Z I N C

General analytical conditions

STOCK SOLUTION

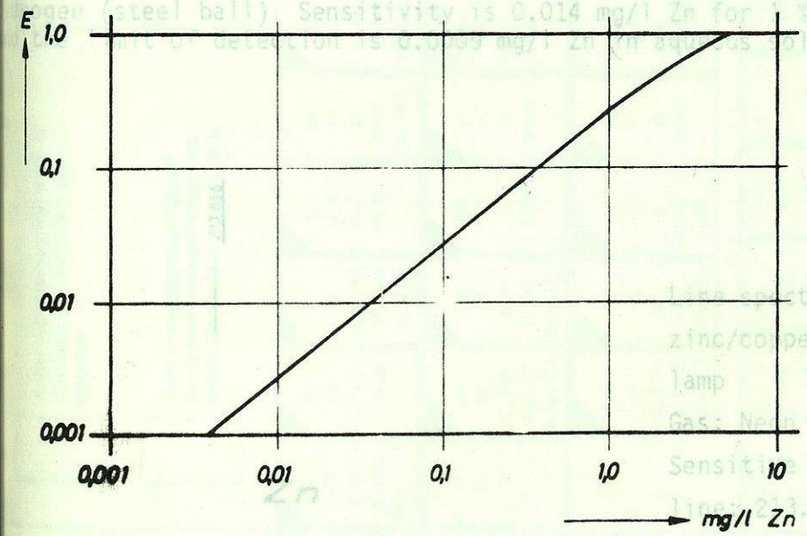
Dissolve 1.000 g metallic Zn in about 3 ml conc. HC l and make up to 1 l.
This solution contains 1000 mg/l Zn.

INSTRUMENT SETTING

Wavelength	427.7	213.9 nm
Barrier filter	I	
Slit	0.1 mm	0.3 nm
Burner	universal	
Burner height	8 - 9	
Support gas	15.5	air
Fuel gas	8 - 9 *	acetylene
Lamp current	15 mA	normal

* Set to minimum flame absorption with blank solution.

TYPICAL CALIBRATION CURVE with the instrument setting given



SENSITIVITY 0.012 mg/l Zn for 1 % absorption in aqueous solution.

LIMIT OF DETECTION 0.002 mg/l Zn in aqueous solution.

INTERFERENCES

So far no interferences have been observed in the air/acetylene flame.

POINTS ON ANALYSIS

Slit width:

Slit width can be increased to 0.5 mm if Cu-free hollow cathode lamp is used.

Lamp current:

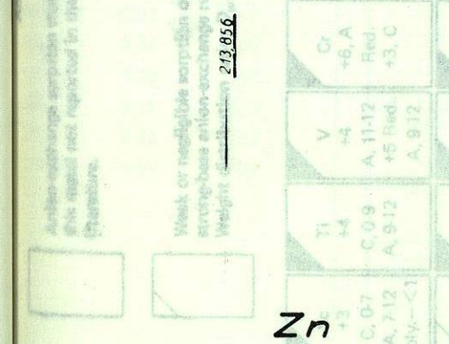
With increasing current the sensitivity of the measuring set-up is reduced. Ideal amperage: 7 - 10 mA.

Air/propane flame:

Sensitivity is by about 40 % higher than in the air/acetylene flame with propane burner and with 15.5 scale divisions air and 4-5 scale divisions propane (set to minimum intrinsic absorption of flame). But the worse reading stability does not improve the detection limit.

Air/hydrogen flame:

Maximum reading stability and limit of detection is obtained when using universal burner with 16.5 scale divisions air and 5-6 scale divisions hydrogen (steel ball). Sensitivity is 0.014 mg/l Zn for 1 % absorption and the limit of detection is 0.0009 mg/l Zn in aqueous solutions.



Line spectrum of a zinc/copper hollow cathode lamp
Gas: Neon
Sensitive analytical line: 213.9 nm

Anion-exchange behavior

Anion-exchange sorption study of this metal not reported in the literature.

Weak or negligible sorption on strong-base anion-exchange resin. Weight distribution ratio: $D_w < 5$.

Moderate sorption: $5 < D_w < 50$.

Strong sorption: $D_w > 50$.

