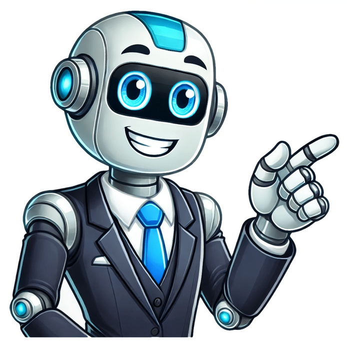

10th science guide

This resource provides questions and answers for Chapter 7: Atoms and Molecules in Samacheer Kalvi's 10th Science textbook. It aims to help students revise their notes, complete homework assignments, and prepare for board exams. The chapter covers various topics related to atoms and molecules, including mass, atomic number, isotopes, and molecular formula. The resource includes a set of multiple-choice questions that cover different aspects of atoms and molecules. For example, question 1 asks which of the following has the smallest mass: one atom of helium or six billion trillion atoms of helium? The correct answer is one atom of helium. Another question asks which of the following is a triatomic molecule. The correct answer is carbon dioxide. The resource also includes fill-in-the-blank questions that test students' understanding of key concepts, such as isobars, isotones, and relative atomic mass. For example, one question asks what is meant by the term "relative atomic mass." The correct answer is that it is otherwise known as atomic mass. Overall, this resource provides a comprehensive review of Chapter 7: Atoms and Molecules in Samacheer Kalvi's 10th Science textbook. It can help students prepare for their board exams and develop a deeper understanding of the concepts covered in the chapter. **Part III: Multiple Choice Questions** * A molecule's composition is determined by its ______________________. (Answer: same) * One mole of any gas occupies ______________________ ml at S.T.P. (Answer: 22,400) * The atomicity of phosphorus is ______________________. (Answer: not specified) **Part IV: True or False Questions** * Two elements can form more than one compound. (True) * Noble gases are diatomic. (False; they are monoatomic) * The gram atomic mass of an element has no unit. (False; it has the unit of grams) * 1 mole of Gold and Silver contain the same number of atoms. (True) * Molar mass of CO_2 is ______________________. (Answer: 44 g) **Part V: Assertion and Reason Questions** * Question 1: + Assertion: Atomic mass of aluminum is 27. + Reason: An atom of aluminum is 27 times heavier than 1/12th of the mass of a C-12 atom. + Answer: (a) Assertion and Reason are correct, Reason explains the Assertion. * Question 2: + Assertion: The Relative Molecular Mass of Chlorine is 35.5 a.m.u. + Reason: The natural abundance of Chlorine isotopes are not equal. + Answer: (c) Assertion is wrong, Reason is correct. **Part VI: Short Answer Questions** * Question 1: Define "Relative Atomic Mass". + Answer: Relative atomic mass of an element is the ratio between the average mass of its isotopes to $\frac{1}{12^{th}}$ part of the mass of a carbon-12 atom. * Question 2: Write the different types of isotopes of oxygen and its percentage abundance. + Answer: Oxygen has three stable isotopes: 16O (99.76%), 17O (0.03%), and 18O (0.21%). * Question 3: Define "Atomicity". + Answer: The number of atoms present in the molecule is called its 'Atomicity'. * Question 4: Give two examples of heteroatomic molecules. + Answer: HI, HCl * Question 5: What is Molar Volume? + Answer: One mole of any gas occupies 22.4 litres (or) 22400 ml at S.T.P. * Question 6: Find the percentage of nitrogen in ammonia. + Answer: Molar mass of NH_3 = 17 g; therefore, percentage of nitrogen is 82.2%. **Part VII: Long Answer Questions** * Question 1: + Calculate the number of water molecules present in one drop of water which weighs 0.18 g. + Answer: The molecular mass of water (H_2O) is 18. 18 g of water molecule = 1 mole. 0.18 g of water = $\frac{1}{18} \times 0.18$ = 0.01 mole. 1 mole of water contains 6.023×10^{23} water molecules. 