Science 10 Name:_____

Mr. Korbutt Blk:_____ Date:_____

Study of the Universe Notes

UNIT BIG IDEA: The formation of the _____ can be explained by the _____.

History of Astronomy

- Humans have always been fascinated by the night sky. The history of astronomy is the study of human kinds early attempts to understand the universe

What is the Universe

- _____ is understood as different things to different people
- _____ is the study of the universe
  - Cosmologists study the structures and changes in the universe
- Universe: _____, including all matter, energy, planets, stars, galaxies, and the space in which all of this exists

Progression in Studies

- There was a time when scientists held a _____ view of the universe. Where the earth was at the centre of the universe and that all other celestial bodies revolved around it.
- These ideas eventually changed to a _____ view where the sun is at the centre
- This time of change is known as the_____.

A Brief History of Astronomy

- The best known astronomers are those associated with modern scientific results
- **Copernicus** (Polish, 1500s) proposed the heliocentric system, and was chastised for it
- **Galileo Galilei** (Italian, 1564-1642) designed _____ telescopes with 30x magnification, discovered moons of Jupiter, sunspots, phases of Venus
- **Isaac Newton** (English, 1642-1727) discovered the _____ that allow us to understand the cosmos
- **Edwin Hubble** (American, 1889-1953) determined that our universe is _____
- **Carl Sagan** (1934-1996) Charismatic teacher whose boundless enthusiasm captivated audiences and popularized astronomy. Founded the Planetary Society.
- **Stephen Hawking** (1942-2018) famous for his work with black holes and relativity and author of several popular science books.

Ancient Tools

- before the discovery of the telescope, the _____ was the only observing devices sometimes aided by a variety of sighting devices
- Tycho Brahe (Danish, late 1500's) used long sighting "tubes"
- neolithic farmers made _____ to point to the midsummer sunrise

Modern Tools: Telescopes

- Three functions of Optical telescopes:

1. _____

- over minutes-hours with chemical or digital photography

2. **Enable astronomers to _____ distant objects from one another** (resolution)
3. **_____ the images they form**

Modern Telescopes

- Optical telescopes can be divided into three categories

- 1. _____ telescopes that use lenses to gather and focus light
- 2. _____ telescopes that use mirrors to gather and focus light
- 3. Catadioptric telescopes use both mirrors and lenses to form an image. ex Schmidt-Cassegrain telescope

Refracting Telescopes

- Using a large glass _____ (objective) of the right shape, light is refracted (bent) to a small lens (eyepiece)
- ex. binoculars, telescope
- The following figure illustrates the use of a lens to gather and focus light, and the use of two lenses to make a simple refracting telescope
- refracting telescopes were popular during the later half of the 19th century but fell out of favour for research purposes
- refracting telescopes suffer from several drawbacks
    - flaws in the glass, bubbles, limited aperture size, gravity distortion
    - the above problems can be minimized/corrected with the use of the next type of scope...

Reflecting Telescopes

- A reflecting telescope is an optical telescope which uses a combination of curved or flat _____
- The mirrors reflect the light and form an image, rather than lenses to reflect or bend light to form an image
- the largest optical telescopes are reflecting telescopes. Ex Hubble Space telescope

Multiple Mirror Reflectors

- These telescopes use a series of _____to equal the light-collecting power of one enormous mirror
- _____are used to make sure all the mirrors are always lines up perfectly.

Hubble Space Telescope

- Launched aboard space shuttle Discovery on April 24, 1990 the Hubble Space Telescope (HST), is a large _____observatory
- Orbiting _____ km above the Earth provides Hubble with a deep and clear views of the Universe without the atmospheric interference
- It's range extends from our solar system to the far reaches of the known universe

James Webb Space Telescope

- the next generation of space based telescopes and the scientific successor to Hubble
- Planned launch date: 2021

What is it isn't visible light

- Some telescopes detect other forms of light that aren't part of the visible spectrum
- _____ telescopes
- _____ telescopes

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Radio Telescope

- Radio telescopes detect radio waves, the _____of the electromagnetic spectrum
- The waves are amplified and transmitted to a computer for information procession
- the benefit for using them is that there is _____ from clouds
- used to for objects that are _____ observable with visible light but emit radiation and radio wavelengths (pulsars, quasars, nebulae, parts of galaxies)

Infrared Telescopes

- similar to an optical telescope but designed to detect _____radiation.
- Infrared radiation is given off by _____ objects therefor these telescopes are used to detect heat and determine temperature of distant objects
- need to be _____from local heat sources (liquid nitrogen/helium or locating telescope in polar region)
- placed in space or at high altitudes (above lower atmosphere) as water vapor absorbs infrared radiation

Other Telescopes

- UV telescopes: detect UV rays and report the _____
- X-ray telescopes: used to detect _____
- Gamma Ray telescopes: detect harmful gamma rays, and report them
- Cosmic Ray observatory: built to detect high-energy cosmic rays (mostly protons). Not yet possible to form an image from cosmic rays

Your Mission

- What you already know: p.288-291
- Read p. 294-305, 322-323
- Workbook 4.1