Li +1 C	Be +2 C											B	C	N	O	F	
Na +1 C	Mg +2 C											Al +3 C	Si	P	S	Cl	
K +1 C	Ca +2 C	Sc +3 C, 0-7 A, 7-12 Poly.—<1	Ti +4 C, 0-9 A, 9-12	V +4 A, 11-12 +5 Red. A, 9-12	Cr +6, A Red. +3, C	Mn +2 C, 0-11 A ~ 12	Fe +3 C, 0-1 A, 1 M +2A >10	Co +2 C, 0-6 A, 6-12	Ni +2 C	Cu +2 C, 0-4 A, 4-12	Zn +2 C, 0-1 A, 4-12	Ga +3 A > 0.5 M	Ge +4 C, 0-8 A, 8-12	As +3 A > 5 +5 C	Se +4 A	Br	
Rb +1 C	Sr +2 C	Y +3 C	Zr +4 C, 0-6 A, 6-12 Poly. <1	Nb +5 A > 0.1 M Poly. <1	Mo +6 A 1 M	Tc +7 A Inert	Ru +4 A > 1 M	Rh +4 A Inert	Pd +2 A > 0.1 M Inert	Ag +1 Insol. 0-6 A > 6M	Cd +2 C, 0-1 A, 1-12	In +3 C?	Sn +2, A >1 M +4 A	Sb +3 A +5 A > 5	Te +4 A > 3 M	I	
Cs +1	Ba +2		Hf +4 C, 0-7 A, 7-12 Poly. <1	Ta +5 A > 0.1 Poly. <1	W +6 A Poly. Hyd.	Re +7 A Inert	Os +3, +4 A > 0.1 M	Ir +4 A > 0.1 M Inert	Pt +4 A > 0.1 M Inert	Au +3 A > 0.1 M Inert	Hg +2 A Inert	Tl +3, A +1 Insol.	Pb +2 C Sl. Sol.	Bi +3 A > 0.5 M	Po +4 A	At	
Fr +1 C	Ra +1 C	La +3 C	Ce +3 C	Pr +3 C	Nd +3 C	Pm +3 C	Sm +3 C	Eu +3 C	Gd +3 C	Tb +3 C	Dy +3 C	Ho +3 C	Er +3 C	Tm +3 C	Yb +3 C	Lu +3 C	
		Ac +3 C	Th +4 C	Pa +5 A > 4 M	U +6 A > 1 M +4 A 6 M												

Anion-exchange behavior in chloride systems (0-12 Molar)

Fig. 1

UMN PREPARATION

APAK beads do not crush or ure easily and may be packed y into GC columns. For best re-, the packing material should dded to the column through a el in small amounts -- a frac- of a cubic centimeter. This is gh material to fill 5 to 7.5 cm 3 in.) in column length at a . After each addition, the col- should be vibrated or gently ed to insure the column is ed tightly and has a low void me. The efficiency of the col- is directly dependent upon how the column is packed.

column should be conditioned carrier flow for at least two s at about 25 to 50°C below emperature limit of the PORA- . While the column is condition- he effluent end should not be ected to the detector. For y efficient columns more ma- l should be added to the effluent of the column at the end of the itioning period to fill any voids. column should be further con- ned for an additional half hour. highest sensitivity, the column d be conditioned overnight. porous polymers will discolor heating, but this does not t the separation.

BLE III. PHYSICAL PROPERTIES R PORAPAK POROUS POLYMERS

Surface (m^2/gm)	Density (g/cm^3)	Maximum Temperature (°C)
100-200	0.27	250
500-600	0.34	250
450-600	0.30	250
300-450	0.35	250
225-350	0.38	190
250-350	0.43	190

TABLE IV. RETENTION TIMES ON PORAPAK POROUS POLYMERS (MINUTES)