0.01 mole of water contain $\frac{6.023 \times 10^{23}}{1} \times 0.01$ = 6.023×10^{21} molecules. * Question 2: + $N_2 + 3 H_2 \rightarrow 2 NH_3$ (The atomic mass of nitrogen is 14, and that of hydrogen is 1) + 1 mole of nitrogen (28 g) + 3 moles of hydrogen (6 g) → 2 moles of ammonia (34 g) * Question 3: + Calculate the number of moles in (i) 27 g of Al; (ii) 1.51×10^{23} molecules of NH_4Cl. + Answer: (i) 27 g of Al Given mass atomic mass = $\frac{Given\ mass}{Atomic\ mass}$ = $\frac{27}{27}$ = 1 mole. (ii) 1.51×10^{23} molecules of NH_4Cl Molar mass of NH_4Cl = 79 g. Number of moles = $\frac{Number\ of\ molecules}{Avogadro's\ number}$ = $\frac{1.51 \times 10^{23}}{6.023 \times 10^{23}}$ = 0.25 mole. The modern atomic theory states that atoms are not indivisible, and their properties can vary within an element. Atoms of different elements may have the same atomic masses, while those of the same element can have different masses due to isotopic variation. The relationship between relative molecular mass and vapour density is as follows: the relative molecular mass of a gas or vapour is equal to twice its vapour density under standard temperature and pressure (STP) conditions. This can be derived from Avogadro's law, which states that equal volumes of all gases contain an equal number of molecules. In the case of calcium carbonate decomposition on heating, 1 mole of $CaCO_3$ is involved in the reaction, and the gram molecular mass of $CaCO_3$ is calculated to be 100 g. Additionally, 1 mole of CO_2 is produced from the reaction. Finally, several problems are presented for calculation, including: * Converting grams to moles for different elements (H_2, Cl_2, S_8, P_4) * Calculating the percentage composition of calcium carbonate * Determining the relative abundance of isotopes in boron-10 and boron-11 based on an average atomic mass Given text: paraphrase this text: triatomic molecule? (a) Phosphorous (b) Sulphur (c) Bromine (d) Ozone. Answer: (d) Ozone. Question 18. For the reaction A + 2B → C, 5 moles of A and 8 moles of B will produce: (a) 5 moles of C (b) 4 moles of C (c) 8 moles of C (d) 13 moles of C Answer: (b) 4 moles of C Question 19. The vapour density of a gas is 32. Its relative molecular mass will be: (a) 32 (b) 16 (c) 64 (d) 96 Answer: (c) 64 Question 20. Find the odd one out _____. (a) Silver (b) Potassium (c) Iron (d) Phosphorous. Answer: (d) Phosphorous. The concept of atoms has changed with the discovery of artificial transmutation, which allows for the creation or transformation of atoms. There are different types of molecules based on their atomicity, which can be classified as monoatomic (single atom), diatomic (two atoms), triatomic (three atoms), and polyatomic (multiple atoms). The atomic mass unit (amu) is defined as one-twelfth the mass of a carbon-12 atom, which has six protons and six neutrons. Avogadro's hypothesis states that equal volumes of gases at similar temperatures and pressures contain an equal number of molecules. This can be used to derive the value of atomicity by considering reactions between hydrogen and chlorine to form hydrogen chloride gas. Isotopes are atoms of the same element with different mass numbers, while isobars are atoms of different elements with the same mass number. Relative atomic mass (RAM) refers to the average atomic mass of an element. Sodium bicarbonate breaks down into sodium carbonate, water, and carbon dioxide when heated, resulting in a specific amount of moles, mass, and volume of these products. The atomic mass of carbon-12 is used as a standard because it has a whole-number mass, unlike other nuclides. This makes it easier to measure the atomic masses of other elements. The cost of common salt (sodium chloride) can be calculated based on its gram-molar mass and the price per kilogram. Finally, there are three hot questions that require calculations and problem-solving skills: 1. Why is the atomic mass of carbon-12 used as a standard? 2. What is the cost of one mole of sodium chloride (common salt)? 