



## LESSON PLAN: **Stellar Fingerprints: The Spectra of the Stars**

### **Glossary**

**Absorption:** The process by which light transfers its energy to matter. For example, a gas cloud can absorb starlight that passes through it. After the starlight passes through the cloud, dark lines called absorption lines appear in the star's continuous spectrum at wavelengths corresponding to the light-absorbing elements.

**Black hole:** A region of space containing a huge amount of mass compacted into an extremely small volume. A black hole's gravitational influence is so strong that nothing, not even light, can escape its grasp. Swirling disks of material — called accretion disks — may surround black holes, and jets of matter may arise from their vicinity.

**Electromagnetic spectrum:** The entire range of wavelengths of electromagnetic radiation, including radio waves, microwaves, infrared light, visible light, ultraviolet light, X-rays, and gamma rays.

**Emission:** The process by which matter gives off energy in the form of light. Each chemical element emits and absorbs radiated energy at specific wavelengths. The collection of emission lines in an emission spectrum corresponds to the chemical elements contained in a celestial object.

**Filter:** A type of window that absorbs certain colors of light while allowing others to pass through. Astronomers use filters to observe how celestial objects appear in certain colors of light or to reduce the light of exceptionally bright objects. For example, a pair of sunglasses acts as a type of filter, reducing the amount of incoming light while still allowing some light to pass through to the eyes.

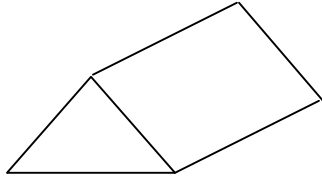
**Fusion:** A nuclear process that releases energy when light atomic nuclei combine to form heavier nuclei. Fusion is the energy source for stars like our Sun.

**Intensity:** The amount, degree, or quantity of energy passing through a point per unit time. For example, the intensity of light that Earth receives from the Sun is far greater than that from any other star because the Sun is the closest star to us.

**Neutron stars:** An extremely compact ball of neutrons created from the central core of a star that collapsed under gravity during a supernova explosion. Neutron stars are extremely dense: they are only 10 kilometers or so in size, but have the mass of an average star (usually about 1.5 times more massive than our Sun). A neutron star that regularly emits pulses of radiation is known as a pulsar.

**Planetary nebulae:** An expanding shell of glowing gas expelled by a star late in its life. Our Sun will create a planetary nebula at the end of its life.

**Prism:** A homogeneous transparent solid used to produce a continuous spectrum. A prism usually has triangular bases and rectangular sides.



**Quantum states:** Refers to the complete description of the state of a subatomic particle to the extent allowed by the uncertainty principle. Quantum states are associated with energy. A particle in the ground state is at its lowest energy and a particle in an excited state has absorbed energy from its surroundings.

**Quantum Theory of Matter:** A modern physical theory concerned with the emission and absorption of energy by matter and with the motion of material particles; the quantum theory and the theory of relativity together form the theoretical basis of modern physics.

**Spectroscopy:** The study and interpretation of a celestial object's electromagnetic spectrum. A spectrograph or spectrometer is used to analyze an object's electromagnetic spectrum.

**Stellar evolution:** The process of change that occurs during a star's lifetime from its birth to its death.

**Supernova:** The explosive death of a massive star whose energy output causes its expanding gases to glow brightly for weeks or months.

**Quantum Mechanics:** The branch of physics that deals with the very small, including molecules, atoms and fundamental particles. Quantum mechanics is the description of the motion and interaction of particles at the small scales where the discrete nature of the physical world becomes important.

**White dwarf star:** The hot, compact remains of a low-mass star like our Sun that has exhausted its sources of fuel for thermonuclear fusion. White dwarf stars are generally about the size of the Earth.