	COMPOUND	P	Q	R	S	N	T
ACIDS	Acetic Acid	0.39	1.08	2.14	3.68	4.18	5.21
	Propionic Acid	0.65	2.42	4.75	9.05	9.11	10.68
	iso-Butyric Acid	0.91	4.43	8.28	16.41	16.32	18.13
	Butyric Acid	1.05	5.22	9.87	19.71	19.80	22.30
	iso-Valeric Acid	1.52	9.69	16.85	36.81	36.79	39.50
	Valeric Acid	1.89	12.12	21.70	45.70	45.30	48.90
ALCOHOLS	Methanol	0.24	0.35	0.39	0.48	0.61	0.69
	Ethanol	0.30	0.60	0.63	0.76	1.21	1.20
	iso-Propyl alcohol	0.37	0.91	0.89	1.03	1.79	1.90
	tert-Butyl alcohol	0.38	1.40	1.35	1.69	2.56	2.67
	n-Propyl alcohol	0.43	1.22	1.24	1.53	2.52	2.60
	sec-Butyl alcohol	0.50	1.93	1.85	2.40	3.69	3.81
	iso-Butyl alcohol	0.61	2.18	2.16	2.72	4.63	4.74
	tert-Pentyl alcohol	0.62	3.17	2.90	3.78	5.87	5.84
	n-Butyl alcohol	0.69	2.58	2.68	3.39	5.78	5.71
	iso-Pentyl alcohol	1.07	4.87	4.75	6.14	10.82	10.76
	n-Pentyl alcohol	1.10	5.63	5.67	7.04	12.88	12.40
ALDEHYDES	Acetaldehyde	0.24	0.44	0.39	0.49	0.65	0.71
	Propionaldehyde	0.35	0.87	0.79	0.97	1.44	1.46
	Acrolein	0.35	0.81	0.77	0.91	1.44	1.52
	iso-Butyraldehyde	0.46	1.51	1.37	1.67	2.54	2.50
	Butyraldehyde	0.54	1.77	1.62	1.96	3.07	3.04
ALKANES	Pentane	0.34	1.24	1.02	1.19	1.39	1.10
	Hexane	0.48	2.56	2.03	2.46	3.00	2.20
	Heptane	0.73	5.26	4.27	5.03	6.22	4.39
	Octane	1.14	10.99	8.54	10.36	13.28	8.94
ARYLS	Benzene	0.87	2.76	2.56	3.00	4.00	3.74
	Toluene	1.33	5.72	5.31	6.41	8.54	7.61
	Ethyl Benzene	2.09	11.60	10.69	12.98	17.58	15.05
	o-Xylene	2.52	13.48	12.53	15.32	20.79	18.05
CHLOROALKYLS	Methylene Chloride	0.41	0.98	0.94	1.09	1.48	1.67
	Chloroform	0.59	1.89	1.76	2.15	2.91	3.04
	Carbon Tetrachloride	0.75	2.87	2.42	2.98	3.49	3.04
	1,2-Dichloroethane	0.78	2.28	2.16	2.56	3.84	4.09
	1,2-Dichloropropane	0.98	3.84	3.47	4.23	6.29	6.37
ESTERS	Methyl formate	0.27	0.51	0.53	0.57	0.91	0.94
	Methyl acetate	0.38	1.01	0.97	1.11	1.74	1.75
	Ethyl acetate	0.52	1.99	1.83	2.15	3.30	3.16
	Methyl propionate	0.57	1.99	1.83	2.15	3.30	3.16
	iso-Propyl acetate	0.65	3.18	2.75	3.38	5.22	4.89
	Propyl acetate	0.83	4.09	3.56	4.36	6.91	6.57
	Butyl acetate	1.39	8.78	7.35	9.44	14.60	13.88
ETHERS	Diethyl ether	0.33	1.41	0.98	1.27	1.45	1.28
	iso-Propyl ether	0.52	2.99	2.40	2.92	3.94	3.20
	Dibutyl ether	1.94	19.64	14.55	19.11	26.95	20.25
GLYCOLS	Ethylene glycol	0.94	2.39	3.36	4.19	9.34	12.43
	2,3-Butanediol	1.41	6.06	–	–	–	–
	1,3-Propanediol	1.83	6.06	–	–	–	–
	1,3-Butanediol	2.19	9.64	–	–	–	–
	1,4-Butanediol	3.38	13.97	–	–	–	–
	Diethylene glycol	4.21	16.95	–	–	–	–
	Glycerol	4.92	19.15	–	–	–	–
KETONES	Acetone	0.33	0.89	0.81	0.96	1.59	1.66
	2-Butanone	0.53	1.82	1.59	1.95	3.22	3.17
	2-Pentanone	0.80	3.67	3.17	4.02	6.63	6.32
NITRILES	Acetonitrile	0.38	0.75	0.76	0.87	1.50	1.85
	Propionitrile	0.44	1.02	1.01	1.16	1.97	2.23
	Acrylonitrile	0.55	1.40	1.37	1.62	2.91	3.34
ADDITIONAL COMPOUNDS	Nitromethane	0.53	1.02	1.13	1.26	2.54	2.99
	Dioxane	0.98	3.35	2.84	3.39	5.28	5.91
	Pyridine	1.35	4.34	4.06	4.59	7.53	7.24
	Dimethyl sulfoxide	2.60	8.70	7.85	8.38	19.50	23.62
	Phenol	4.04	15.11				
	Benzyl alcohol	6.73	30.62				

