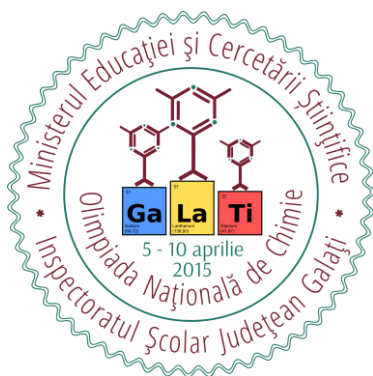




MINISTERUL EDUCAȚIEI ȘI CERCETĂRII ȘTIINȚIFICE
INSPECTORATUL ȘCOLAR JUDEȚEAN GALAȚI
OLIMPIADA NAȚIONALĂ DE CHIMIE
EDIȚIA a XLIX-a
GALAȚI
5-10 APRILIE 2015

Barem de evaluare și de notare
Proba practică
Clasa a VIII-a

Subiectul IA **(65 de puncte)**

Tabelul 1. Rezultatele obținute în urma identificării:

Nr. probă Reactiv	1	2	3	4	5	punctaj
Na_2S	$\text{Al}(\text{OH})_3 \downarrow$ precipitat alb gelatinos	$\text{SnS} \downarrow$ precipitat maro (chocolat)	X	$\text{CdS} \downarrow$ precipitat galben	$\text{ZnS} \downarrow$ precipitat alb (alb pulverulent)	24 de puncte
H_2SO_4	X	X	$\text{BaSO}_4 \downarrow$ pp. alb pulverulent	X	X	
NH_3	$\text{Al}(\text{OH})_3 \downarrow$ precipitat alb gelatinos	$\text{Sn}(\text{OH})_2 \downarrow$ precipitat alb	X	$\text{Cd}(\text{OH})_2 \downarrow$ precipitat alb gelatinos	$\text{Zn}(\text{OH})_2 \downarrow$ precipitat alb gelatinos	
NH_3 exces	nu se dizolvă	nu se dizolvă	X	Se dizolvă cu formare de $[\text{Cd}(\text{NH}_3)_4]^{2+}$	se dizolvă cu formare de $[\text{Zn}(\text{NH}_3)_4]^{2+}$	
NaOH	$\text{Al}(\text{OH})_3 \downarrow$ precipitat alb gelatinos	$\text{Sn}(\text{OH})_2 \downarrow$ precipitat alb	X	$\text{Cd}(\text{OH})_2 \downarrow$ precipitat alb gelatinos	$\text{Zn}(\text{OH})_2 \downarrow$ precipitat alb gelatinos	
NaOH exces	se dizolvă cu formare de $[\text{Al}(\text{OH})_4]^-$	se dizolvă cu formare de $[\text{Sn}(\text{OH})_4]^{2-}$	X	nu se dizolvă	se dizolvă cu formare de $[\text{Zn}(\text{OH})_4]^{2-}$	
Cationul identificat	Al^{3+}	Sn^{2+}	Ba^{2+}	Cd^{2+}	Zn^{2+}	20 de puncte

