

By the end of the unit, the students will be able to:

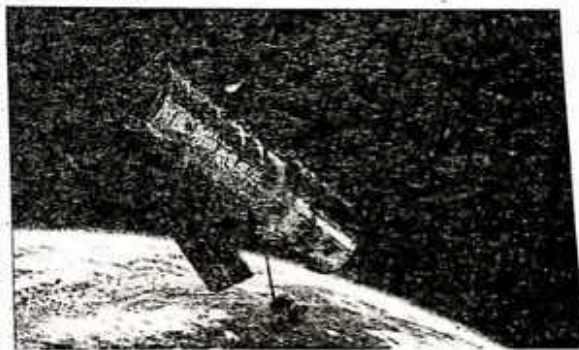
- Use pre-reading strategies to predict the content of a text from topic / picture, title / headings, key words and visuals etc. by using prior knowledge, asking questions and contextual clues.
- Skim text to
 - have general idea of the text.
 - infer theme/ main idea.
- Apply critical thinking to interact with text, use intensive reading strategies (while-reading) to
 - scan to answer short questions.
 - make simple inferences using context of the text and prior knowledge.
 - distinguish between what is clearly stated and what is implied.
 - deduce meaning of difficult words from context.
- Analyze to use in their own writing, features of an expository composition showing comparison and contrast between things, events, situations, places, actions, idea or a problem:
 - methods for organizing comparison and contrast.
 - connectives of comparison and contrast.
 - similes and metaphors for comparison and contrast.
- Recognize, pronounce and represent primary and secondary stress in words with the help of dictionary.
- Use various reference sources to refine vocabulary for interpersonal, academic and work place situations, including figurative, idiomatic and technical vocabulary. and represent primary and secondary stress in words with the help of dictionary
- Use the knowledge of roots, suffixes and affixes to determine the meaning of unfamiliar words.
- Demonstrate use of nouns and noun phrases and clauses in apposition.

Look at the night sky, and you see primarily darkness. A vast multitude of glittering sparks drift over our heads, scattered across the sky. Our gaze registers their beauty but little else. Our vision cannot bring these dazzling pinpoints into focus, observe their true nature. To our eyes, they are mysteries.

Humanity has sought to move beyond the limited vision of biology since the days of Galileo. Telescopes have brought the heavens to Earth, exposed the distant treasures of the universe, revealed countless galaxies cloaked within the apparent darkness. And perhaps no telescope has done so much to bring the wonder and reality of the universe home as the Hubble Space Telescope.

The concept of a telescope in orbit around Earth was first mentioned in a science book by Arthur C. Clarke. This telescope would peer at the universe from well above the interference of the Earth's ever turbulent atmosphere, which relentlessly blurs the view in ground-based telescopes and makes stars twinkle. Ahead of his time, Clarke outlined the advantages of an orbiting telescope compared with a telescope that might, at some future point, be installed on the Moon's surface, as had been suggested decades earlier. "Even the Moon's extremely tenuous atmosphere might affect certain delicate observations," he wrote. "an observatory in space would be able to survey the complete sphere of the sky."

Today, the orbiting telescope Clarke envisioned is known as the Hubble Space Telescope, and it has been in service since 1990. Before Hubble was launched into orbit around Earth in 1990, there was lots of scientific discussion about what a space telescope might find. The top to-do-list items



for Hubble were to measure the expansion rate of the universe, to find distant galaxies and to determine the chemical content of the space between the galaxies. But everyone expected Hubble's most important discoveries would provide answers to questions that astronomers do not know how to ask and find objects that were not yet even conceived.

Still, no one imagined that Hubble's photographs of deep space would be so utterly, jaw-droppingly beautiful or that the pictures would have a purely visceral appeal to an entire generation, making Hubble a household word synonymous with spectacular images of the cosmos.