Operating Conditions: 1 meter x 2.3 mm ID, stainless steel column, 80 - 100 mesh, 175°C, 25 ml/min N_2 flow, FID.

65

CALBIOCHEM

PRESENTS PROPERTIES OF THE L (NATURAL) AMINO ACIDS:

Name	Formula	Mol. Wt.	% Composition C	% Composition H	% Composition N	Sol.	pI	Specific Rotation [α]D	c	Solvent	t	5N HCl	NAc
alanine	$C_3H_7NO_2$	89.1	40.44	7.92	15.72	16.65	6.11*	+14.7	5.8	1.0N HCl	18	+14.6	+33.0
α-amino-n-butyric acid	$C_4H_9NO_2$	103.1	46.60	8.80	13.59	28.*	5.98*	-				+20.6	+42.0
α-aminoadipic acid	$C_6H_{11}NO_4$	161.2	44.71	6.88	8.69	-	-	-				+25.0	
β-aminoisobutyric acid	$C_4H_9NO_2$	103.1	46.60	8.80	13.59	-	-	-				-	
anserine	$C_{10}H_{16}N_4O_3$	240.3	50.00	6.71	23.32	-	-	+12.2	5.0	water	20	-	
arginine	$C_6H_{14}N_4O_2$	174.2	41.37	8.10	32.16	15.	10.76	+26.9	1.6	6.0N HCl	23	+27.6	+29.4
arginine.HCl	$C_6H_{15}N_4O_2Cl$	210.7	34.21	7.18	26.60	-	-	+22.1(calc.)				+22.8(calc.)	
asparagine	$C_4H_8N_2O_3$	132.1	36.37	6.11	21.21	2.46	5.5	+34.3	2.2	3.4N HCl	20	-	
asparagine.H_2O	$C_4H_{10}N_2O_4$	150.1	32.00	6.71	18.66	-	-	+30.2(calc.)				-	
aspartic acid	$C_4H_7NO_4$	133.1	36.09	5.30	10.52	0.50	2.98	+24.6	2.0	6N HCl	24	+25.4	
canavanine	$C_5H_{12}N_4O_3$	176.2	34.08	6.87	31.80	-	7.99	+ 7.9	3.2	water	20	-	
canavanine.H_2SO_4	$C_5H_{14}N_4O_7S$	274.3	21.90	5.15	20.43	-	-	-				-	
carnosine	$C_9H_{14}N_4O_3$	226.2	47.78	6.24	24.77	-	-	+20.5	2.0	water	20	-	
citrulline	$C_6H_{13}N_3O_3$	175.2	41.13	7.47	23.98	s.	-	+24.3	2.0	1N HCl	27	+24.2	+17.5
cystathionine	$C_7H_{14}N_2O_4S$	222.3	37.82	6.35	12.60	-	-	+23.7	1.0	1.0N HCl	22	-	
cysteic acid	$C_3H_7NO_5S$	169.2	21.27	4.16	8.26	-	-	+7.8	6.0	water	20	-	
cysteine	$C_3H_7NO_2S$	121.2	29.73	5.82	11.56	v.s.	-	-10.1	2.0	water	21	+6.5	+13.0
cysteine.HCl.H_2O	$C_3H_{10}NO_3SCl$	175.6	20.51	5.74	7.98	-	-	+4.5	2.0	5N HCl		-	
cysteine sulfinic acid	$C_3H_7NO_4S$	153.2	23.52	4.61	9.14	-	-	+24.0	1.0	1N HCl	21	-	
cystine	$C_6H_{12}N_2O_4S_2$	240.3	29.99	5.03	11.66	0.01	5.02	-214.	1.0	1N HCl	24	-232.	
