion about whether to reopen a question.



What year was Sputnik
launched in?

Sputnick 1: 1957 (4th
October)

Sputnick 2: 1957 (3rd
November)

Sputnick 3: 1958 (15th
May)

(Any one)



What makes a meteor glow?

Meteors are tiny bits of rock from space. They enter our atmosphere at speeds up to 71 km/s. They glow because friction with air molecules heats them to incandescence.

What is the reason
behind Io being so
geologically active,
even though it is so far
away from the Sun?

Tidal forces due to Jupiter, and the other Galilean Moons.



Why is Mars red?

Because of the
presence of Iron oxide
on its surface.

Which observation did Galileo Galilee make, which most strongly convinced him that the solar system was heliocentric and not geocentric?

The phases of Venus. The heliocentric model strongly supports the observations of phases (like the moon's phases) in Venus. When observed, Galileo was convinced that our solar system was heliocentric.

What was the biggest
flaw in Copernicus's
Model of the solar
system?

He assumed that even
the stars orbit the Sun.

What is the harmony of
the spheres?

It was Pythagoras' theory to explain the motion of the stars and planets.

It predicts that all planets exist in separate spheres going around the Earth, and that all the stars were in a sphere of their own.



How was the Twin
Paradox resolved?
(Qualitative Answer only)

When the travelling twin (in reference of the Earth) turns around, he will undergo acceleration.

However the same argument cannot be applied to the Earth, thus Earth will remain in an inertial frame of reference.

Since there is no symmetry, it is not paradoxical if one twin is younger than the other.

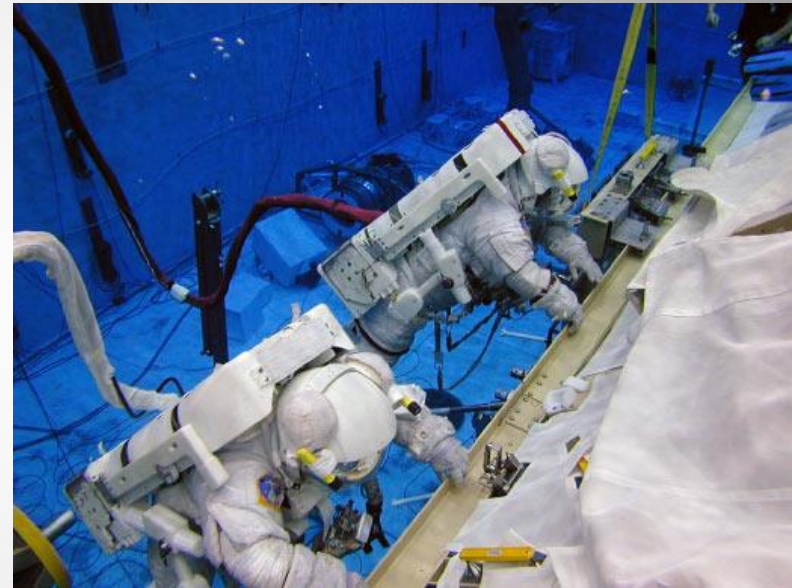
The Roche limit of an object characterizes a distance beyond which objects will collapse into smaller fragments. This distance is approximately 2.5 times the radius of the central body. Consider the Earth. We humans live on the surface of the Earth, well within the Roche limit. **Why do we not break down in to smaller pieces?**

A fundamental assumption when considering the radius of the Roche limit is that the object that is to be broken is held together with nothing but gravity. This is not the case for any of us and practically any other object within the Roche limit of the Earth.

What is an “Einstein Ring” and how does it form?

Einstein ring is the bending of the light from a source (such as a galaxy or star) into a ring through gravitational lensing of the source's light by an object with an extremely large mass (such as another galaxy, or a black hole). This occurs when the source, lens and observer are all aligned.