Hubble – a joint project of NASA and the European Space Agency – orbits Earth 353 miles (569 km) above the planet's surface. Its position allows it to circle free of Earth's atmosphere, which distorts and blocks light from the cosmos. This gives Hubble a pristine view typically unmatched by ground-based telescopes. If the man's eye was as sensitive as Hubble's, he could look from Islamabad and see the glow of a pair of fireflies in London. If the fireflies were six feet apart, he could resolve that there were two of them side by side. Hubble orbits Earth, moving at the speed of about five miles per second (8 km per second) – fast enough to travel from Chitral to Karachi in about three minutes. During the course of a year, Hubble circles Earth over 5,000 times. As the telescope whips around Earth once every 97 minutes, it collects light – much more light than human eyes can hope to capture on their own. Light that reveals everything from the nature of storms on Jupiter to some of the most distant galaxies in the universe.

Hubble's super vision has shown us places in the cosmos that no generation of humans before us has ever seen. The Hubble images have unveiled that beyond the starry sky we see on a clear night, there is another universe, an "undiscovered country" of discordant objects, violent explosions and cataclysmic collisions. Galaxies plow into one another; stars erupt from firestorms of gas and dust and light; newly forming stars shoot out saber like jets of gas as birth announcements to the universe. All this drama plays out against a pitch-black backdrop that is unimaginably infinite.

A single Hubble snapshot can portray the universe as awesome, mysterious and breathtaking—and, at the same time, chaotic, overwhelming and foreboding. The story that the Hubble tells about the universe knows no national, political or ideological boundaries. The images are so overpowering and humbling that they have touched people of all ages. These pictures are a reminder that we inhabit a tiny planet in a vast universe with many remaining unknowns

Since its launch in 1990, the 12-ton bus-sized Hubble Telescope has made more than one million observations and looked at over 38,000 celestial objects. The Hubble archives are filled with more than half a million images. The amount of astronomical data collected is equivalent to about 50 million books, or five times the printed collection of the U.S. Library of Congress.

In 1983, NASA named the telescope after the early-20th-century American astronomer Edwin P. Hubble (1889-1953), who is credited with the 1920s discovery that galaxies are huge, remote systems of billions of stars. The most powerful space camera ever built was installed on Hubble in 2009, along with many other fixes and Hubble was now performing at a higher level than ever before. When we look at stars we look at history. The light that arrive at our location from the farthest objects in the universe is light that left those objects billions of years ago, so we see them as they appeared long ago. The most distant galaxies look strange, smaller, irregular, lacking clearly defined shapes. No telescope before Hubble had the resolution to see these distant galaxies.

Astronomers focused Hubble on what appeared to be a nearly empty patch of sky for 10 days. The results contained 10,000 galaxies at various stages of evolution and covers a patch of sky smaller than the size of a pinhead held at arm's length. To photograph the entire sky in this detail would require 13 million Hubble images with comparable exposure. The stunning image was called the Hubble Deep Field.



The composition of the cosmos finally came into focus in the late 1990s and early into the first decade of the 21st century. The part of the universe with which we are most familiar i-e planets, moons, stars, nebulae and galaxies accounts for less than 1 percent of the universe's total contents. Non-luminous matter (mostly hydrogen dispersed throughout space) is about 3 percent, while the rest is the largely mysterious dark matter and the completely mysterious dark energy.

Our universe started with a bang and has been expanding ever since, the space between galaxies increasing with time. The data received declared that the universe wasn't slowing down at all, as was previously thought, rather it was speeding up as though something were propelling it, driving its expansion faster and faster.

Hubble has thoroughly studied stars. The closest star to our Earth is the Sun. It is considered typical of middle-aged stars, formed from a collapsed cloud of gas and dust. Stars are born in clouds of gas and dust. One such stellar nursery is the Orion Nebula, an enormous cloud of gas and dust many light-years across. Turbulence from deep

within these clouds creates high density regions called knots. These knots contain sufficient mass that the gas and dust can begin to collapse from gravitational attraction. As it collapses, pressure from gravity causes the material at the center to heat up, creating a protostar. One day, this core becomes hot enough to ignite fusion and a star is born. Not all of the material in the collapsing cloud ends up as part of a star — the remaining dust can become planets, asteroids or comets ... or it may remain as dust. The chemical makeup of stars, revealed through spectroscopy, depends on the material in which they originate. In the early universe, stars were formed from matter that lacked most elements except for hydrogen and helium. The other chemical elements have been and still are being created in the interior of stars through nuclear fusion processes. That new material is eventually recycled into subsequent generations of stars and planets. The groupings of stars that form together can vary from a few stars to many hundreds or thousands. The stars in each cluster have a variety of masses. The most massive stars are rare, while the least massive stars are the most numerous. Hubble has probed star clusters of all sizes and uses spectroscopy to determine the detailed chemistry in star cluster members. By taking precise observations of star cluster members, scientists using Hubble can determine their luminosities and temperatures. When their nuclear fuel is exhausted, the most massive stars explode in a spectacular fashion, called a supernova, leaving behind neutron stars, black holes or nothing at all.

