1st 9 weeks

1. Angular Altitude
2. Aphelion
3. Apparent Motion
4. Arc Minute
5. Arc Second
6. Aristotle
7. Asterism
8. Astrolabe
9. Astronomical Unit (AU)
10. Axial Tilt
11. Axis
12. Azimuth
13. Celestial Equator
14. Celestial Sphere
15. Circumpolar
16. Constellation
17. Declination
18. Ecliptic
19. Ejecta
20. Eratosthenes
21. Geocentric Model
22. Helio-centric Model
23. Hipparchus
24. Horizon
25. Hypothesis
26. Inclination
27. Latitude
28. Longitude
29. Light Year
30. Lunar (Synodic) Month
31. Lunar Mare
32. Meridian
33. Metric System
34. Model
35. Neap Tide
36. North Star (Polaris)
37. Occultation
38. Orion
39. Parsec
40. Perihelion
41. Poles
42. Polestar
43. Precession
44. ~~Pseudoscience~~
45. Ptolemy
46. Regolith
47. Revolution
48. Revolve
49. Right Ascension
50. Rotate
51. Rotation
52. Satellite
53. Season
54. Sidereal Day
55. Sidereal Month
56. Solar Day
57. Solar Rays
58. Spring Equinox
59. Spring Tide
60. Summer Solstice
61. Theory
62. Tropic of Cancer
63. Tropic of Capricorn
64. Vernal Equinox
65. Winter Solstice
66. Zenith
67. Zodiac

2nd 9 weeks

1. Accretion
2. Annular Eclipse
3. Apollo 13
4. Apollo Program
5. Asteroid
6. Asteroid Belt
7. Buzz Aldrin
8. Cape Canaveral
9. Ceres
10. Challenger
11. Chromosphere
12. Climate
13. Climate Change
14. Columbia
15. Convection
16. Convection Zone
17. Copernicus
18. Core
19. Corona
20. Coronal Mass Ejection
21. Crescent
22. Dwarf Planet
23. Earth
24. Ellipse
25. Eris
26. Europa
27. Fission
28. Flyby
29. Foci
30. Full Moon
31. Fusion
32. Galileo
33. Ganymede
34. Gas Giant
35. Gemini Program
36. Gibbous
37. Greenhouse Gas
38. Hubble Space Telescope
39. Io
40. ISS
41. Jovian Planet
42. Jupiter
43. Kepler
44. Kuiper Belt
45. Lander
46. Long Period Comet
47. Lunar Eclipse
48. Makemake
49. Mars
50. Matter
51. Meteor
52. Meteoroid
53. Meteorite
54. Mercury
55. Mercury Program
56. NASA
57. Nebular Theory
58. Neil Armstrong
59. Neptune
60. New Moon
61. Newton
62. Orbital Period
63. Oort Clout
64. Orbiter
65. Penumbra
66. Photosphere
67. Planet
68. Planetesimal
69. Plasma
70. Pluto
71. Prominence
72. Quaoar
73. Radiation
74. Radiative Zone
75. Rocky Planet
76. Saturn
77. Saturn V Rocket
78. Sedna
79. Short Period Comet
80. Sol
81. Solar Cycle
82. Solar Eclipse
83. Solar Flare
84. Solar System
85. Solar Wind
86. Space Shuttle
87. Sunspot
88. Sunspots
89. Terrestrial Planet
90. Titan
91. Totality
92. Umbra
93. Uranus
94. VAB
95. Venus
96. Waning
97. Waxing
98. Yuri Gagarin