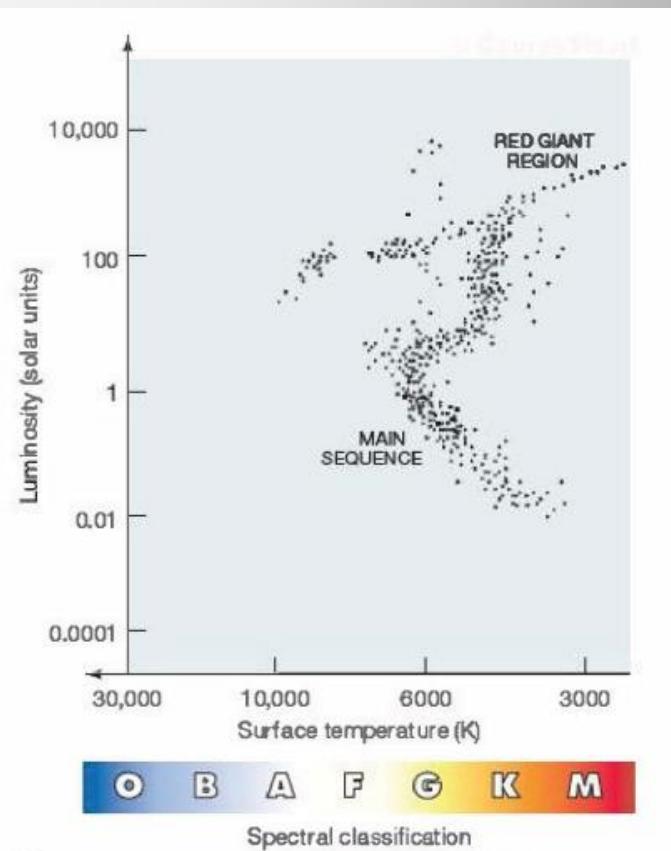
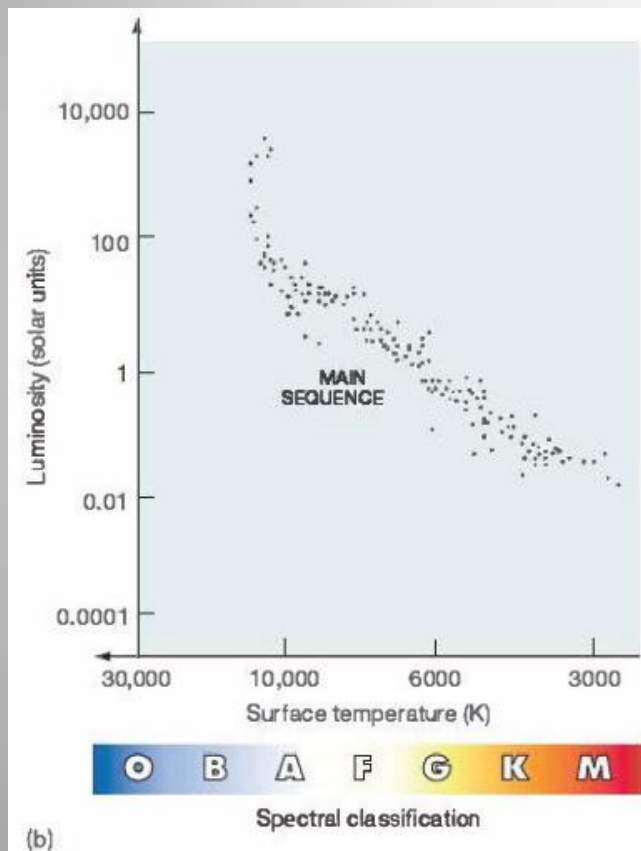
In NASA's Neutral Buoyancy Tank (NBT), there are several safety divers. Why are the divers not allowed to swim underneath the astronauts?



If they were to swim under the astronauts, the bubbles they let go of may get trapped under the astronaut. Thus they will not be neutrally buoyant. If they are not buoyant, the purpose of the neutral buoyancy tank is lost.



Identify the globular and open cluster in the two HR Diagrams. Explain your choice.



Left is Open, Right is Globular

Open Clusters generally have less stars
 Open Clusters have a wider range of
 types of stars (stars in different spectral
 classes)

The evolution of stars can be clearly
 seen in globular clusters

Groups of stars are seen more clearly in
 globular clusters

Globular clusters are (much) older
 (have a lower turn-off point)

I observe that the moon rises at sunset and sets at sunrise. What is phase is the moon in currently.