Galaxies are vast cosmic islands of stars, gas, dust, and dark matter held together by gravity. Hubble's keen eye has revealed intricate details of the shapes, structures, and histories of galaxies — whether alone, as part of small groups, or within immense clusters. From supermassive black holes at galactic centers to giant bursts of star formation to titanic collisions between galaxies, these discoveries allow astronomers to probe the current properties of galaxies as well as examine how they formed and developed over time.

Astronomers classify galaxies into three major categories: elliptical, spiral and irregular. These galaxies span a wide range of sizes, from dwarf galaxies containing as few as 100 million stars to giant galaxies with more than a trillion stars.

Ellipticals, which account for about one-third of all galaxies, vary from nearly circular to very elongated. They possess comparatively little gas and dust, contain older stars and are not actively forming stars anymore. The largest and rarest of these, called giant ellipticals, are about 300,000 light-years across. Astronomers theorize that these are formed by the mergers of smaller galaxies. Much more common are dwarf ellipticals, which are only a few thousand light-years wide.

Spiral galaxies appear as flat, blue-white disks of stars, gas and dust with yellowish bulges in their centers. These galaxies are divided into two groups: normal spirals and barred spirals. Spirals are actively forming stars and comprise a large fraction of all the galaxies in the local universe.

Irregular galaxies, which have very little dust, are neither disk-like nor elliptical. Astronomers often see irregular galaxies as they peer deeply into the universe. These galaxies are abundant in the early universe, before spirals and ellipticals developed. Aside from these three classic categories, astronomers have also identified many unusually shaped galaxies that seem to be in a transitory phase of galactic development. These include those in



the process of colliding or interacting, and those with active nuclei ejecting jets of gas. While the distances between galaxies seem large, so too are galaxies' diameters. Compared to stars, galaxies are relatively close to one another. They interact and even collide. When galaxies collide, they pass through each other; their stars don't crash into each other because of the immense distances between them. However, gravitational interactions between colliding galaxies could create new waves of star formation, supernovas and even black holes. Collisions do distort a galaxy's shape. Four billion years from now, our own Milky Way galaxy is destined for a collision with the neighboring spiral Andromeda galaxy. The Sun will likely be flung into a new region of our galaxy, but our Earth and solar system are in no danger of being destroyed. Andromeda, is now 2.5 million light-years away, but it is inexorably falling toward the Milky Way under the mutual pull of gravity between the two galaxies and the invisible dark matter that surrounds them both.

The appearance and make-up of galaxies are shaped over billions of years by interactions with groups of stars and other galaxies. Astronomers' observations led to the idea that the universe is expanding. Scientists estimate the age of the universe at 13.8 billion years based on the rate of expansion. The early universe was filled mainly with hydrogen and helium, with some areas slightly denser than others. These dense areas slightly slowed the universe's expansion, allowing the hydrogen and helium to

accumulate into small clouds swirling through space. Gravity caused the gas in these clouds to collapse and form the first generation of stars. These first stars rapidly burned out. Gravity continued to collapse the clouds. As other clouds came close to each other, gravity sent them careening into one another and knitted the clouds into larger, spinning packs. As the clouds further collapsed, they became rotating disks, which amassed more gas and dust. New stars formed, creating extensive spiral arms filled with colonies of stars.

Our understanding of planets beyond our own solar system is still in its infancy. Because planets in other solar systems are extraordinarily difficult to see directly, astronomers have had to come up with innovative ways to hunt for them. Only recently have our technology and techniques been up to the task of finding exoplanets.