3. What is the mass of one atom of carbon-12? Given article text here of carbon, if the natural abundance of C–12 and C–13 are 98.90% and 1.10% respectively. Solution: Average atomic mass of carbon = (12 × 0.989) + (13 × 0.011) = 11.868 + 0.143 = 12.011 amu. Question 2. Find how many moles are there in (a) 98 g of H_2SO_4 Answer: (a) 98 g of H_2SO_4 GMM of H_2SO_4 = 2(1) + 32 + 4(16) = 98 g Number of moles = (Given Mass)/(Mol. Mass) = (98)/(98) = 1 mole (b) 18.069 × 1023 atoms of calcium Answer: Number of moles = 3 moles (c) 4.48 L of CO_2 Answer: Number of moles Question 3. Calculate the number of moles in (i) 12.046 × 1023 atoms of copper (ii) 27.95 g of iron (iii) 1.51 × 1023 molecules of CO_2 Answer: (i) 12.046 × 1023 atoms of copper 6.023 × 1023 atoms of copper = 1 mole 12.046 × 1023 atoms of copper = $((1 \times 12.046 \times 10^{23})/(6.023 \times 10^{23}))$ = 2 moles of copper (ii) 27.95 g of iron 55.9 g of iron = 1 mole 27.95 g of iron = (1/(55.9)) × 27.95 = 0.5 mole of iron. (iii) 1.51 × 1023 molecules of CO_2 No of moles = (No. of molecules)/(Avogadro number) = $(1.51 \times 10^{23})/(6.023 \times 10^{23})$ = 0.25 mole of CO_2 Question 4. Calculate the number of atoms of mercury present in 1 kg of Mercury. [Atomic mass of Hg = 200.6] Answer: 200.6 g of Hg contains 6.023 × 1023 Hg atoms ∴ 1 Kg of Hg will contain = $((6.023 \times 10^{23})/(200.6)) \times 1000$ = 30.02 × 1023 Hg atoms Question 5. How many molecules are present in 7 × 10-3 m³ of NH_3 at STP? Answer: Molar volume = 22.4 dm³ = 2.24×10^{-2} m³ 2.24×10^{-2} m³ of NH_3 at STP contains 6.023 × 1023 NH_3 molecules. :. 7 × 10-3 m³ of NH_3 will contain = $((6.023 \times 10^{23})/(2.24 \times 10^{-2})) \times 7 \times 10^{-3}$) = 18.82×10^{22} NH_3 molecule Question 6. What is the mass in grams of the following? (a) 3 moles of NaOH (b) 6.023 × 1022 atoms of Ca (c) 224 L of CO_2 Answer: Formula: (a) 3 moles of NaOH Mass of 3 moles of NaOH = 3 × mol. mass of NaOH GMM of NaOH = 23 + 16 + 1 = 40 g Mass of 3 moles of NaOH = 3 × 40 = 120 g (b) 6.023 × 1022 atoms of Ca = n × atomic mass of ca = 4 g (c) 224 L of CO_2 Mass of 224 L of CO_2 = 10 × 44 = 440 g Question 7. How many grams are therein: (i) 5 moles of water (ii) 2 moles of Ammonia (iii) 2 moles of Glucose Solution: (i) 5 moles of water. Mass of 1 mole of water (H_2O) = 18 g (2 + 16) Mass of 5 moles of H_2O = 18 × 5 = 90 g. (ii) 2 moles of ammonia. Mass of 1 mole of ammonia (NH_3) = 17 g (14 + 3) Mass of 2 moles of ammonia = 17 × 2 = 34 g. (iii) 2 moles of glucose. Mass of 1 mole of glucose ($C_6H_{12}O_6$) = 180 g (72 + 12 + 96) Mass of 2 moles of glucose = 180 × 2 = 360 g. Question 8. Calculate tbe molar mass of the following compounds. (a) Urea (NH_2CONH_2) (b) Ethanol(C_2H_5OH); (c) Boric acid (H_3BO_3) [Atomic mass of N – 14, H – 1, C – 12, B – 11, O – 16] Answer: (a) Urea (NH_2CONH_2) = 2(14) + 4(1) + 1(16) + 1(12) = 28 + 4 + 16 + 12 = 60 g (b) Ethanol(C_2H_5OH) = 2(12) + 6(1) + 1(16) = 24 + 6 + 16 = 46 g (c) Boric acid (H_3BO_3) = 3(1) + 1(11) + 3(16) = 3 + 11 + 48 = 62 g Question 9. Mass of one atom of an element is 6.645×10^{-23} g. How many moles of element are there in 0.320 kg. Answer: Mass of one atom of an element = 6.645×10^{-23} g ∴ Mass of 1 mol of atom = $6.645 \times 10^{-23} \times 6.023 \times 10^{23}$ = 40 g Number of moles = The new syllabus helps students score high marks in board exams by completing homework assignments efficiently. The Tamilnadu Samacheer Kalvi 10th Science Solutions Chapter 3 Thermal Physics provides back questions and answers to understand the concepts better. Students are required to choose the correct answer from the options provided for each question. Key points include: - The universal gas constant is 8.31 mol-1 K-1. - When a substance is heated or cooled, its change in mass is negative. - Linear expansion occurs along both axes (X and Y) when a substance is heated or cooled. Temperature is the average of the molecules' kinetic energies. One calorie is defined as the amount of heat energy required to raise the temperature of 1 gram of water through 1°C. The Avogadro number is 6.023 × 1023, and heat and temperature are convertible quantities. According to Boyle's