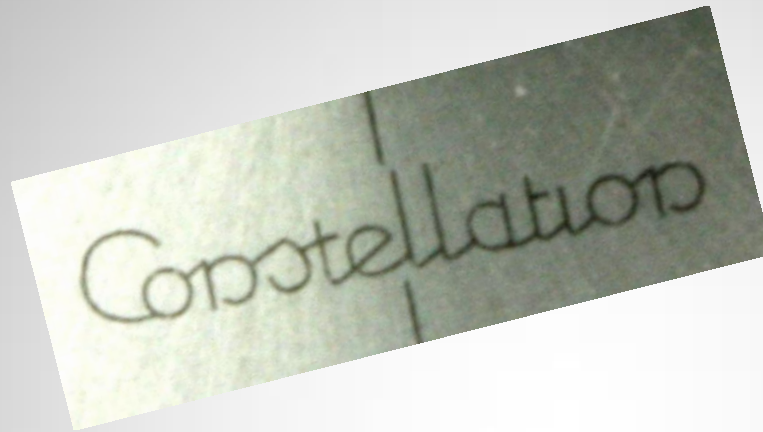
Full Moon

Identify:



Armillary Sphere





State two different definitions of the word “constellation”

1. An area of the celestial sphere, which may also contain an asterism
2. A group of satellites moving in synchronization, along the same or a similar path.

Why does the planet
Venus not have any
seasons.

Because its axial tilt is not significant enough to cause seasons.

In this equation:

$$F = I_{sp} \dot{m} g$$

F is the thrust force by a rocket.

Explain all other variables.



I_{sp} is the specific impulse (s)
 \dot{m} is the mass flow rate in
 kg/s
 And g is the acceleration
 due to gravity at the
 Earth's Surface.

The Cosmological Microwave Background Radiation is a tool astronomers use to measure the beginning of the observable universe. They are looking for the fluctuations in this map. **What caused those fluctuations**, by the theory that is most widely accepted today.

Quantum fluctuations

Which dwarf planet, discovered in 2005, is named after the Greek goddess of strife and discord?



Eris

Why was Dark Matter
crucial to the formation
of celestial structures like
galaxies?

In the beginning, both dark matter and normal matter were homogeneously spread. Due to quantum fluctuations, dark matter started to clump. This induced normal matter to clump and allowed the universe to form various celestial structures.

When do the Orionids
(meteor shower) occur?