The quest took a huge leap forward in 2000 when Hubble studied the exoplanet HD 209458 b, the first extrasolar planet known to make "transits" across the face of its star. Hubble became the first telescope to directly detect an exoplanet's atmosphere and survey its makeup. As a planet passes between its star and us, a small amount of light from the star is absorbed by the gas in the planet's atmosphere, leaving chemical "fingerprints" in the star's light. In the case of HD 209458 b, Hubble detected the signature of sodium that did not belong to the star. It was the mark of sodium gas in the atmosphere of the planet.

Since then, astronomers have discovered many more planets transiting their stars, and have used Hubble to investigate some of those planets' atmospheres. In the atmosphere exoplanet HD 189733 b, located 63 light-years away, Hubble detected methane. This was the first organic molecule identified in the atmosphere of a planet outside our solar system.

In 2018, astronomers Hubble conducted the first spectroscopic survey of several Earth-sized planets orbiting in their star's habitable zone, a region at a distance from the star where liquid water, the key to life as we know it, could exist on the planets' surfaces. Only 40 light-years away — a stone's throw on the scale of our galaxy — scientists



found seven planets orbiting the red dwarf star TRAPPIST-1. Four of these planets lie in the star's habitable zone.

Hubble revealed that at least three of the habitable-zone exoplanets do not seem to exhibit puffy, hydrogen-rich atmospheres similar to gaseous planets such as Neptune. This means the atmospheres may be more shallow and rich in heavier gases like those found in Earth's atmosphere, such as carbon dioxide, methane and oxygen.

As we try to study smaller and smaller planets, we'll need even greater precision enabled by more powerful telescopes and advanced technologies, such as those provided by the James Webb Space Telescope. Someday, the same kind of atmospheric observations Hubble is making could reveal the chemical signatures of life on a far-off world. If life does exist among the stars, this could be how we find it.

Exoplanets have always been — and still are — difficult to find. Seeing them directly is like looking for a firefly next to a lighthouse from a mile away. Astronomers have had to devise clever and highly precise techniques to uncover exoplanets.

Hubble continues to make significant contributions to the search for and study of planets around other stars. Its longevity, stability and instrumental sensitivity make it a unique asset in the quest for understanding alien worlds.

The great cathedrals were monuments to the glory of God, the Great Pyramids were monuments to the fear of death, the Great Wall of China was the ultimate defense fortress, the Panama Canal was a timely revolution in global transportation. The Hubble Space Telescope has earned a place in history texts that will be written a millennium from now. It will be remembered as one of the greatest manifestations of pure human curiosity.

Glossary

Word	Meaning
backdrop(n)	everything that can be seen around an event or scene
blur(v)	Make or become something less clear or sharp
careen(v)	to move forward very quickly especially in a way that is dangerous or shows a loss of control
cataclysmic(adj.)	(of a natural event) causing sudden and violent change
discordant(adj.)	not in agreement; combining with other things in a way that is strange or unpleasant

drift over(v)	A continuous slow movement from one place to another
exoplanet(n)	a planet located outside our solar system
extrasolar(adj.)	(of a planet, etc.) outside our solar system
foreboding(n)	a strong feeling that something unpleasant or dangerous is going to happen
galactic(adj.)	relating to a galaxy
habitable(adj.)	suitable for people to live in
ignite(v)	to set afire, to cause (a fuel) to burn
intricate(adj.)	having a lot of different parts and small details that fit together
jaw-droppingly(adv.)	in a way that is so large or good that it surprises you very much
longevity(n)	long life; the fact of lasting a long time
manifestations(n)	an event, action or thing that is a sign that something exists or is happening;
pinpoint(v)	to find and show the exact position of somebody/something
pristine(adj.)	fresh and clean, as if new
probe(n)	a complete and careful investigation of something
protostar(n)	a cloud of gas and dust in space believed to develop into a star
spectroscopic(adj.)	connected with the process of forming and looking at spectrum with a spectroscope
spectroscopy(n)	The study of forming and looking at spectra using spectroscopes (a piece of equipment for forming and looking at spectrum)
tenuous(adj.)	so weak or uncertain that it hardly exists
transit(n)	the process of being moved or carried from one place to another
turbulent(adj.)	in which there is a lot of sudden change, trouble, argument and sometimes violence
visceral(adj.)	resulting from strong feelings rather than careful thought

Reading Comprehension

1. Why did the cosmologists need a telescope in space well above the Earth's atmosphere?
2. What does the author mean by the sentence "when we look at stars we look at history"?
3. Why will the life on Earth not disturb even if our galaxy Milkyway collides with its neighbouring Andromeda?
4. What is the Hubble Deep Field?
5. How does the formation of stars take place in star nurseries?
6. How do scientists study the atmosphere of an exoplanet through "fingerprint" technique?
7. How will you explain in astronomical terms the statement, "what you see is not always what you get"?