3rd 9 weeks

1. Absolute Magnitude
2. Absorption spectrum
3. Angular Momentum
4. Annie Jump Cannon
5. Aperture
6. Apparent Magnitude
7. Astrobiology
8. Binary Stars
9. Blackbody
10. Blackbody Curve
11. Blazar
12. Blue Giant
13. Blue-Shift
14. Brown Dwarf
15. Chandrasekhar Limit
16. Deuterium
17. Diffraction Grating
18. Doppler Effect
19. Drake Equation
20. Electromagnetic Force
21. Electromagnetic spectrum
22. Emission Spectrum
23. Exoplanet
24. Fermi Paradox
25. Frequency
26. Fusion
27. Gamma Rays
28. Gravity
29. Greenhouse gas
30. Habitable Zone
31. Hertzsprung-Russell Diagram
32. Hydrogen Lines
33. Hypergiant
34. Infrared
35. Inverse Square Law
36. Kepler Space Telescope
37. Kepler's Laws
38. Light Curve
39. Luminosity
40. Magnitude
41. Main Sequence Star
42. Microwaves
43. Neutron Star
44. Newton's Laws
45. Orbit
46. Planetary Nebula
47. Red Dwarf
48. Pulsar
49. Quasar
50. Radial Velocity
51. Radio waves
52. Red Giant
53. Red-Shift
54. Reflecting Telescope
55. Refracting Telescope
56. ROYGBV
57. Singularity
58. Spectral Class
59. Spectrometer
60. Spectroscopy
61. Star
62. Stephon-Boltzmann Law
63. Strong Nuclear Force
64. Supergiant
65. Supernova
66. Telescope
67. Temperature
68. Transit
69. Tritium
70. Ultraviolet
71. Variable Star
72. Visible Light
73. Wavelength
74. Weak Nuclear Force
75. Wein's Law
76. White Dwarf
77. X-Ray

4th 9 weeks

1. Absolute Zero
2. Age of the Universe
3. Andromeda Galaxy
4. Annihilation
5. Anti-Matter
6. Background Radiation
7. Baryonic Matter
8. Big Bang Theory
9. Big Bounce Theory
10. Big Crunch Theory
11. Big Freeze Theory
12. Big Slurp Theory
13. Big Rip Theory
14. Black Hole
15. Cepheid Variable Stars
16. Closed Universe
17. Cosmic Microwave Background Radiation (CMBR)
18. Cosmic Horizon
19. Cosmological Constant
20. Cosmological Principle
21. Critical Density
22. Dark Matter
23. Dark Energy
24. Dark Epoch
25. Dwarf Galaxy
26. $E=mc^2$
27. Edwin Hubble
28. Electron-Degeneracy Pressure
29. Elliptical Galaxy
30. Entropy
31. Epoch of Recombination
32. Event Horizon
33. Expansion
34. Flat Universe
35. Galaxy
36. Galaxy Clusters
37. Grand Unified Theory (GUT)
38. Gravitational Lensing
39. Hawking Radiation
40. Heat Death
41. Hubble Deep Field
42. Hubble's Constant
43. Inflation Theory
44. Irregular Galaxy
45. Isotropic
46. Local Group
47. Main-Sequence Fitting
48. Matter
49. Milky Way Galaxy
50. Neutron Star
51. Neutron-Degeneracy Pressure
52. Observable Universe
53. Olber's Paradox
54. Opaque Epoch
55. Open Universe
56. Oscillating Universe
57. Parallax
58. Penzias/Wilson
59. Planck Length
60. Planck Time
61. Planet 9
62. Positron
63. Redshift
64. Relativity
65. Schwarzschild Radius
66. Singularity
67. Sloan Great Wall
68. Spaghettification
69. Speed of Light
70. Spiral Galaxy
71. String Theory
72. Supernova 1a
73. Supernova Type II
74. Tully-Fisher Relation
75. Virgo Supercluster