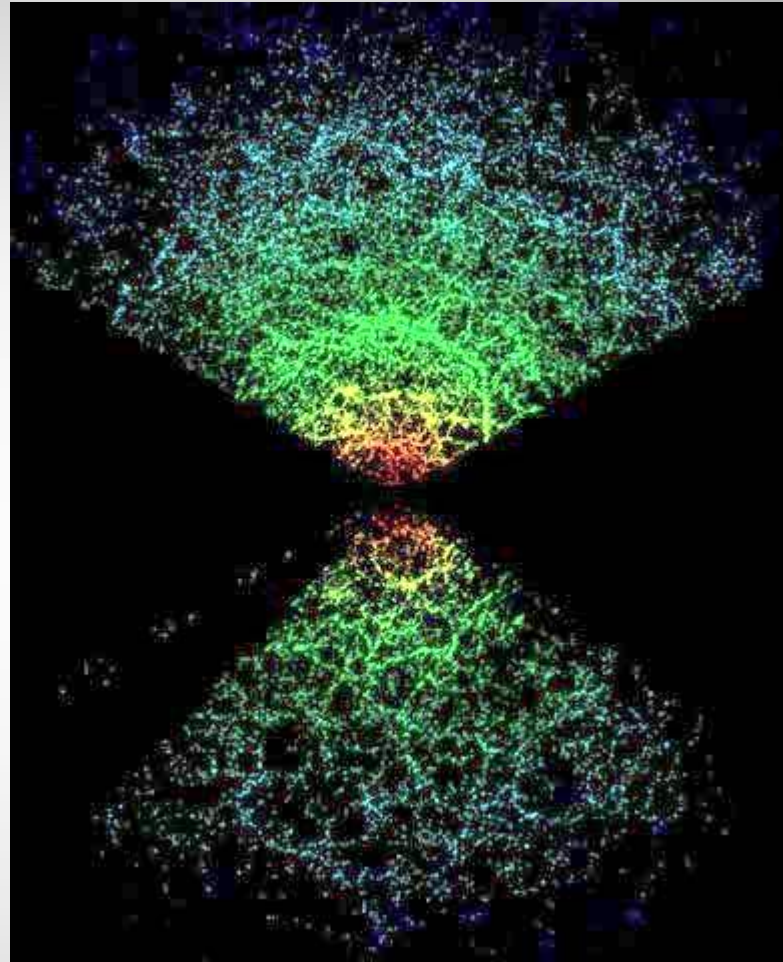
October

Peak Date: 21st October

When did the first stable
hydrogen atoms
formed?

Approximately 377,000
years after the big bang.

The SLOAN digital Sky survey is shaped like a sand clock. Explain why this is so, even though it should be looking all the way around the Earth.

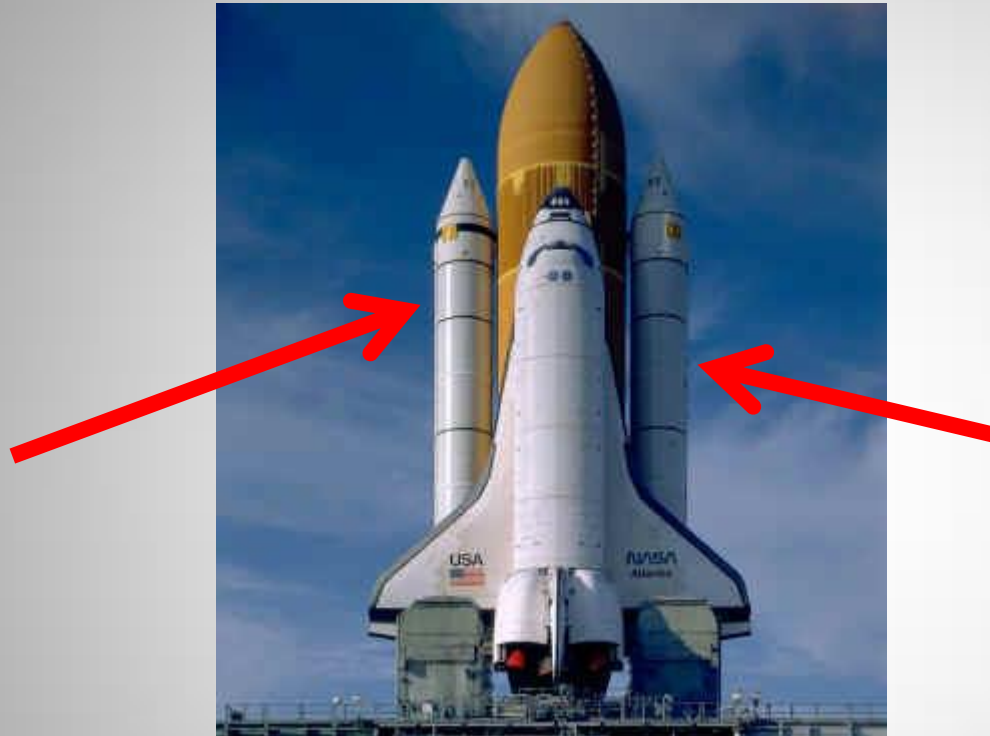


The portions that have not been included here are due to the milky way galaxy. The digital sky survey looks at regions above and below the milky way plane.

Explain how we deduce the presence and measure the mass of a supermassive black hole in the centre of a galaxy.

Doppler shift measurements
These suggest an extremely high velocity at the center of the galaxy, which implies a very high mass object. From the distances and the velocity the mass of the black hole can be estimated.

Also direct observation of stars



What fuel does this type of this rocket use?

