Eureka!

Science, Physical Science

TVO 1998-99

Science SOL: 4.3, 5.4, 6.3, 6.5, 6.7, CH.5, PS.2, PS.6, PS.7, PS.10

9 10-minute programs for grades 6-12

One Year Tape and Keep Rights

No Duplication Rights

This series of short, humorous, and information-packed programs brings physics concepts to vibrant, vigorous life. Each program takes a simple and direct approach to the subject matter. While the basic concepts are explained in a voice-over, cartoon characters and a variety of animated objects demonstrate the principles on the screen. Constant review and reinforcement make the message clear. As a result, the study of physics becomes easier and more accessible to students.

101. Inertia—This program introduces the series and sets forth the concept of inertia, the first law of physics: things like to keep on doing what they're already doing. **PS.10**

102. Mass—Building on the concept of inertia, this program adds the factor of mass, tells how it is measured, and shows how it differs from size and that inertia increases with mass. **PS.10**

103. Speed—The concept of speed is introduced to the inertia-mass relationship. Concept: Force varies with mass and rate of change of speed. **PS.10**

104. Acceleration 1—With the examples of a bicycle and a baseball player, an important rule of physics becomes apparent. Concept: Force = mass x acceleration. **PS.10**

105. Acceleration 2—An animated locomotive helps explain how acceleration works and how it is calculated. The importance of reasonable units is stressed. Concept: Acceleration = m/s2. **PS.10**

106. Gravity—Isaac Newton's celebrated falling apple is cited to explain the force of gravity and the unit with which the force of gravity is measured. Concept: Force of gravity = mass x 10 m/s2. **PS.10**

107. Weight vs. Mass—This program explains the difference between weight and mass and shows how only the mass of an object is the same on the moon and on the earth. **PS.10**

108. Work—A circus strongman and a clown help present the physics definition of work. Concept: Work = force x distance. **PS.10**

109. Kinetic Energy—Animated billiard balls help demonstrate kinetic energy-the energy of motion. **6.3, PS.6**

110. Potential Energy—A rock teetering on the edge of a cliff is shown to have potential energy-the energy of position. **6.3, PS.6**

UNIT 2: SIMPLE MACHINES

111. The Inclined Plane—This program demonstrates how an inclined plane allows you to trade increased distance for decreased force. **PS.10**

112. The Lever—The lever principle, is defined: "The longer the arm of the lever to which force is applied, the less that force need be." **PS.10**

113. Mechanical Advantage and Friction—Professors A and B compare the mechanical advantage of an inclined plane with that of a lever. **PS.10**

114. The Screw and the Wheel—This program provides examples and definitions of a screw and a wheel: a screw is simply a twisted inclined plane; a wheel is simply a circular lever whose fulcrum has become an axle. **PS.10**

115. The Pulley—This program shows viewers how a pulley works to lift a heavy object. Doubling the number of ropes supporting the weight, doubles the mechanical advantage. **PS.10**

UNIT 3: HEAT AND TEMPERATURE

116. Molecules in Solids—This program defines the three states of

matter, illustrates the lattice-work pattern of molecules in solids, and reveals the origin of the word "molecule." **5.4, 6.5, PS.2, CH.5**

117. Molecules In Liquids—As molecules in a solid get hotter, they vibrate faster and faster and eventually slip out of their lattice-work pattern. When this occurs, the substance melts, changing from a solid to a liquid state. **5.4, 6.5, PS.2, CH.5**

118. Evaporation and Condensation—A goldfish bowl filled with water demonstrates evaporation, in which speeding molecules escape from a liquid to form a gas. **5.4, 6.7, PS.2, PS.7**

119. Expansion and Contraction—Using balloons to illustrate the process, *Eureka!* shows how, when matter gets hot, its molecules go faster and the solid, liquid, or gas expands. Conversely, when matter gets cold, its molecules go slower, and the solid, liquid, or gas contracts. **5.4, 6.7, PS.2, PS.7**

120. Measuring Temperature—*Eureka!* shows viewers how Swedish scientist Anders Celsius invented the Celsius thermometer using the expansion of mercury as a measure of temperature. **PS.7**

121. Temperature vs Heat—*Eureka!* explains that heat refers to quantity of hotness, and is determined by the mass and speed of molecules. This program demonstrates that a bucket of water at a temperature of 50°C contains more heat than a cup of water at 100° C. **PS.7**

UNIT 4: THE CONDUCTION OF HEAT

122. Atoms—This program explains that molecules are made up of atoms. In pure metals, all the atoms are arranged separately in a lattice-work pattern, but in most nonmetals, liquids, and gases, the atoms are bunched together into molecules. **5.4, 6.5, PS.2**

123. Electrons—Using an animated model of an atom, *Eureka!* illustrates how electrons whiz so quickly around the nucleus that they appear to form layers. **5.4, 6.5, PS.2**

124. Conduction—*Eureka!* looks at the process of conduction, explaining that the application of heat to an object makes the molecules or atoms vibrate faster and cause a sort of "domino effect." **4.3, PS.7**

UNIT 5: THE CONVECTION OF HEAT

125. Volume and Density—This program explains that volume refers to the amount of space an object envelops and that density refers to the amount of mass that is compacted in a given volume. **PS.7, CH.5**

126. Buoyancy—Showing viewers that objects immersed in a liquid are buoyed up by a force equal to the weight of the liquid displaced, this program explains the principle of buoyancy. **PS.2**

127. Convection—This program explains how the principle of buoyancy is responsible for the process of heat transfer called convection. **PS.7**

128. Heat as Energy—Heat is produced whenever there is movement and friction between two objects. Since movement is a form of energy, it follows that heat must also be a form of energy. **PS.7**

129. Radiation Waves—One of the chief ways in which heat energy moves is in the form of waves. This kind of heat transfer is called radiation. **PS.7**

130. The Radiation Spectrum—Viewers learn that the waves of heat energy radiated by the sun come in many forms, which together make a band, or spectrum, of energy waves. **PS.7**