law, the graph between pressure and reciprocal of volume is a straight line. Thermal energy always flows from a system at higher temperature to a system at lower temperature. However, this statement is false according to Charles' law, as the volume is directly proportional to temperature at constant pressure. The correct matches are: - Avogadro number: 6.023 × 1023 - Heat and temperature: convertible quantities - One calorie: amount of heat energy required to raise water's temperature by 1°C Assertions and reasons for questions 1 and 2: 1. Assertion: True, Reason: False (Heat does not always flow from one end of the rod to the other when it is only heated.) 2. Assertion: True, Reason: True (Gases are highly compressible than solids and liquids due to interatomic or intermolecular distance.) **Thermodynamic Properties** * The coefficient of cubical expansion is defined as the ratio of increase in volume per degree rise in temperature to its unit volume. * Boyle's law states that when the temperature of a gas remains constant, the volume of a fixed mass of gas is inversely proportional to its pressure ($P \propto 1/V$). * The law of volume states that when the pressure of a gas remains constant, the volume of a gas is directly proportional to its temperature ($V \propto T$). **Ideal and Real Gases** * Ideal gases obey Boyle's law, Charles's law, and Avogadro's law. * Real gases do not behave ideally due to intermolecular forces. **Coefficients of Expansion** * Coefficient of real expansion: the ratio of true rise in volume per degree rise in temperature to its unit volume (SI unit: K-1). * Coefficient of apparent expansion: the ratio of apparent rise in volume per degree rise in temperature to its unit volume (SI unit: K-1). **Numerical Problems** * Problem 1: A copper rod whose area of cross-section changes from 10 m² to 11 m² due to heating. Find the final temperature given an initial temperature of 90 K and a coefficient of superficial expansion of 0.0021/K. * Problem 2: Calculate the coefficient of cubical expansion of a zinc bar whose volume is increased by 0.25 m³ from 0.3 m³ due to a change in temperature of 50 K. **Ideal Gas Equation** * The ideal gas equation relates the properties of an ideal gas: PV = RT. * It combines Boyle's law, Charles's law, and Avogadro's law. * The constant R is called the universal gas constant (8.31 J/mol-K). **Experiment for Measuring Real Expansion** * This experiment measures the coefficient of real expansion by observing the volume change in a liquid as it is heated. **Apparent Expansion of a Liquid** When you heat a liquid, it initially expands and rises in a container. As the container heats up, the liquid appears to contract and its level drops. However, if you continue heating the liquid, it will eventually expand again and rise to its original level or even higher. The difference between the initial and final levels is called apparent expansion. On the other hand, the difference between the intermediate level (when the container was hot) and the final level is called real expansion. **HOT Question** If you hold ice at 0°C in one hand and water at 0°C in the other, your hand with the ice will feel colder because the ice absorbs energy from your skin as it melts. This process releases more "chillness" or coldness to your hand. **Thermal Physics Questions and Answers** The text then presents a series of multiple-choice questions and answers on thermal physics topics such as temperature scales, ideal gas equations, linear expansion, heat transfer, and more. The questions cover concepts like Kelvin scale, Celsius scale, real and apparent expansions, Avogadro's Number, and the process of convection. Let me know if you'd like me to rephrase anything else! The provided text appears to be a set of multiple-choice questions related to thermodynamics, heat transfer, and physical properties of materials. I'll provide summaries for each question. 