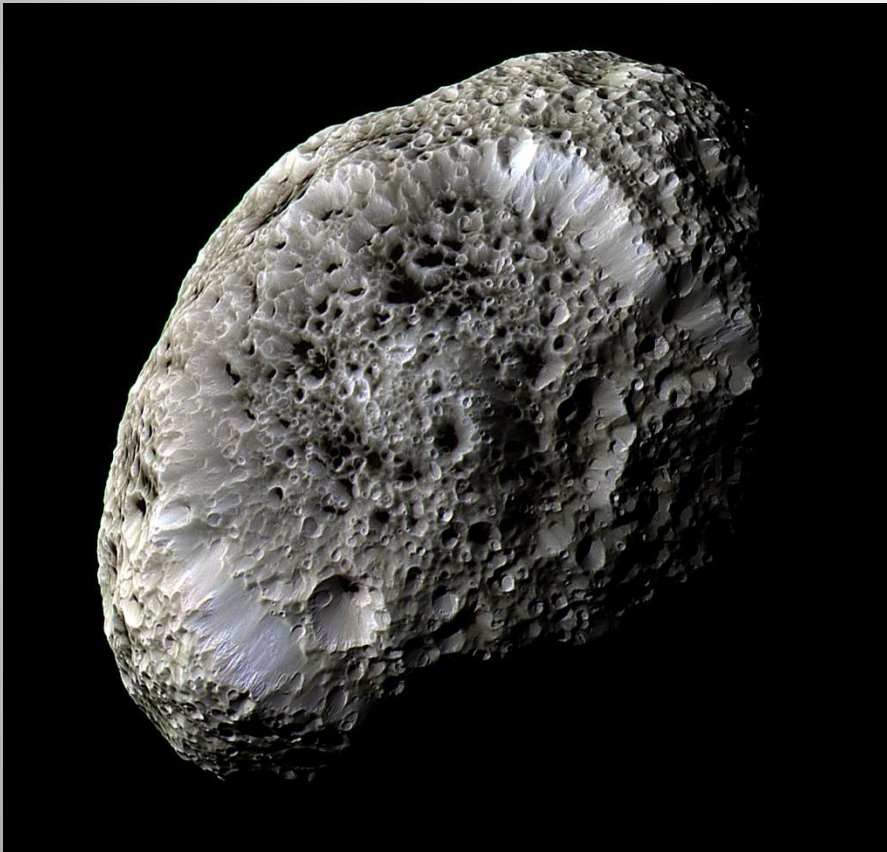
Solid Rocket Fuel

The Molniya orbit has an orbital inclination of 63.4 degrees. What was its use during the cold war?