Astronomy Study Guide
Example Questions

1. What is the average distance from the Earth to the Sun? (AU, miles, km)
2. How do you calculate scale model distances?
3. How did the planets form?
4. Be able to read a diagram of the phases of the Moon.
5. What alignment of the Earth, Moon and Sun cause the spring and neap tides?
6. What force creates the ocean's tides?
7. How do the different types of eclipses occur? What do they look like in the sky?
8. Why does the Earth have fewer visible craters than the Moon?
9. How would you best describe the shape of the Earth's orbit?
10. How would a faster rotating Earth affect the tides?
11. What happens to an ellipse as the foci become closer together?
12. What would happen to the seasons if the tilt of the Earth changed?
13. On the HR diagram, where do the different groups of stars occur?
14. Be able to interpret a diagram showing the Earth's rotation and tilt angle around the Sun.
15. How does the size of an impact crater compare to the impactor?
16. What things are considered necessary for a planet to be considered habitable?
17. What is a sunspot? How long is the sunspot cycle?
18. How does solar activity affect life on Earth?
19. When would we experience a solar eclipse? Lunar eclipse?
20. Where does fusion take place in the Sun? What is fusion?
21. What determines the color order of visible light in the electromagnetic spectrum?
22. Which planet has the most circular orbit around the Sun? Has the most moons? Closest? Hottest? Etc.?
23. How do we determine the characteristic of a star? (Size, temp, age, composition, etc.?)
24. Why would a runaway greenhouse effect be bad for Earth? How do we know this?
25. How long is a lunar cycle?
26. How does wavelength and energy change across the electromagnetic spectrum?
27. What are the approximate sizes of the planets in relation to each other?
28. What is the Milky Way?
29. How does the amount of sun hitting the Earth (angle of insolation) change during the year?
30. The path a star follows during its lifetime is determined by what factors?
31. What will our Sun most likely end as?
32. What is the correct order of the electromagnetic spectrum?
33. What is difference between waxing and waning?
34. Can we see the entire surface of the Moon from Earth?
35. Can you observe the Moon during the day?
36. What is the closest star to Earth?
37. How does the Universe End?
38. What is the Big Bang?
39. What is the Cosmic Microwave Background Radiation and where did it come from?
40. What happens when we fall into a Black Hole?
41. How do stars die?
42. What is dark matter and dark energy?
43. How do we tell how far away things are in space?
44. How far away are things in the Universe? (I.e. Moon, stars, galaxies, Hubble deep field, etc.)
45. How are elements larger than iron created?
46. What is the James Webb space telescope?
47. What is the special about the speed of light?
48. How far back in time can we see? How?
49. What is Hubble's constant? How do we find it?
50. What is redshift, and why is it helpful for astronomers?
51. What are the 4 fundamental forces in nature?
52. What is the Hubble Constant? How is it calculated? How is it used by astronomers?
53. How might the universe end?

What you should be able to do and what test questions might be over!!

Identify examples of pseudoscience (such as astrology, phrenology) in society.

- Students will understand what is and what is not science.
- Students will understand the difference between astronomy and astrology.
- Students will understand that scientific investigations and observations must meet certain criteria.
- Students will understand that scientific ideas are testable.
- Students will understand the difference between science and pseudoscience.
- Students will understand the scientific process use d by astronomers.

- Test Questions may include scientific thinking and processes.
- Test Questions may include scientific experimentation.

Describe and apply the coordinate system used to locate objects in the sky.

- Students will find stars and constellations in the sky.
- Students will understand and use the celestial sphere to locate objects in the sky.
- Students will understand how to use altitude and azimuth (horizontal coordinate system) and right ascension and declination (equatorial coordinate system) to find sky objects.
- Students will locate zenith, horizon, ecliptic, celestial equator (zodiac constellations), celestial North and South Pole.
- Students will recognize constellations and their use.
- Students will understand how the sky changes and how objects in the sky change throughout the year and each night.

- Test Questions may not access the location of constellations or order of zodiac constellations.
- Test Questions may require students to identify right ascension and declination — equatorial coordinates — of an object.
- Test Questions may require students to identify altitude and azimuth — horizontal coordinates — of an object.
- Test Questions may require students to recognize how objects move in the sky.
- Test Questions may require students to determine latitude on earth using location of objects in the sky.

Distinguish the various methods of measuring astronomical distances and apply each in appropriate situations.