1. The correct answer is: (b) 336×10^3 J 2. The correct relation between α, β, and γ is: (c) α = β/2 = γ/3. 3. The correct answer is: (b) Temperature remains the same. 4. The correct answer is: (c) Steam contains more heat than water at the same temperature. 5. The correct expansion coefficient with the largest magnitude is: (c) γ, and the smallest magnitude is α. 6. The correct statement according to the principle of mixtures is: (c) Heat gained by the body. 7. The correct answer is: (c) More water vapour required at high temperatures. 8. The correct reason for solids maintaining constant temperature in a steam heater is: (c) Melting point of solid is 100°C. 9. The correct dependency on atmospheric conditions for saturation air is: (b) Temperature of atmosphere. 10. The correct formula for the volume of a gas at t°C is: $V_t = V_o(1 + \frac{t}{273})$. 11. The correct answer for the quantity of water vapour required to saturate air at higher temperatures is: (c) More. 12. The correct relationship between length (L0) and change in temperature is: $L_0 = \frac{\Delta L}{\alpha\_L \Delta T}$. 13. The correct unit for the coefficient of linear expansion is: K^{-1}. 14. The correct statement regarding the coefficient of superficial expansion is: (c) Different for different materials. 15. The correct ratio of change in area to its original area is: $\frac{\Delta A}{A\_0} = \alpha\_A \Delta T$. 16. According to Boyle's law, the relation between pressure (P) and volume of a gas is: $P \propto 1/V$. 17. At constant temperature of a gas, PV = constant. 18. The correct mathematical form of Charles' law is: $\frac{V}{T}$ = constant. 19. If V is the volume and n is the number of atoms present in it, then: (c) V = n. Please note that I've paraphrased each question to summarize its main point, but not changed the original context or wording. Question 1: True or False - To Avogadro's law $\frac{V}{n}$ = constant Answer: 2. False Question 2: Relation between Celsius and Kelvin is K= C + 273 Answer: 3. True Question 3: When a body is heated mass is not altered. Answer: 5. True Question 4: Cubical expansion is different for different materials. Answer: 7. False Question 5: As per Boyle's law PV= constant. Answer: 9. False Question 6: Match the items in column-I to the items in column-II A - (s) B - (t) C - (p) D - (q) Question 1: Answer: A – (t), B – (s), C – (p), D – (q) Question 2: Answer: A – (s), B – (r), C – (p), D – (q) Question 3: Answer: A – (t), B – (s), C – (p), D – (q) Question 7: Assertion and reason type questions Question 1: Assertion: In a pressure cooker, the water starts boiling again on removing its lid. Reason: The impurities in water bring down its boiling point. Answer: (c) The assertion is true but the reason is false Question 2: Assertion: Air at some distance above the fire is hotter than same distance below it. Reason: Air surrounding the fire carries heat upwards. Answer: (a) Both the assertion and the reason are true and the reason is the correct explanation of the assertion Question 3: Assertion: Woolen clothes keep the body warm in winter. Reason: Air is a poor conductor of heat. Answer: (a) Both the assertion and the reason are true and the reason is the correct explanation of the assertion Question 4: Assertion: Temperature near the sea coast is moderate. Reason: Water has a high thermal conductivity. Answer: (b) Both the assertion and the reason are true but the reason is not the correct explanation of the assertion Question 5: Assertion: It is hotter over the top of fire than at the same distance on the sides. Reason: Air surrounding the fire conducts more heat upwards. Answer: (c) The assertion is true but the reason is false Question 6: Assertion: Perspiration from human body helps in cooling the body Reason: Answer: (True, but reason is not specified) 1. Temperature is the property that determines whether a body is in equilibrium with its surroundings. 2. Gas thermometers are more sensitive than mercury thermometers because the thermal (cubic) expansion of gases is much larger than that of mercury. 