Writing Suggestions

A. Comparison and Contrast Essays

A compare and contrast essay looks at the similarities and differences between two or more objects.

Methods for Organization: Compare and contrast essays are structured in two main ways.

1. Block Structure

For the block structure, all information about one object being compared/contrasted is given first, and information about the other object is listed afterwards.

Block Structure

Introduction

Introduction
Object 1 - Point 1
Object 1 - Point 2
Object 1 - Point 3
Transition sentence/paragraph
Object 2 - Point 1
Object 2 - Point 2
Object 2 - Point 3
Conclusion

Conclusion**2. Point-by-Point Structure**

For the point-by-point structure, each similarity (or difference) for one object is followed immediately by the similarity (or difference) for the other.

Point-by-Point

Introduction

Introduction
Point 1
Object 1 > Object 2
Point 2
Object 1 > Object 2
Point 3
Object 1 > Object 2
Conclusion

Conclusion**Connectives of comparison and contrast**

Connectives of comparison and contrast are transitional devices which show the similarities or differences. So commonly used transitional devices of comparison and contrast are given below.

Connectives of Comparison

similarly
likewise
also
both... and...
not only... but also...
neither... nor...
just like (+ noun)
similar to (+ noun)
to be similar (to)
to be the same as
to be alike
to compare (to/with)

Examples

Computers can be used to communicate easily, for example via email. Similarly/Likewise, the mobile phone is a convenient tool for communication.

Both computers and mobile phones can be used to communicate easily with other people.
Just like the computer, the mobile phone can be used to communicate easily with other people.

The computer is similar to the mobile phone in the way it can be used for easy communication.

Connectives of Contrast

however
in contrast
in comparison
by comparison
on the other hand
while
whereas
but
to differ from
to be different (from)
to be dissimilar to
to be unlike

Examples

Computers, although increasingly small, are not always easy to carry from one place to another. However, the mobile phone can be carried with ease.
Computers are generally not very portable, whereas the mobile phone is.
Computers differ from mobile phones in their lack of portability.
Computers are unlike mobile phones in their lack of portability.

B. Keeping in view the text of 'Truck Art' and the pattern of comparison and contrast organization in composition; write an expository essay on "Old Means of Communication vs Modern Means of Communication".

Oral Communication

Students are separately given a random word like sun, star or moon. The rest of the students must not see the word and thus each student will explain the word. The other students listen carefully to the speech and attempt to guess the secret word.

Vocabulary and Grammar

- A. Find the meanings of the following idioms related to weather in proper reference source and then match them to their exact meanings as given in column B.

Column A	Column B
To brighten up	"I don't have a clue" / "I have no idea"
To take a shine to	a large amount of money which is won or unexpectedly received
To make hay when the sun shines	a period in which someone is having less success than usual
Come rain or shine	a state of great happiness
To chase rainbows	approaching problem
To save for a rainy day	every difficult situation has a more comforting and hopeful aspect
To wait for a raindrop in the drought	everyone must experience difficulties or all fortune at one time or another
Right as rain	fit and healthy
To take a rain check	misfortunes seem to either all come in quick succession or all come at once
Into each life some rain must fall	to become more cheerful
To rain on someone's parade	to develop a liking for
It never rains but it pours	to have a casual conversation
Raining cats and dogs	to have unrealistic, impractical, or fanciful ideas
Dry Spell	to hear a rumour about something
Windfall	to make the most of an opportunity while it lasts
To shoot the breeze	to pursue something that is impossible/impractical
To get wind of something	to put something aside for a future time in which it may be needed
To know which way the wind blows	to refuse an offer, while demonstrating enthusiasm to accept it in the future
To sail close to the wind	to spoil someone's plans/to prevent someone from enjoying themselves
To throw caution to the wind	to take a great risk/to behave recklessly
Cloud/storm on the horizon	to understand what is happening in changing circumstances and be able to anticipate what will happen in the future
Every dark cloud has a silver lining	to verge on the limit of what is acceptable, allowed, or honourable
Cloud nine	to wait/hope for something which has little chance of happening
To have your head in the clouds	whatever the weather/situation
"I don't have the foggiest"	raining heavily

