Types of chemical reactions

Experiment 1.

Decomposition reaction

Laboratory equipment:

- 3 test tubes in a rack (1 dry)
- gas burner
- torch (wooden stick)
- handle on the tube

Chemicals:

- crystalline $KMnO_4$

Pour into each of two test tubes approximately 2 cm^3 of distilled water. Drop a few crystals of potassium permanganate $KMnO_4$ to the firs one and notice color of the solution. Pour few crystals of $KMnO_4$ into a third - dry test tube. Heat the contents of the tube carefully over the burner. Place the smoldering torch in the test tube to check the evolution of oxygen. After the decomposition of the contents, pour it into the second test tube with distilled water. Observe the green color of the solution due to the presence of $KMnO_4$.

Experiment 2.

Synthesis

Laboratory equipment:

- iron plate
- gas burner
- metal pliers

Chemicals:

- powder mixture of Zn and S (weight ratio Zn: S = 2:1)

Place the small amount of powder mixture of zinc and sulfur on the center of the iron plate and heat up over the burner. Observe formation of zinc sulfide.

Experiment 3.

Double exchange (double displacement) reactions

Laboratory equipment:

- 3 test tubes in a rack

Chemicals:

- $BaCl_2$
- $Pb(NO_3)_2$
- H_2SO_4
- NaOH
- KI

Pour approximately 1 cm^3 of barium chloride $BaCl_2$ to each of three test tubes. Add sequentially approximately 1 cm^3 of sulfuric acid H_2SO_4, sodium chloride NaOH and potassium iodide KI. Observe the reactions. Perform similar reactions to plumbous nitrate $Pb(NO_3)_2$.

Experiment 4.

Single displacement (substitution) reactions

Laboratory equipment:

2 test tubes in a rack

Chemicals:

- Fe (plate or rod)
- Zn (plate or rod)

- 0.1 M $CuSO_4$
- 1 M HCl

Clear the plates(rods) with sandpaper, wash with distilled water and degrease with alcohol. Pour sequentially approximately 2 cm^3 of salt acid and copper (II) sulfate $CuSO_4$ to the test tubes. Dip the iron plate in first test tube. Observe the evolution of hydrogen. Then dip Fe in the second test tube. Watch the deposited copper. Perform analogous experiments with zinc.

Experiment 5.

Redox reactions

Laboratory equipment:
- 3 test tubes in a rack

Chemicals:
- $KMnO_4$
- $NaHSO_3$
- H_2SO_4
- NaOH

Pour approximately 5 drops of potassium permanganate $KMnO_4$ solution to each of 3 test tubes. Add 5 drops of sulfuric acid H_2SO_4 to the test tube 1, 5 drops of distilled water to the test tube 2 and 5 drops of sodium hydroxide NaOH to the test tube 3. Then add 5 drops of sodium hydrosulfite $NaHSO_3$ to each tube. Observe a color change in each of the tubes.

Experiment 6.

Exothermic reaction

Laboratory equipment:
- 1 test tube

Chemicals:
- magnesium
- 1M CH_3COOH

Pour approximately 1g (1 pinch) of magnesium in a test tube. Add approximately 1 cm^3 of solution of 1M CH_3COOH. Observe a significant increase in the temperature and evolution of hydrogen.

$$Mg + 2CH_3COOH = (CH_3COO)_2\,Mg + H_2 + Q$$

20..../.... **Gr.**	*Name, surname:* *Temat:* **Types of chemical reactions**	*Assistant signature*

Reaction type	Course of the reaction	Change of oxidation state	Observations, conclusions
Experiment 1. Decomposition of potassium permanganate			
analysis, redox, heterogenic	$2\ KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$	$Mn^{+VII} \rightarrow Mn^{+VI}$ reduction $Mn^{+VII} \rightarrow Mn^{+IV}$ reduction $O^{-II} \rightarrow O^0$ oxidation	evolution of oxygen, color change: raspberry to green
Experiment 2. Synthesis of zinc sulfide			
	$Zn + S =$		
Experiment 3. Double displacement reactions			
1.double exchange, heterogenic	$BaCl_2 + H_2SO_4 = BaSO_4\downarrow + HCl$	–	white precipitate
2.	$BaCl_2 + NaOH =$		
3.	$BaCl_2 + KI =$		
4.	$Pb(NO_3)_2 + H_2SO_4 =$		
5.	$Pb(NO_3)_2 + NaOH =$		
6.	$Pb(NO_3)_2 + KI =$		
Experiment 4. Substitution reactions			
1. siubstitution, redox, heterogenic	$Fe + HCl = FeCl_2 + H_2\uparrow$	$Fe^0 \rightarrow Fe^{+II}$ oxidation $2H^+ \rightarrow H_2^0$ reduction	evolution of hydrogen
2.	$Zn + HCl =$		
3.	$Fe + CuSO_4 =$		
4.	$Zn + CuSO_4 =$		
Experiment 5. Redox reactions			
1.redox, homogenic	$2KMnO_4 + 5NaHSO_3 + 3H_2SO_4 =$ $= 2MnSO_4 + K_2SO_4 + 5NaHSO_4 + 3H_2O$	$Mn^{+VII} \rightarrow Mn^{+II}$ red. $S^{+IV} \rightarrow S^{+VI}$ oxidation	color change: raspberry to colorless
2.	$KMnO_4 + NaHSO_3 + H_2O = MnO_2$ $+NaHSO_4 + KOH$ *(balance the reaction)*		

3.	$KMnO_4 + NaHSO_3 + NaOH = K_2MnO_4 + Na_2MnO_4 + NaHSO_4 + H_2O$ *(balance the reaction)*		
Experiment 6. Exothermic			
	$Mg + CH_3COOH =$		