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| **TEXAS CTE LESSON PLAN**  [www.txcte.org](http://www.txcte.org) | |
| **Lesson Identification and TEKS Addressed** | |
| **Career Cluster** | Science, Technology, Engineering & Mathematics |
| **Course Name** | AC/DC Electronics |
| **Lesson/Unit Title** | The Nature of Matter |
| **TEKS Student Expectations** | **130.405. (c) Knowledge and Skills**  (6) The student develops an understanding of basic direct current (DC) electricity principles. The student is expected to:  (B) demonstrate an understanding of atomic theory and the relationship between atomic number and materials conductivity and insulation characteristics  (9) The student applies the concepts and skills to simulated and actual work situations. The student is expected to:  (A) use tools and laboratory equipment in a safe manner to construct and repair circuits  (B) use precision measuring instruments to analyze circuits and prototypes  (E) describe and perform measurements, including period and amplitude, using an oscilloscope  (F) use multiple software applications to simulate circuit behavior and present concepts |
| **Basic Direct Teach Lesson**  (Includes Special Education Modifications/Accommodations and  one English Language Proficiency Standards (ELPS) Strategy) | |
| **Instructional Objectives** | The student will be able to:   1. Match terms associated with the nature of matter to the correct definitions 2. Determine the location of different atomic particles 3. Distinguish between inner and outer orbits 4. Relate outer shell electrons to electricity and chemistry 5. Describe the random drift of electrons 6. Describe how the number of valence electrons determines conductivity |
| **Rationale** | Knowledge of how matter is related to electricity is fundamental to the understanding of how electricity works. |
| **Duration of Lesson** | Teacher’s Discretion |
| **Word Wall/Key Vocabulary**  *(ELPS c1a,c,f; c2b; c3a,b,d; c4c; c5b) PDAS II(5)* | Refer to the terminology activity |
| **Materials/Specialized Equipment Needed** | * The Nature of Matter Terminology and Concepts Activity * The Nature of Matter Terminology and Concepts Activity Key * The Nature of Matter Exam * The Nature of Matter Exam Key * Pencil and paper * Dry board eraser * Dry board markers (assorted colors) * Two bar magnets * Computer * Overhead projector and screen * Dry board |
| **Anticipatory Set**  (May include pre-assessment for prior knowledge) | Read chapter on current in textbook   * Complete activities |
| **Direct Instruction \*** | I. Introduction  A. Overview.  B. Review terms and definitions with students.  C. Terms are important because they form the foundation for understanding why some electrons are used one way (as conductors) and why other electrons are used another way (as insulators).  D. Properties come from an understanding of atoms and how atoms act, group, and react.  II. Atoms  A. There are two models of an atom.  1. An older solar system model—called the Bohr model—looks at electrons as particles orbiting a nucleus the same way planets orbit the sun.  2. A modern Cloud model treats an electron not like a particle but like a wave.  B. Make sure students note the location of all the atomic particles.  III. Elements and Compounds - Distribute The Nature of Matter Terminology and Concepts Activity and have students complete.  A. Review fundamental definitions that lay the groundwork for understanding matter and where electrons come from.  B. How does this relate to electricity?  IV. Electrons and Orbits  A. Electrons do not just move around a nucleus randomly; they form patterns.  B. These patterns represent individual quantized energy values where only certain values are allowed.  C. We call these “layers” or “orbits” because that is an easy concept to understand, but the orbits can have odd three-dimensional shapes.  D. There is a mathematical formula that determines how many electrons go into each orbit.  E. Only outer shell electrons are important because these are the only ones that can become free or form bonds between atoms.  V. Periodic Table of the Elements  A. This table can help students determine how electrons arrange themselves (because they follow regular patterns).  B. Review the organization and components of the table, how to read it, and how to see patterns.  VI. Free Electrons and Metals  A. Free electrons are important for conductors.  B. Free electrons are created when the outer shell (valence) electrons are only very weakly attracted to the nucleus.  C. Different metals are fairly similar to each other because—even though they have different numbers of protons—they almost always have two electrons in the outer shell.  D. They always have two electrons in the outer shell because each additional electron, to balance each additional proton, goes into an inner shell.  VII. Good Conductors: summary:  A. The reason copper, gold, and silver each has only one electron in its outer shell is shown through the graphics.  B. A full inner shell makes an atom much more stable than one that is only partially full.  C. The single outer shell electron is “extra” (meaning not needed for stability and very weakly attracted to the nucleus).  D. Review summary before beginning demonstrations and exam.  VIII. Teacher’s Demonstrations - Search the Internet for a demonstration to preview (if needed).  A. Show two bar magnets.  B. Prove the law of electrical charges right.  IX. The Nature of Matter Exam  A. Allow time for students to take the exam.  B. Grade exam with grade key.  *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 \*** | The students will observe, ask questions, and analyze the demonstration presented by the teacher.  *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 \*** | 1. The student will replicate the demonstrations.  2. The student will answer the discussion questions in The Nature of Matter Terminology and Concepts Activity and turn them in for evaluation.  *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** | Provide a brief review before the exam. |
| **Summative/End of Lesson Assessment \*** | Informal Assessment  The teacher will monitor each student or small group as they individually work to complete the assignments. If re-teach is needed on any information or procedure, all those involved will stop and participate in the re-teach.  Formal Assessment   * Use The Nature of Matter Terminology and Concepts Activity Key to grade the activity. * Use The Nature of Matter Exam and The Nature of Matter Exam Key.   *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  *NONE* |
| **References/Resources/**  **Teacher Preparation** | * Buchla, D. and Floyd, T. (2005). The science of electronics: DC/AC. (Chapter 4). Upper Saddle River, NJ: Pearson Prentice Hall. * Floyd, T. (1993). Principles of electric circuits: electron flow version. Don Mills, Ontario: Macmillian Publishing Co. * Robertson, L. (1980). Basic electronics I. Stillwater, OK: Mid-American Vocational Curriculum Consortium, Inc. |
| **Additional Required Components** | |
| **English Language Proficiency Standards (ELPS) Strategies** |  |
| **College and Career Readiness Connection[[1]](#footnote-1)** |  |
| **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)** | SkillsUSA  Technology Student Association |
| **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)