Activity

- B. The syllable of the words written in capital letters is 'stressed' while that with small letters is 'unstressed'. Practically pronounce these words with stressed and unstressed syllable. Also verify them by consulting an authentic dictionary of pronunciation.

SAMples, CARton, PURple, RAIny, CHIna, HAPpy, reLAX, reCEIVE, diRECT, aMONG, aSIDE, beTWEEN, deCIDE, PREsent (adjective), preSENT(verb), OBject (noun), obJECT (verb), ORDERly, Silently, LOvingly, MANager, GARDener, EAsier, RARity, OPTimal, GRAdient, GENorous, ADDable, DURable, LAUGHable, differENTIAL, SOcial, fiNANCial, muSician, phySician, cliNICian, BAKery, SCEnery, coMEDian, ciVILian, techNICian, reSIstible, imPOSSible, TERRible, arCHAic, plaTonic, characteRISTIC, diaBETics, paediatricS, TOPics, classifiCation, repoSition, vegeTATION, MEDIA, bacTERia, vicTORia, inGREdient, PATient, ANCient, mySTERious, reLigious, VARious, SELfish, ENGLISH, PUnish, hypNOSis, diagNOSis, osMOSis

- C. Read the following prefixes and add them to the relevant word, given below to make a new word. Also write the new meaning in the given space.

Prefix	Meaning
dis	not, opposite of
mis	wrongly
un	not
re	again
inter	between
pre	before
non	not
super	above
sub	under
anti	against, opposing

Word

satisfied
spell
acceptable
election

New Word

Meaning

_____	_____
_____	_____
_____	_____
_____	_____

related
pay
sense
script
merge
bacterial

D. Combine the following sentences by placing nouns and noun phrases in apposition.

1. The first prime Minister of Pakistan was assassinated in 1951.
He was Liaqat Ali Khan.
2. The river Indus' annual flow is about 243 cubic kilometres.
It is the longest river of Pakistan.
3. Ustad Ahmad Lahori was the chief architect of Taj Mahal, in Agra, India.
He hailed from Lahore.
4. John Kennedy was known for his eloquent and inspirational speeches.
He was a popular US President.
5. The first country to recognise Pakistan is The Islamic republic of Iran.
It is our neighbouring country.
6. My uncle's car is the envy of my friends.
It is a sporty red convertible with bucket seats.
7. The chief surgeon took his daughter on a hospital tour.
He is an expert in organ transplant procedures.
8. The problem delayed the entire program.
It was that you did not come on time.
9. The worry troubles me too much.
It is who we should invite.
10. Hamad is very dear to me.
He is my younger brother.

E. Noun Clauses

Noun clauses are dependent clauses that can replace any noun in the sentence: subjects, objects, and/or subject complements. In all, there are five different functions that a noun clause can serve: subjects, direct objects, indirect objects, objects of the preposition, and subject complements.

NOT FOR SALE

Using the noun clauses given at the end, complete the following sentences:

1. The prize will be given to _____.
2. Do you know _____?
3. I don't understand _____.
4. _____ made his friends angry.
5. _____ astonished her teachers.
6. _____ was not very agreeable.
7. The food inspector checked _____.
8. She did not know _____.
9. His problem was _____.
10. Hammad's great achievement at school was _____.
11. The teacher is not responsible for _____.
12. The money will go to _____.
13. It's very disappointing _____.
14. They are perfectly happy _____.
15. Umair runs so fast _____.

Noun clauses: (that he couldn't speak fluently, what Hurain wrote, whichever charity you choose, where they live now, that you were coming with us, what time it is, when he became the class proctor, what you are talking about, whoever stands first in the class, what the students decided to do, that the food was hygienically safe, what Umair said, that you failed in the examination, how the girl behaved, that he can outrun a cat)