

Appendix A. The name and focus of each experiment

NOE	The name of the Experiment	Focus of the Experiment
1	Density	In this experiment, the PSTs focused on how density of a smooth shaped matter and non-smooth shaped matter can be calculated.
2	Separation of mixture	The activity consists of the separation of different solutions such as C ₂ H ₅ OH and water, oil and water, sand and NaCl, and extraction of spinach or grass.
3	Chemical and physical changes	The experiment focused on investigating what can kind of changes can be classified as chemical or physical changes. In this context, students investigated the effect of heat on naphthalene, Cu(SO ₄) ₂ · 5H ₂ O, NH ₄ Cr ₂ O ₇ and the effect of HCl and water on NaHCO ₃ .
4	Fundamental laws of chemistry	The focused of the experiment was the law of conservation of mass and the law of constant proportions. The students heated and calculated the mass of Fe and S and worked on combustion of Mg for this experiment.
5	Preparation, dilution and concentration of solutions	The students focused on to prepare, dilute and concentrate of a solution. For this purpose, the students prepared two different solution of K ₂ CrO ₄ and HCl, and then they added water for dilution and heated for concentrating the solution.
6	Identification of Acids-base and salts	The experiment focused identification of acids, bases and salts using different indicators. In this context, HCl, CH ₃ COOH, KOH, NH ₃ , CH ₃ COONa, NH ₄ Cl, NaCl were used as acids, bases and salts and red cabbage, litmus papers and universal indicator were used as indicators.
7	Redox reactions	In this experiment, the students performed redox reactions and focused on writing its equations. Students used KMnO ₄ , H ₂ SO ₄ , K ₂ Cr ₂ O ₇ , FeSO ₄ to perform two experiments.
8	Precipitation reactions	In this experiment, the students performed precipitation reactions and focuses on writing its equations. Students used NH ₄ Cl, KBr, Na ₂ SO ₄ , NaOH, FeSO ₄ , Pb(NO ₃) ₂ , CH ₃ COONa, CaCO ₃ , and BaCl ₂ to perform seven experiments.
9	Gases	The students investigated diffusion of gases, and the effect of heat on the motion of gases. Students used NH ₃ , HCl and heat to perform experiment.
10	Metals	The students investigated the characteristic color of metals on fire. For this purpose, they performed the fire test to investigate the effect of heat on the metals of the first and second group. For this purpose, they used Na, K, Ca, Ba metals.
11	Chemical reactions	The focus of the experiment was whether or not the chemical reactions can be grouped. In this context, the student performed combustion, redox, and dissolution-precipitation reactions. In the combustion reaction, they used Cu metal. In the redox reaction, they used Zn metal and HCl. In the dissolution-precipitation reaction, they used Pb(NO ₃) ₂ and KI.
12	Reaction rate	In this experiment, students focused on how the rate of a reaction can be calculated. The decay rate (decomposition) of H ₂ O ₂ was observed taking into account the volume of the oxygen that accumulated in the gas accumulation tube.
13	Factors effecting to reaction rate	The activity focused on concentration, heat, contact surface and catalyst effect on reaction rate. The students used Na ₂ S ₂ O ₃ , HCl, and five different test tubes to understand how the reaction rate changes for effect of concentration on reaction rate. The PSTs heated Na ₂ S ₂ O ₃ , HCl, and five different test tubes for different temperatures to understand how the reaction rate changes for effect of concentration on reaction rate. The PSTs used powder chalk and a piece of chalk to understand the effect of contact surface

		on reaction rate. The PSTs inserted a calcined match into H_2O_2 solution. In another baker, the PSTs put a calcined match into H_2O_2 with MnO_2 (catalyst) to investigate the effect of catalyst on reaction rate.
14	Factors effecting to Chemical equilibrium	This activity focused on how the addition of a substance affects chemical equilibrium. Students used K_2CrO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$, HCl , and NaOH substances and three different test tubes to determine how chemical equilibrium was affected by addition of a substance. Moreover, the students used NaCl and $\text{Cu}(\text{NO}_3)_2$ to investigate the effect of the heat on chemical equilibrium.
15	Acid-base titration	The activity included titration of a strong acid with a known concentration and volume and a strong base with a known volume. In this experiment, students determined which formula and indicator can be used to calculate the concentration of an unknown base solution. HCl and NaOH were used as acid and bases and phenolphthalein as an indicator.
16	Solubility of solutions	The activity focused on whether or not all substances dissolve in every solution. Students used different solvents and different substances. NaCl , I_2 , and olive oil were provided as solute; H_2O and $\text{C}_2\text{H}_5\text{OH}$ were provided as solvent.
17	Equilibrium of solubility	The experiment focused on the criteria of precipitation and common ion effect on the equilibrium of solubility. The students used $\text{Pb}(\text{NO}_3)_2$ and KI to perform experiment.
18	Calculation of molecular mass	This activity included calculation of the molecular mass of a metal with two atomicity. For this, students used Mg metal and HCl and determined the pressure of a gas on the water. They used equations and formulas to calculate the molecular mass of the metal.
19	Electrochemistry	In this activity, students tried to understand whether or not every metal reacts with acids. In this context, they considered the activity of the metals and the characteristic of the acids. They examined Zn , Cu , and Fe metals and HCl and HNO_3 .
20	Soap production	Here, students focused on soap production and how soap cleans dirt.

NOE= Number of Experiments