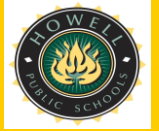




# Astronomy



<b>Month</b>  Example Sept/Jan	<b>Content                      Sub-Category                      or                      Strand</b>	<b>National Common Core                      Standards</b>  <b>Code &amp; Language</b>	<b>Michigan Standards                      High School Content                      Expectations (HSCEs)</b>  <b>Code &amp; Language</b>	<b>Essential Skills</b>	<b>Examples of                      Formative                      Assessments</b>	<b>Vocabulary</b>



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Month  Example Sept/Jan	<u>Content</u> Sub-Category or Strand	National Common Core Standards  Code & Language	Michigan Standards High School Content Expectations (HSCEs)  Code & Language	Essential Skills	Examples of Formative Assessments  	Vocabulary  
Sept/Jan	Unit 1: History of Astronomy		<p>E1.2 Scientific Reflection and Social Implications The integrity of the scientific process depends on scientists and citizens understanding and respecting the "Nature of Science." Openness to new ideas, skepticism, and honesty are attributes required for good scientific practice. Scientists must use logical reasoning during investigation design, analysis, conclusion, and communication. Science can produce critical insights on societal problems from a personal and local scale to a global scale. Science both aids in the development of technology and provides tools for assessing the costs, risks, and benefits of technological systems. Scientific conclusions and arguments play a role in personal choice and public policy decisions. New technology and scientific discoveries have had a major influence in shaping human history. Science and technology continue to offer diverse and significant career opportunities.</p>	<p>*Beliefs of ancient and medieval astronomers. *Progression of the models of the solar system. *Kepler's Laws. *Newton's Laws of Motion. *Newton's Law of Gravitation.</p>	<p>*Timeline. *Kepler Space Telescope Data. * Kepler's 3rd Law Problems. *Gravitational Force Problems.</p>	<p>Aristotle, Ptolemy, Copernicus, Galileo, Kepler, Newton, Einstein.</p>



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			<p>E1.2A Critique whether or not specific questions can be answered through scientific investigations.</p> <p>E1.2B Identify and critique arguments about personal or societal issues based on scientific evidence.</p> <p>E1.2C Develop an understanding of a scientific concept by accessing information from multiple sources. Evaluate the scientific accuracy and significance of the information.</p> <p>E1.2D Evaluate scientific explanations in a peer review process or discussion format.</p> <p>E1.2f Critique solutions to problems, given criteria and scientific constraints.</p> <p>E1.2h Describe the distinctions between scientific theories, laws, hypotheses, and observations.</p>			



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			E1.2i Explain the progression of ideas and explanations that lead to science theories that are part of the current scientific consensus or core knowledge.  E1.2k Analyze how science and society interact from a historical, political, economic, or social perspective.  P1.2 Scientific Reflection and Social Implications			



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			<p>The integrity of the scientific process depends on scientists and citizens understanding and respecting the "Nature of Science." Openness to new ideas, skepticism, and honesty are attributes required for good scientific practice. Scientists must use logical reasoning during investigation design, analysis, conclusion, and communication. Science can produce critical insights on societal problems from a personal and local scale to a global scale. Science both aids in the development of technology and provides tools for assessing the costs, risks, and benefits of technological systems. Scientific conclusions and arguments play a role in personal choice and public policy decisions. New technology and scientific discoveries have had a major influence in shaping human history. Science and technology continue to offer diverse and significant career opportunities.</p>			

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			<p>P1.2i Explain the progression of ideas and explanations that lead to science theories that are part of the current scientific consensus or core knowledge.</p> <p>P3.3 Newton's Third Law Whenever one object exerts a force on another object, a force equal in magnitude and opposite in direction is exerted back on the first object.</p> <p>P3.3A Identify the action and reaction force from examples of forces in everyday situations (e.g., book on a table, walking across the floor, pushing open a door).</p> <p>P3.3b Predict how the change in velocity of a small mass compares to the change in velocity of a large mass when the objects interact (e.g., collide).</p> <p>P3.6 Gravitational Interactions</p>			



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			<p>Gravitation is an attractive force that a mass exerts on every other mass. The strength of the gravitational force between two masses is proportional to the masses and inversely proportional to the square of the distance between them.</p> <p>P3.6A Explain earth-moon interactions (orbital motion) in terms of forces.</p> <p>P3.6B Predict how the gravitational force between objects changes when the distance between them changes.</p> <p>P3.6C Explain how your weight on Earth could be different from your weight on another planet.</p>			

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Sept/Feb	Unit 2: Observational Astronomy		<p>E1.1A Generate new questions that can be investigated in the laboratory or field.</p> <p>E1.1B Evaluate the uncertainties or validity of scientific conclusions using an understanding of sources of measurement error, the challenges of controlling variables, accuracy of data analysis, logic of argument, logic of experimental design, and/or the dependence on underlying assumptions.</p>	<p>*Recognize stars and constellations. *Motions of planets and stars. *How the earth's tilt causes the seasons. *Planets on the ecliptic.</p>	<p>*Star map. Night view observations.</p>	<p>Celestial Equator, Meridian, Aizmuth, Zenith, Altitude, North Celestial Pole, Circumpolar, Constellation, Asterism, Ecliptic, Zodiac</p>