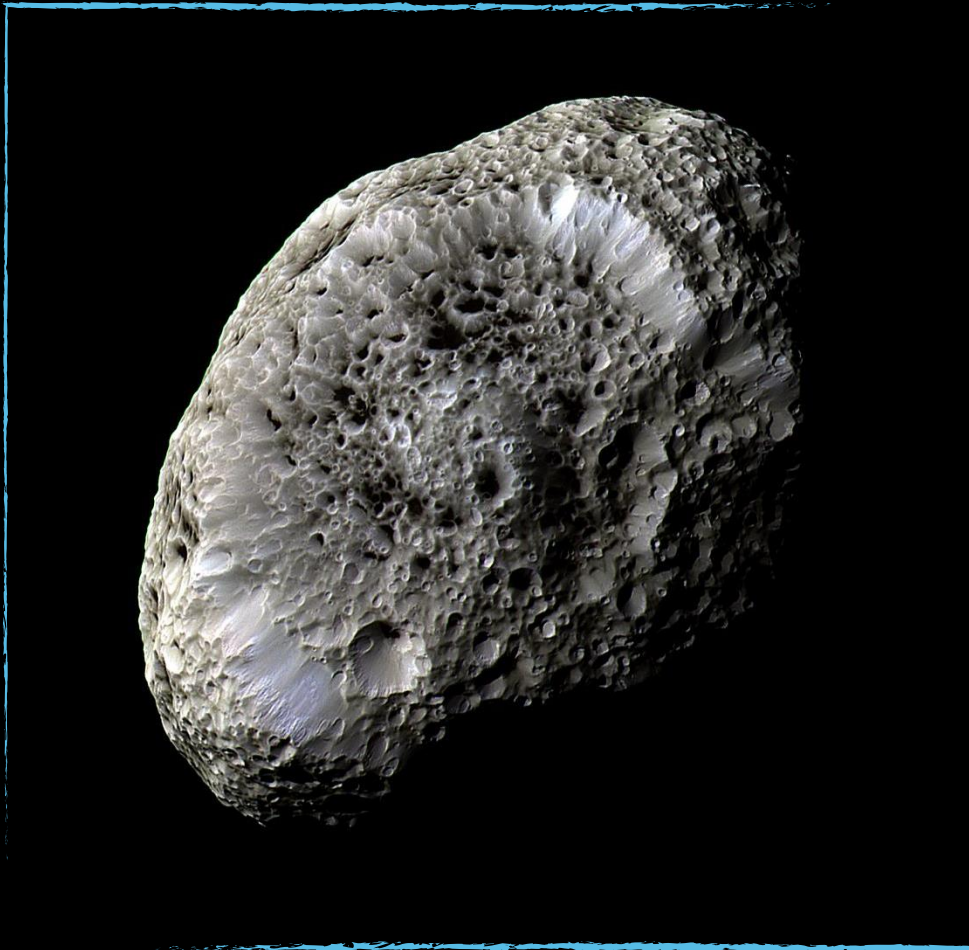
Orbital Inclination: 63.4 degrees.

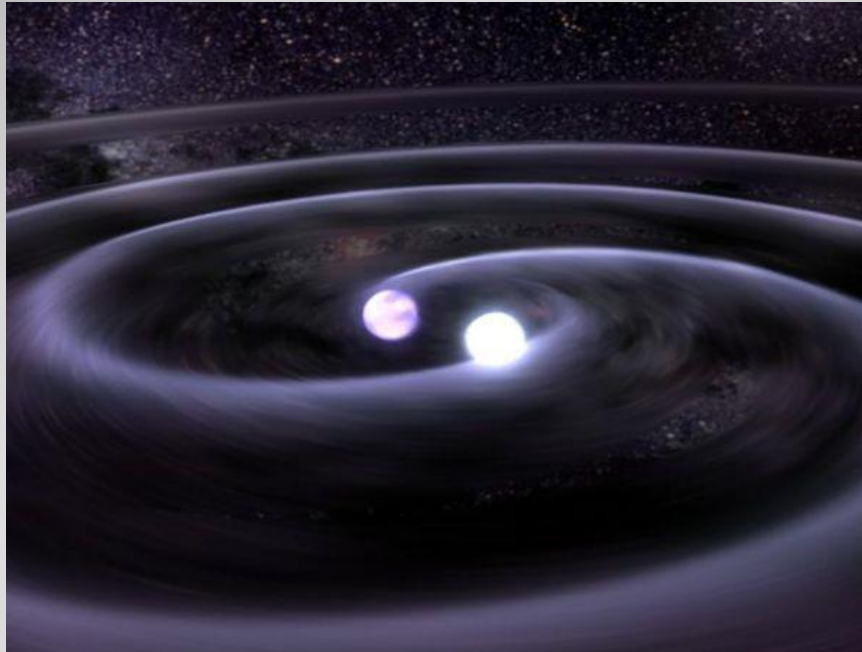
Advantages: This HEO satellite spends most of its time over 2 super powers of the cold war, the Soviet Union and the United States of America. Both used this orbit with spy satellites to spy on the the other country.

Identify:



Hyperion





What is the maximum mass of a white dwarf star?

1.44 solar masses

What are the three most important aspects to choosing a telescope?

Focal Length Aperture Cost

How does magnetism
hinder stellar formation?

The magnetic field lines will cause contraction to occur in the direction of the magnetic field lines and not much in the perpendicular direction. This will cause distorted shapes to be formed.