Tabelul 2

Nr. crt.	Cationul identificat	Reactivul	Reacții	Punctaj
1	Al^{3+}	Na_2S	$\text{S}^{2-} + \text{H}_2\text{O} \rightleftharpoons \text{HS}^- + \text{HO}^-$; $\text{HS}^- + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{S} \uparrow + \text{HO}^-$ $\text{Al}^{3+} + 3 \text{HO}^- \rightarrow \text{Al}(\text{OH})_3 \downarrow$	5 puncte
		H_2SO_4	X	
		NH_3	$\text{NH}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NH}_4^+ + \text{HO}^-$ $\text{Al}^{3+} + 3 \text{HO}^- \rightarrow \text{Al}(\text{OH})_3 \downarrow$	
		NH_3 exces	X	
		NaOH	$\text{Al}^{3+} + 3 \text{HO}^- \rightarrow \text{Al}(\text{OH})_3 \downarrow$	
		NaOH exces	$\text{Al}(\text{OH})_3 \downarrow + \text{HO}^- \rightarrow [\text{Al}(\text{OH})_4]^-$	
2	Sn^{2+}	Na_2S	$\text{Sn}^{2+} + \text{S}^{2-} \rightarrow \text{SnS} \downarrow$	4,5 puncte
		H_2SO_4	X	
		NH_3	$\text{NH}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NH}_4^+ + \text{HO}^-$ $\text{Sn}^{2+} + 2 \text{HO}^- \rightarrow \text{Sn}(\text{OH})_2 \downarrow$	
		NH_3 exces	X	
		NaOH	$\text{Sn}^{2+} + 2 \text{HO}^- \rightarrow \text{Sn}(\text{OH})_2 \downarrow$	
		NaOH exces	$\text{Sn}(\text{OH})_2 \downarrow + 2 \text{HO}^- \rightarrow [\text{Sn}(\text{OH})_4]^{2-}$	
3	Ba^{2+}	Na_2S	X (posibil: $\text{Ba}^{2+} + \text{SO}_3^{2-} \rightarrow \text{BaSO}_3 \downarrow$ $\text{Ba}^{2+} + \text{SO}_4^{2-} \rightarrow \text{BaSO}_4 \downarrow$)	1,5 puncte
		H_2SO_4	$\text{Ba}^{2+} + \text{SO}_4^{2-} \rightarrow \text{BaSO}_4 \downarrow$	
		NH_3	X	
		NH_3 exces	X	
		NaOH	X	
		NaOH exces	X	
4	Cd^{2+}	Na_2S	$\text{Cd}^{2+} + \text{S}^{2-} \rightarrow \text{CdS} \downarrow$	4,5 puncte
		H_2SO_4	X	
		NH_3	$\text{NH}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NH}_4^+ + \text{HO}^-$ $\text{Cd}^{2+} + 2 \text{HO}^- \rightarrow \text{Cd}(\text{OH})_2 \downarrow$	
		NH_3 exces	$\text{Cd}(\text{OH})_2 \downarrow + 4 \text{NH}_3 \rightarrow [\text{Cd}(\text{NH}_3)_4](\text{OH})_2$	
		NaOH	$\text{Cd}^{2+} + 2 \text{HO}^- \rightarrow \text{Cd}(\text{OH})_2 \downarrow$	
		NaOH exces	X	
5	Zn^{2+}	Na_2S	$\text{Zn}^{2+} + \text{S}^{2-} \rightarrow \text{ZnS} \downarrow$	5,5 puncte
		H_2SO_4	X	
		NH_3	$\text{NH}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NH}_4^+ + \text{HO}^-$ $\text{Zn}^{2+} + 2 \text{HO}^- \rightarrow \text{Zn}(\text{OH})_2 \downarrow$	
		NH_3 exces	$\text{Zn}(\text{OH})_2 \downarrow + 4 \text{NH}_3 \rightarrow [\text{Zn}(\text{NH}_3)_4](\text{OH})_2$	
		NaOH	$\text{Zn}^{2+} + 2 \text{HO}^- \rightarrow \text{Zn}(\text{OH})_2 \downarrow$	
		NaOH exces	$\text{Zn}(\text{OH})_2 \downarrow + 2 \text{HO}^- \rightarrow [\text{Zn}(\text{OH})_4]^{2-}$	

Tabelul 3

				punctaj	
Ecuția/ ecuațiile reacțiilor chimice ce au loc la adaos de KOH	$\begin{aligned} \text{Fe}^{3+} + 3 \text{HO}^- &\rightarrow \text{Fe}(\text{OH})_3 \downarrow \\ \text{Al}^{3+} + 3 \text{HO}^- &\rightarrow \text{Al}(\text{OH})_3 \downarrow \\ \text{Cr}^{3+} + 3 \text{HO}^- &\rightarrow \text{Cr}(\text{OH})_3 \downarrow \\ \text{Mn}^{2+} + 2 \text{HO}^- &\rightarrow \text{Mn}(\text{OH})_2 \downarrow \\ \text{Al}(\text{OH})_3 \downarrow + \text{OH}^- &\rightarrow [\text{Al}(\text{OH})_4]^- \\ \text{Cr}(\text{OH})_3 \downarrow + \text{OH}^- &\rightarrow [\text{Cr}(\text{OH})_4]^- \end{aligned}$			12 puncte	
Procesul de filtrare	Filtratul conține: $[\text{Al}(\text{OH}_4)]^-$ și $[\text{Cr}(\text{OH})_4]^-$	Precipitatul este alcătuit din: $\text{Mn}(\text{OH})_2$ și $\text{Fe}(\text{OH})_3$	8 puncte		
Ecuția/ ecuațiile reacțiilor chimice la adaos de H_2O_2	$2 [\text{Cr}(\text{OH})_4]^- + 3 \text{HO}_2^- \rightarrow 2 \text{CrO}_4^{2-} + 5 \text{H}_2\text{O} + \text{HO}^-$			5 puncte	
Ecuția/ ecuațiile reacțiilor chimice la adaos de CH_3COOH	$[\text{Al}(\text{OH})_4]^- + \text{H}_3\text{O}^+ \rightarrow \text{Al}(\text{OH})_3 \downarrow + 2 \text{H}_2\text{O}$			5 puncte	
Caracterizarea sistemului	Soluția conține CrO_4^{2-} (K^+ , CH_3COO^- , CH_3COOH) Precipitatul este alcătuit din $\text{Al}(\text{OH})_3$	Masa de precipitat	0,39 g	5 puncte	