- Students will understand that distances in space cannot be measured using the same units.
- Students will determine appropriate units for measurements
- Students will calculate distances in space.
- Students will understand how parallax can be used to help determine distance to stars.
- Students will understand how astronomers use standard candles to estimate the size of the universe.
- Students will understand how the speed of light and light years are related.

- Test Questions may address appropriate units.
- Test Questions may not require students to have specific quantitative distance knowledge.

Connect surface features to surface processes that are responsible for their formation.

- Students will understand planetary characteristics (distance from sun, moons, size, composition, atmosphere, gravity, temperature, surface features) and how they help us understand planets.
- Students will understand the solar system changes over time.
- Students will understand the conditions needed for a world to be considered habitable.

- Students will understand that formation and differentiation of planets is determined by gravity and density.
- Students will understand that not all planets are similar to Earth because of differences in pressure, temperature, and size.

- Test Questions may not require specific knowledge of quantitative astronomical data.
- Test Questions may require knowledge of states of matter.
- Test Questions may require knowledge of basic elemental distribution in the solar system.
- Test Questions may require knowledge of the formation of the solar system.
- Test Questions may require knowledge of states of matter related to temperature.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

- Students will understand that laws describe and theories explain.
- Students will understand that theories and laws are well-tested and wellsupported.
- Students will understand that a theory is based on a series of well-tested hypotheses.
- Students will understand that theories are based on years of tested hypotheses leading to scientific evidence.

- Test Questions may require students to understand the difference between a theory and a hypothesis.
- Test Questions may not require students to cite evidence for a particular theory.
- Test Questions may assess a conceptual understanding of a theory.

Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

- Students will understand that fission happens on earth and fusion happens in the stars.
- Students will understand how hydrogen fusion powers stars.
- Students will understand how stars are element factories.
- Students will understand $E=mc_2$.
- Students will understand how fusion influences the life cycle of a star and its place on the HR diagram.
- Students will understand that mass can be converted to energy.

- Test Questions may require students to identify fusion and fission.
- Test Questions may not require students to calculate $E=mc_2$.
- Test Questions may require students to understand the fusion process.
- Test Questions may require students to understand the life cycle of a star as it relates to fusion.
- Test Questions may require students to recognize that $E=mc_2$ can produce large amounts of energy from small amounts of mass over long periods of time.

Describe how the gravitational force between two objects depends on their masses and the distance between them.

- Students will use the law of universal gravitation to understand the influence of gravitational constant, mass, and distance.
- Students will understand that gravity determines weight, not mass.
- Students will calculate the effects of gravity using the inverse square law.
- Students will compare mass and weight as it relates to gravity.
- Students will understand that gravity can impact mass over large distances.
- Students will understand that gravity is responsible for the formation and stability of most celestial objects.

- Students will understand how gravity can affect light.
- Students will understand that the mass of objects does not change, even with a changing gravitational force.

- Test Questions may include basic calculations based on magnitude.
- Test Questions may not include calculations using the gravitational constant.
- Test Questions may include conceptual understanding of gravity.
- Test Questions may include comparing gravity to other fundamental forces.
- Test Questions may include how gravity can influence the formation and structure of celestial objects.

Recognize that time, length, and energy depend on the frame of reference.

- Students will understand that events observed in the universe occur on a three-dimensional coordinate system.
- Students will understand that the point of view of the observer can influence observations.
- Students will understand that the speed of light is constant.
- Students will understand that the laws of physics are invariable, and that changes seen when objects are accelerating are only seen by the observer.

- Test Questions may not assess specific equations.
- Test Questions may include the theory of special relativity.

Relate the history of and explain the justification for future space exploration and continuing technology development.

- Students will understand that astronomical discoveries advance with the advancement of technology.
- Students will understand that space exploration helps guide new discoveries.
- Students will understand how telescopes collect EMR.
- Students will understand that space travel is built on previous exploration and limited to technology current at the time.
- Students will understand that technology developed for space is used on earth.

