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| **TEXAS CTE LESSON PLAN**  [www.txcte.org](http://www.txcte.org) | |
| **Lesson Identification and TEKS Addressed** | |
| **Career Cluster** | Transportation, Distribution & Logistics |
| **Course Name** | Energy and Power of Transportation Systems |
| **Lesson/Unit Title** | Four Stroke Cycles of an Engine |
| **TEKS Student Expectations** | **130.460. (c) Knowledge and Skills**  (3) The student applies technical knowledge and skills to simulated  situations. The student is expected to:  (A) identify the major components in a vehicular system |
| **Basic Direct Teach Lesson**  (Includes Special Education Modifications/Accommodations and  one English Language Proficiency Standards (ELPS) Strategy) | |
| **Instructional Objectives** | **Students will…**  Explain step-by-step the four strokes of an engine. |
| **Rationale** | This lesson is designed to enable entry level students to understand the four strokes of an engine and how a 4 stroke engine functions. After completing this lesson students will be able to understand the operating principles of four stroke internal combustion engines. |
| **Duration of Lesson** | 1 45-minute period |
| **Word Wall/Key Vocabulary**  *(ELPS c1a, c, f; c2b; c3a, b, d; c4c; c5b) PDAS II (5)* | * Intake * Compression * Power * Exhaust * Valves * Piston * Cylinder Block * Cylinder Head |
| **Materials/Specialized Equipment Needed** | * <https://www.cteonline.org/resources/view/35035> * <https://www.cteonline.org/resources/view/33781> |
| **Anticipatory Set**  (May include pre-assessment for prior knowledge) | Show smoking tail pipe cartoon as students arrive: <https://www.cteonline.org/resources/view/33781>  After the students are seated, ask the question, "Has anyone ever wondered why a car smokes?"  Show diagram: <https://www.cteonline.org/resources/view/35035>  “The lecture will be on intake, compression, power and exhaust, which are the four strokes of an engine and what happens in each stroke. The diagram shows all four strokes. The importance of each step will be tied in.” |
| **Direct Instruction \*** | Lecture  This lesson is designed to help students understand the four strokes of an engine and how a 4 stroke engine functions.  The engines of cars actually have multiple cylinders. The movement of the piston from the top of its travel to the bottom of its travel is called a stroke. Each cycle required to the air-fuel mixture has 4 strokes. During the intake stroke, the piston is pulled down by the turning of the crankshaft, creating a vacuum above it. The piston moves back up in the cylinder on the compression stroke, compressing the air-fuel mixture. As the piston approaches the top of its travel, a spark ignites the mixture. During the power stroke, the burning fuel expands rapidly, forcing the piston to move back down in the cylinder. The exhaust valve opens as the piston approaches the bottom of its travel. This is so that burning gases can escape before the piston begins to move upwards in the cylinder again. During the exhaust stroke the piston moves back up forcing any remaining exhaust form the cylinder through the open exhaust valve. As the crankshaft rotates, the piston goes back down in the cylinder as the 4-stroke cycle repeats itself.  Re-emphasize the importance of a step-by-step process. Place students in groups of 4 to allow for peer teaching.  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  *NONE* |
| **Guided Practice \*** | **Students will…**   * Work together in groups and explain to each other how the 4-stroke engine works and to tell the difference with each stroke.   *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  *NONE* |
| **Independent Practice/Laboratory Experience/Differentiated Activities \*** | **Students will…**   * Explain step-by-step the four strokes of an engine. Individual students will be directed through a step-by-step process. Actual practice will come after the demonstration.   *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  *NONE* |
| **Lesson Closure** | After student explanations are completed, inform students that the next lesson will be on the cooling system.  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  *NONE* |
| **Summative/End of Lesson Assessment \*** | **Students will…**   * Explain the four strokes of an engine in two minutes. |
| **References/Resources/**  **Teacher Preparation** | <https://www.cteonline.org/resources/view/33791>  <https://www.cteonline.org/resources/view/35896> |
| **Additional Required Components** | |
| **English Language Proficiency Standards (ELPS) Strategies** |  |
| **College and Career Readiness Connection[[1]](#footnote-1)** | Cross-Disciplinary II A 2 a  Science VIII D 3 b, c  Science VIII E 1 e  Science VII E 1 b  ELA IV B 1 a |
| **Recommended Strategies** | |
| **Reading Strategies** |  |
| **Quotes** |  |
| **Multimedia/Visual Strategy**  **Presentation Slides + One Additional Technology Connection** |  |
| **Graphic Organizers/Handout** |  |
| **Writing Strategies**  **Journal Entries + 1 Additional Writing Strategy** |  |
| **Communication**  **90 Second Speech Topics** |  |
| **Other Essential Lesson Components** | |
| **Enrichment Activity**  (e.g., homework assignment) |  |
| **Family/Community Connection** |  |
| **CTSO connection(s)** | DECA, SkillsUSATexas |
| **Service Learning Projects** |  |
| **Lesson Notes** |  |

1. Visit the Texas College and Career Readiness Standards at <http://www.thecb.state.tx.us/collegereadiness/CRS.pdf>, Texas Higher Education Coordinating Board (THECB), 2009. [↑](#footnote-ref-1)