3. Thermodynamic temperature refers to the temperature measured on the Kelvin scale, which is defined as the absolute zero point using the kelvin scale. 4. The relationship between different temperature scales: Celsius and Kelvin are related by K = C + 273, while Fahrenheit and Kelvin are related by [K] = (F + 460) × $\frac{5}{9}$, with 0 K equal to -273°C. 5. Not all liquids expand when heated; for example, water contracts from 0°C to 4°C. 6. When two bodies at different temperatures are brought into contact, there will be a transfer of heat energy until thermal equilibrium is established between them. 7. If a cold body is placed in contact with a hot body, some thermal energy will be transferred, causing the temperature of both bodies to rise, but they will eventually reach thermal equilibrium. 8. Invar is used in clock pendulums and springs because it has extremely low thermal expansion, resulting in minimal changes in length between summer and winter, which ensures accurate timekeeping. 9. Heating refers to the process by which heat energy flows from a body at a higher temperature to another body at a lower temperature. 10. The average velocity of molecules in an ideal gas is zero since the velocity components along all axes are equal in magnitude but opposite in direction. 11. When heat is given to a substance, its temperature rises, and it may change state (solid to liquid or liquid to gas), or expand. 12. The absolute scale temperature cannot be negative because it is directly proportional to the kinetic energy of molecules, which can never be negative. 13. Linear expansion refers to the increase in size of an object when heated or cooled. Length of a body changes in response to alterations in its temperature, resulting in linear or longitudinal expansion. Characteristics of an ideal gas include compliance with all gas laws at any value of temperature and pressure, negligible molecular size, and absence of force attraction or repulsion between molecules. The relationship between change in length and coefficient of linear expansion is given by the equation $\Delta L/L_0 = \alpha L \Delta T$, where ΔL represents the change in length (final length minus original length), L_0 is the original length, ΔT denotes the change in temperature (final temperature minus initial temperature), and αL signifies the coefficient of linear expansion. Superficial or areal expansion refers to an increase in area of a solid body due to heating. The coefficient of superficial expansion represents the ratio of increase in area per degree rise in temperature to its unit area, as expressed by the equation $\Delta A/A_0 = \alpha A \Delta T$. Cubical or volumetric expansion occurs when there is an increase in volume of a solid body due to heating. The relationship between change in volume and change in temperature is given by the equation $\Delta V/V_0 = \alpha V \Delta T$, where ΔV denotes the change in volume (final volume minus initial volume), V_0 is the original volume, ΔT represents the change in temperature (final temperature minus initial temperature), and αV signifies the coefficient of cubical expansion. Real expansion of a liquid occurs when it is heated directly without using any container. Apparent expansion of a liquid refers to the expansion observed without considering the expansion of the container. Avogadro's law states that at constant pressure and temperature, the volume of a gas is directly proportional to the number of atoms or molecules present in it, with the equation V α n (or) V/n = constant. Avogadro's number (NA) is the total number of atoms per mole of substance, equal to 6.023×10^{23}/mol. Real gases exhibit intermolecular forces of attraction, whereas ideal gases do not interact with each other. The ideal gas equation relates all properties of an ideal gas and is also referred to as the equation of state due to its ability to provide the relationship between the various properties of a gas. The text covers various thermodynamic concepts, including temperature scales and numerical problems. 