- Test Questions may not address knowledge of specific missions.
- Test Questions may include different types of telescopes.
- Test Questions may include general advancements from space programs.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

- Students will differentiate between different types of EMR by wavelength, frequency, and energy.
- Students will solve problems involving wavelength, frequency and energy.
- Students will understand that all EMR travels at the same speed: the speed of light.
- Students will understand that the frequency of waves can change based on motion.
- Students will relate EMR to astronomical applications and phenomena (telescopes, spacecraft, Doppler Effect, speed of light).
- Students will relate types of EMR to the astronomical objects and conditions that produce them.
- Students will understand how the energy of EMR affects color.
- Test Questions may include the order of types of EMR
- Test Questions may include applying the formula to calculate wavelength, frequency, and speed ($V = \lambda f$).

State Standards

- SC.912.E.5.7- relate the history of and explain the justification for future space exploration and continuing technology development.
- SC.912.E.5.9 - analyze the broad effects of space exploration on the economy and culture of Florida.
- SC.912.E.5.2 - Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.
- SC.912.E.5.4 - Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.
- SC.912.E.7.7 - identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.
- SC.912.P.10.4 - describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.
- SC.912.E.5.10 - describe and apply the coordinate system used to locate objects in the sky.
- SC.912.E.5.11 - distinguish the various methods of measuring astronomical distances and apply each in appropriate situations.
- SC.912.E.5.5 - explain the formation of planetary systems based on our knowledge of our Solar System and apply this knowledge to newly discovered planetary systems.
- SC.912.E.5.6 - develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other.
- SC.912.P.12.2 - analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.
- SC.912.P.12.3 - interpret and apply Newton's three laws of motion.
- SC.912.P.12.4 - describe how the gravitational force between two objects depends on their masses and the distance between them.
- SC.912.P.12.6 - qualitatively apply the concept of angular momentum.
- SC.912.E.5.2 - identify patterns in the organization and distribution of matter in the universe and the forces that determine them.
- SC.912.E.5.11 - distinguish the various methods of measuring astronomical distances and apply each in appropriate situations.
- SC.912.E.6.2 - connect surface features to surface processes that are responsible for their formation.
- SC.912.E.7.7 - identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.
- SC.912.P.8.1 - differentiate among the 4 states of matter.
- SC.912.P.8.4 - explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.
- SC.912.P.10.4 - describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.
- SC.912.P.10.9 - describe the quantization of energy at the atomic level.
- SC.912.P.10.19 - explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not.
- SC.912.P.10.21 - qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.
- SC.912.P.8.1 - differentiate among the four states of matter.
- SC.912.P.10.11 - explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.
- SC.912.P.10.18 - explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

- SC.912.P.10.19 - explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not.
- SC.912.P.12.4 - describe how the gravitational force between two objects depends on their masses and the distance between them.
- SC.912.P.10.22 - construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.
- SC.912.P.10.20 - describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.
- SC.912.E.5.11 - distinguish the various methods of measuring astronomical distances and apply each in appropriate situations.
- SC.912.P.10.4 - describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.
- SC.912.P.10.10 - compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).
- SC.912.P.10.21 - qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.
- SC.912.P.12.6 - qualitatively apply the concept of angular momentum.
- SC.912.E.5.1 - cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe.
- SC.912.E.5.2 - identify patterns in the organization and distribution of matter in the universe and the forces that determine them.
- SC.912.P.12.4 - describe how the gravitational force between two objects depends on their masses and the distance between them.
- SC.912.P.12.2 - analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.
- SC.912.P.10.21 - qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.
- SC.912.P.12.7 - recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.
- SC.912.P.12.8 - recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light.
- SC.912.P.12.9 - recognize that time, length, and energy depend on the frame of reference.
- SC.912.P.12.6 - qualitatively apply the concept of angular momentum.