

APPENDIX I

Sample Lessons of the Control Groups

Sample 1: Occurrence and allotropic forms of Phosphorous

Teacher: Today we'll learn Phosphorous. Anyone who can tell me the symbol of phosphorous.

S: P

T: Good. The symbol of Phosphorous is P. The atomic number is 15 and the atomic weight is 31. Phosphorous is a very reactive element and so it is not found free in nature. It is found in the compound form. The chief minerals of phosphorous are Phosphorite, Fluorapatite and Chlorapatite (teacher writes the formula of the minerals on the board). Phosphorous is present in the compound form in the body of animals and plants. Your bones are made of phosphorous compounds. P is obtained by heating the minerals with coke and sand in an electric furnace. P shows allotropy. What is allotropy?

S: Existing in different forms.

T: An element which shows different physical forms but the same chemical composition is called allotropy. P exhibits mainly three allotropic forms 1) white or yellow phosphorous, 2) red phosphorous and 3) black phosphorous. Ordinary P is white in colour and it turns yellow when exposed to light. It is a soft solid and can be cut easily with a knife. It catches fire if exposed to air. This is because it is highly reactive. P is reactive because of its special structure. (Teacher draws the structure on the board and continues with the explanation).

T: What is the molecular formula of P?

S: P₄.

T: What is the atomic number?

S: 15.

T: What is the atomic weight?

S: 31.

T: What are the allotropic forms?

S: Yellow, red and black phosphorous.

T: Write down this question and answer. How does P occur in nature? Give its important minerals.

Teacher dictates the answer.

Sample 2: Exothermic and Endothermic Reactions

T: What do we do when we want heat?

S: We burn wood, coal.

S: Switch on a heater.

S: Burn kerosene.

S: We burn things.

T: Burning of coal, kerosene etc., are chemical changes. When coal burns carbon dioxide and heat are produced. When wood is burned the carbon present in the wood combines with oxygen to form carbon dioxide. The hydrogen present in the wood combines with the oxygen in the air producing water. There are many other chemical reactions where heat is produced when the reaction occurs. Such reactions are called Exothermic reactions. Other examples of exothermic reactions are: 1) carbon dioxide is produced when carbon monoxide is burned in oxygen i.e., $\text{CO} + \text{O} \rightarrow \text{CO}_2 + 67.6 \text{ K cal.}$ (teacher writes the equation on the blackboard). A lot of heat is produced in this reaction and so it is called an exothermic reaction. 2) when hydrogen burns in oxygen a lot of heat is produced, about 57.8 kilo calories of heat. The equation for the reaction is $\text{H}_2 + \text{O} \rightarrow \text{H}_2\text{O} + 57.8 \text{ K. Cal.}$ Exo means giving out and thermic is connected to heat. Therefore, exothermic reactions are where heat is given out during the reaction.

The teacher then goes on to explain endothermic reactions.

T: Take down this question and answer. Define exothermic reaction and give two examples.

Teacher dictates the notes to the students.
