LESSON PLAN FOR WEEK ONE 15TH SEPTEMBER, 2023

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| THEME: | Heat |
| DATE: | 14 – 09 – 2023 |
| CLASS: | SS2 |
| TIME: | 10:30am - 11:50am |
| DURATION | 80 MINUTES |
| PERIOD | 2 |
| SUBJECT: | Physics |
| UNIT TOPIC: | Heat Energy |
| LESSON TOPIC: | Types of Thermometers |

SPECIFIC OBJECTIVE: By the end of the lesson, learners should be able to

1. Differentiate between the different types of thermometers
2. Explain the types of thermometers
3. Explain absolute Scale of Temperature

INSTRUCTIONAL RESOURCES: Charts showing thermometers with different thermometric scales.

LESSON PRESENTATION

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| STEP 1 | PREVIOUS KNOWLEDGE: The students are conversant with Ice and Steam points of a thermometer | | Students recall. |
| STEP 2 | EXPLORATION: The teacher arouses the interests of the learners by telling them how a liquid-in-glass thermometer differs from a gas thermometer but both still do the same work when placed in the armpit of a human being, using his chart. | |  |
| STEP 3 | DISCUSSION:  **Thermometers**  Thermometers are instruments used to measure temperature. Thermometers are named using the thermometric properties employed in the measurement of temperature. Each one makes use of the change in the physical properties of materials they are made of, to indicate temperature change.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | NAME OF THEERMOMETER | THERMOMETRIC SUBSTANCE | THERMOMETRIC SUBSTANCE | ADVANTAGE | | 1 | Liquid-in-glass thermometer | Alcohol or mercury | Change in the volume of the liquid with temperature | Portable and easy to use | | 2 | Gas thermometer | Gas | Change of gas pressure at constant volume with temperature | Accurate measurement of temperature and gives wider ranges of temperature | | 3 | Thermocouple thermometer | Two dissimilar metals | Changes in the e.m.f. between two different metals kept at different temperature | Quick response to temperature changes and wider ranges of temperature | | 4 | Resistance thermometer | Resistance wire | Change in electrical resistance of wire with temperature | It responds to a small change in temperature, very accurate and measure wider range of temperature | | 5 | Bimetallic thermometer | Two different metals | The differential expansion of the two metals of the bimetallic strip |  |   Note the following:  1. ***Clinical Thermometer***: This is a form of liquid-in-glass thermometer used in hospitals for measuring the temperature of human body. The temperature of a normal healthy person is about , but it may rise to about in cases of high fever. Thus, the temperature range of the clinical thermometer is .  2. ***Combined maximum and minimum thermometer***: This is a type of mercury – in – glass thermometer used in meteorological stations. It records both the maximum and minimum temperatures for the day.  ***ABSOLUTE SCALE OF TEMPERATURE***  Temperature has no property of direction but has magnitude or size, which depends on the scale being used.  The absolute scale of temperature is thermodynamic scale because it gives us the idea of the lowest possible temperature or absolute zero with the value of .  The ***absolute zero*** is the lowest possible temperature below which nothing can be cooled since temperature is the measure of the average or mean kinetic energy of the molecules of a substance. It follows that as we subtract heat from a substance, its temperature drops and hence its kinetic energy until it eventually becomes zero under which the molecules remain stationary.  The Celsius Scale is the most commonly used scale. This scale is based on two fixed points – the lower fixed point () and the upper fixed point (). The gap between these points is called the ***fundamental interval.***  ***Reasons why water cannot be used as a thermometric liquid***   * It has a small range of expansion * It freezes at and boils at . * It does not expand uniformly (also contracts from 0 to ). * It wets glass. * It is colourless, making the meniscus of the glass difficult to read.   ***COMPARISM OF MERCURY AND ALCOHOL AS THERMOMETRIC LIQUIDS***  ***Advantages of mercury over alcohol***  1. Mercury has a much greater conductivity than alcohol and expands rapidly and thus indicates a  temperature change quickly, alcohol being a poor conductor responds slowly.  2. Mercury is opaque because of its silvery surface and can be easily seen in a glass. Alcohol has to be coloured in order to be seen.  3. Mercury does not wet glass; alcohol does and this can lead to an inaccurate result during  measurement.  4. Mercury is not easily vaporized; alcohol does even at low temperature.  5. Mercury boils at while alcohol boils at , mercury can therefore be used to measure  higher temperature than alcohol.  ***Advantages of alcohol over mercury***  1. Alcohol freezes at while mercury freezes at , alcohol can therefore be used to  measure lower temperatures than mercury.  2. The expansivity of alcohol is about six times that of mercury for the same temperature rise. | | Students listen attentively and take down notes. |
| STEP 4 | APPLICATION:  To convert from one scale to another, use interpolation technique.            Fahrenheit scale Celsius scale Kelvin scale  Where:  F is the unknown in Fahrenheit scale;  C is the unknown in the Celsius scale  K is the unknown in the Kelvin scale  The formula below can be used | | Students ask questions on the topic which the teacher answers. |
| STEP 5 | EVALUATION: The teacher evaluates the students using the following:   1. What is a thermometer? 2. Differentiate between a clinical thermometer and a resistance thermometer? 3. Explain absolute scale of temperature? | | The students answer the questions. |
| Assignment   1. The length of mercury thread when it is at , and at an unknown temperature is , and respectively. Find the value of θ? 2. The pressure at ice point for a constant volume gas is . while that at the steam point is . What temperature will this thermometer indicate at .   References  **Extensive physics for Senior Secondary Schools and Colleges, by OSINUBI SAHEED et al. New School Physics for SS2 by M.W ANYAKOHA {Ph D}. Senior Secondary Physics for SS2 by P. N OKEKE et al.** | |  |