1. The thermodynamic scale of temperature is defined as one part of 273.16th of the triple point water's thermodynamic temperature. 2. To convert Celsius to Kelvin, add 273 to the Celsius temperature (e.g., 100°C = 373 K). 3. To convert Kelvin to Celsius, subtract 273 from the Kelvin temperature (e.g., 23 K = -250°C). 4. The change in length of a material over time can be calculated using the formula $\Delta L = \alpha Lt \Delta T$, where α is the coefficient of linear expansion and ΔT is the change in temperature. 5. When the temperature of a material changes, its volume expands or contracts according to the coefficients of cubical and linear expansion. 6. The gas equation PV/T = RT can be used to calculate the volume of a gas at different temperatures and pressures. 7. The coefficient of superficial expansion (change in area) can be calculated using the formula $\Delta A/A = \alpha \Delta T$, where α is the coefficient of cubical expansion and ΔT is the change in temperature. 8. The universal gas constant (R) can be calculated using the ideal gas equation PV/T = RT, given that one mole of a gas at standard temperature and pressure occupies 22.4 liters. 9. When a gas is heated through a certain temperature, its pressure increases by a certain percentage, allowing us to calculate the initial temperature of the gas. 10. Other numerical problems cover various thermodynamic concepts, including the calculation of coefficients of expansion and the use of the ideal gas equation. Each question requires an understanding of thermodynamic principles and the application of formulas to solve problems involving temperature scales, material properties, and gas behavior. Given article text here Looking at the original text, it appears to be a collection of multiple questions related to thermodynamics and physical properties of materials. The text is written in a formal and informative tone, suggesting that it may be from an educational or technical context. The main topics covered include: 1. Calculating pressure exerted by a mixture of gases 2. Minimizing heat transfer in a thermos flask 3. Explaining linear expansion in solids 4. Superficial expansion 5. Cubical expansion Overall, the text seems to be an educational resource that aims to explain various physical concepts and phenomena related to thermodynamics and materials science. At what common temperature does a block of wood and metal appear equally cold or hot when touched? The answer lies in thermal equilibrium, where both the body and our hand have the same temperature, specifically 37°C. If there's no heat transfer, we can't determine if it's hot or cold. Water at room temperature doesn't sublime to steam because its critical temperature is much higher than room temperature. This is due to the unique properties of water that make it resist change at lower temperatures. Good conductors of heat also conduct electricity well, and vice versa, due to the movement of electrons in materials. This phenomenon is rooted in the behavior of atoms and molecules when heated or cooled. Charle's law fails when dealing with low-temperature gases because their molecules interact more strongly, causing them to deviate from ideal gas behavior. At extremely low temperatures, even at absolute zero on the kelvin scale, it becomes impossible for a material to have zero volume. When sugar is added to tea, the temperature decreases due to heat sharing between the two substances. This phenomenon occurs because the sugar molecules absorb and distribute the existing heat evenly. A metal disc with a hole in it will experience an increase in hole size when heated, as expansion occurs due to thermal energy. The kelvin scale measures temperatures from absolute zero onwards; therefore, there is no possibility of achieving negative temperatures on this scale.