Identify:



Dragon Space Ship by Space X



The number of visual and eclipsing binaries as compared to spectroscopic binaries varies significantly. Why is this?

Visual binaries have to be almost perpendicular to sight from Earth, and eclipsing binaries have to be parallel to sight from Earth. By contrast, spectroscopic binaries can be at nearly any angle.

It is much harder and takes much longer to detect visual and eclipsing binaries. Finding spectroscopic binaries is relatively easier. This will cause the numbers to vary significantly.

Visual binaries have to be close enough to Earth for them to be resolved by telescopes. Thus it is much harder.

Do stars evolve along
the main sequence?

Usually, No
They fall onto the main
sequence but usually
they stay there, and not
move up/down

What is meant by the
local group in
astronomy?

It is a group of galaxies in the “vicinity” and includes the Milky Way galaxy, the Andromeda galaxy, and many more.

Coordinated Universal
Time is abbreviated UTC.
Why is the abbreviation
so weird?

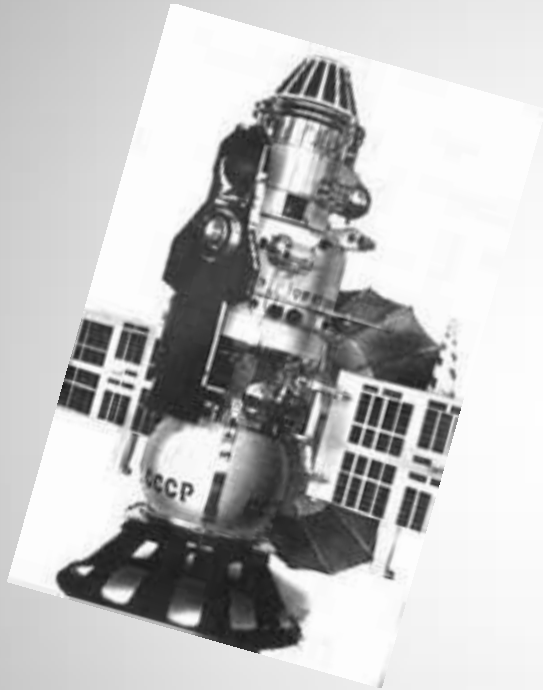
The English abbreviated it as 'CUT' while the French abbreviated it as 'TUC'. To allow for the same abbreviation, a compromise was decided upon at UTC.

What is special about the spectrum of Seyfert Galaxies, and what does that show?

The broad lines show the rapid internal motion
The rapid variability in the luminosity implies that radiation has a source much less than 1 light year across.

Explain how scientists know the composition of a star (like our Sun), without actually having visited it.

From the spectrum of the star. The emission spectrum is unique to every element, and thus we can measure the composition of the star.



The Russian built Venera
7 visited which planet?