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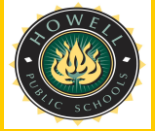
<b>Month</b>  Example Sept/Jan	<b>Content Sub-Category or Strand</b>	<b>National Common Core Standards</b>  <b>Code &amp; Language</b>	<b>Michigan Standards High School Content Expectations (HSCEs)</b>  <b>Code &amp; Language</b>	<b>Essential Skills</b>	<b>Examples of Formative Assessments</b>	<b>Vocabulary</b>
			<p>E1.1C Conduct scientific investigations using appropriate tools and techniques (e.g., selecting an instrument that measures the desired quantity—length, volume, weight, time interval, temperature—with the appropriate level of precision).</p> <p>E1.1D Identify patterns in data and relate them to theoretical models.</p> <p>E1.1E Describe a reason for a given conclusion using evidence from an investigation.</p> <p>E1.1f Predict what would happen if the variables, methods, or timing of an investigation were changed.</p> <p>E1.1g Based on empirical evidence, explain and critique the reasoning used to draw a scientific conclusion or explanation.</p>			



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			<p>E1.1h Design and conduct a systematic scientific investigation that tests a hypothesis. Draw conclusions from data presented in charts or tables.</p> <p>E1.1i Distinguish between scientific explanations that are regarded as current scientific consensus and the emerging questions that active researchers investigate.</p> <p>Standard E5: The Earth in Space and Time. Students explain theories about how the Earth and universe formed and evolved over a long period of time. Students predict how human activities may influence the climate of the future.</p> <p>E5.p1A Describe the motions of various celestial bodies and some effects of those motions.</p> <p>E5.p1B Explain the primary cause of seasons.</p> <p>E5.p1C Explain how a light year can be used as a distance unit.</p>			



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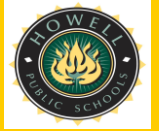
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Oct/Mar	Unit 3: Moon		E5.p1A Describe the motions of various celestial bodies and some effects of those motions. (prerequisite)	Understand the effect of the moon on Earth. Describe the cause of solar eclipses. Explain why the moon has phases. Describe why the same face of the moon is always seen from Earth	Moon observation calendar, Eclipse demonstration, phase demonstration	Phases, Orbit, Tides, Craters, Highlands, Rilles, Eclipses, gravitational lock
Oct/Mar	Unit 4: Light & Telescopes		E5.1 The Earth in Space E5.1d Differentiate between the cosmological and Doppler red shift.  P4.6A Identify the different regions on the electromagnetic spectrum and compare them in terms of wavelength, frequency, and energy  P4.4 Waves (mechanical and electromagnetic) are described by their wavelength, amplitude, frequency, and speed.	Recognize how emission, absorption, and continuous spectra are formed and analyzed. Characteristics of refractive and reflective telescopes.	Unit Test	Red-shift, blue-shift, absorption spectra, photon energies, wavelength, frequency, hertz





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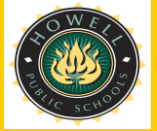
Astronomy						
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			<p>P4.6 Electromagnetic waves (e.g., radio, microwave, infrared, visible light, ultraviolet, x-ray) are produced by changing the motion (acceleration) of charges or by changing magnetic fields. Electromagnetic waves can travel through matter, but they do not require a material medium. (That is, they also travel through empty space.) All electromagnetic waves move in a vacuum at the speed of light. Types of electromagnetic radiation are distinguished from each other by their wavelength and energy.</p> <p>P4.8 The laws of reflection and refraction describe the relationships between incident and reflected/refracted waves.</p>			
<b>Nov/Apr</b>	Unit 5: Sun		E5.2B Relate events on the Sun to phenomena such as auroras, disruption of radio and satellite communications, and power grid disturbances.	Layers of the sun, Coronal Mass Ejecton, Sunspot Cycle, Effects on earth, spectra of layers,	Unit Test	Solar flares, prominences, Sun spots, spicules, CME, Auroras, Sunspot cycle,



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			E5.2A Identify patterns in solar activities (sunspot cycle, solar flares, solar wind) E5.2C Describe how nuclear fusion produces energy in the Sun  E5.2D Describe how nuclear fusion and other processes in stars have led to the formation of all the other chemical elements			Babcock cycle
<b>Nov/Apr</b>	Unit 6: Solar System		E5.1A Describe the position and motion of our solar system in our galaxy and the overall scale, structure, and age of the universe	Planet Project, Scale model of the solar system	Unit Test	Planets, Asteroids, Comets, Meteoroids, meteoroids, meteor, meteorite
<b>Dec/May</b>	Unit 7: Stellar Evolution		E5.1 The Earth in space E5.1b Describe how the Big Bang theory accounts for the formation of the universe E5.2x Stellar Evolution E5.2e Explain how the Hertzsprung-Russell (H-R) diagram can be used to deduce other parameters (distance)	HR online activity, HR worksheet	Unit Test	HR diagrams, Nebulae, Main sequence stars, red giants, White dwarfs, Neutron Stars, Black Holes, pulsar

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			<p>E5.2f Explain how you can infer the temperature, life span, and mass of a star and its mass from its color. Use the H-R diagram to explain the life cycles of stars.</p> <p>E5.2g Explain how the balance between fusion and gravity controls the evolution of a star (equilibrium).</p> <p>E5.2h Compare the evolution paths of low-, moderate-, and high-mass stars using the H-R diagram</p>			
Jan/May	Unit 8: Galaxies		None listed	Recognize the types of galaxies, galaxy evolution, galaxy classification	Unit Test	Elliptical, Spiral, Barred Spiral, Irregular, E0