Venus

30

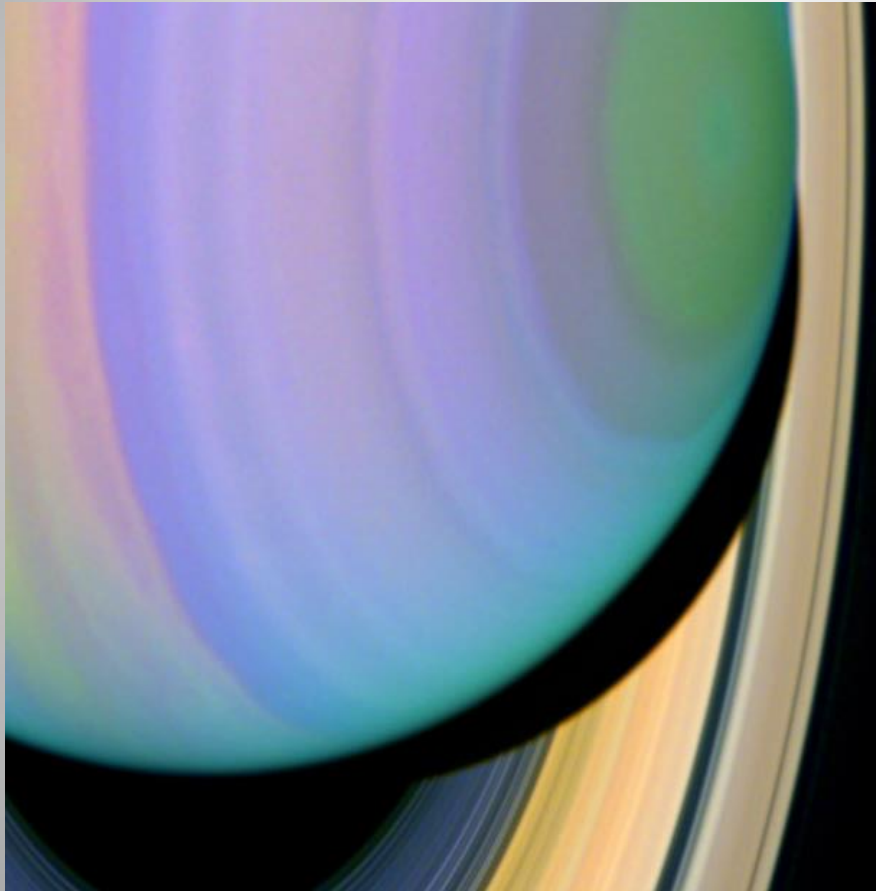


In this picture, there are two major facts that can be “proven”. State one.

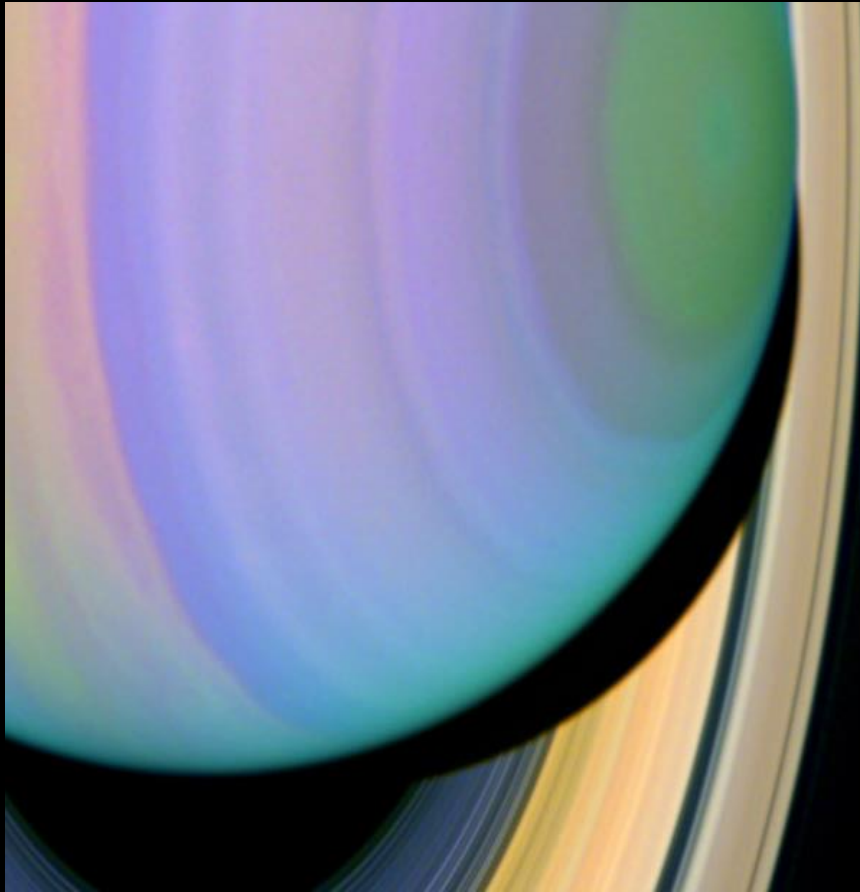


The presence of Dark Matter in the universe And gravitational lensing.

Identify:



Saturn. In the UV spectrum (False color)



THE eND

A horizontal blue brushstroke line, resembling a paint stroke, extending across the width of the slide below the text.