2,4-diaminobutyric acid	$C_4H_{10}N_2O_2$	118.1	40.67	8.53	23.71	-	-	-				+31.6	
α,ε-diaminopimelic acid	$C_7H_{14}N_2O_4$	190.2	44.20	7.42	14.73	-	-	+ 8.1	5.0	water	24	+45.1	
α,ε-diaminopimelic acid.HCl	$C_7H_{15}N_2O_4Cl$	226.7	37.09	6.67	12.36	-	-	-				+38.5	
2,3-diaminopropionic acid	$C_3H_8N_2O_2$	104.1	34.61	7.75	26.91	-	-	-				+38.0	
diiodotyrosine	$C_9H_9NO_3I_2$	433.0	24.97	2.10	3.23	0.06	4.29	+ 2.9	5.0	1.1N HCl	20	-	
3,4-dihydroxyphenylalanine	$C_9H_{11}NO_4$	197.2	54.81	5.62	7.10	0.50	-	-12.0	1.0	4N HCl	25	-	
djenkolic acid	$C_7H_{14}N_2O_4S_2$	254.3	33.06	5.55	11.02	0.10	-	-44.5	2.0	1N HCl	26	-	
ethionine	$C_6H_{13}NO_2S$	163.2	44.15	8.03	8.58	-	-	+23.5	0.8	0.2N HCl	25	+23.5	+18.0
S-ethylcysteine	$C_5H_{11}NO_2S$	149.2	40.24	7.43	9.39	-	-	-8.5	5.0	5N HCl	22	-	
ergothioneine	$C_9H_{15}N_3O_2S$	229.3	47.14	6.59	18.33	-	-	+116.0	5.0	water	21	-	
ergothioneine.HCl.H_2O	$C_9H_{18}N_3O_3SCl$	283.8	38.09	6.39	14.81	-	-	+92.7	2.2	water	25	-	
glutamic acid	$C_5H_9NO_4$	147.1	40.81	6.17	9.52	0.86	3.08	+31.2	1.0	6N HCl	22	+31.8	
glutamine	$C_5H_{10}N_2O_3$	146.1	41.09	6.90	19.17	4.25	-	+6.1	3.6	water		-	
glycine	$C_2H_5NO_2$	75.1	32.00	6.72	18.66	25.0	6.20	0					
histidine	$C_6H_9N_3O_2$	155.2	46.44	5.85	27.09	4.19	7.64	-39.0	1.1	water	25	+11.5	+ 7.5
histidine.HCl.H_2O	$C_6H_{12}N_3O_3Cl$	209.6	34.38	5.77	20.06	-	-	-				+8.7 (calc.)	
homocysteine thiolactone	C_4H_7NOS	117.2	40.99	6.02	11.95	-	-	-				-	
homocysteine thiolactone.HCl	C_4H_8NOSCl	153.6	31.27	5.25	9.12	-	-	+21.5	1.0	water	26	-	
homocystine	$C_8H_{16}N_2O_4S_2$	268.3	35.81	6.01	10.44	-	-	+77.0	1.0	1N HCl	26	+78.0	
homoserine	$C_4H_9NO_3$	119.1	40.33	7.62	11.76	-	-	-				+18.3a	+12.0a
5-hydroxylysine	$C_6H_{14}N_2O_3$	162.2	44.43	8.70	17.28	-	-	+18.5	2.0	6N HCl	25	-	
5-hydroxylysine.HCl	$C_6H_{15}N_2O_3Cl$	198.7	36.28	7.61	14.10	-	-	+11.8 (calc.)				-	
hydroxyproline	$C_5H_9NO_3$	131.1	45.80	6.92	10.68	36.11	5.82	-75.2	1.0	water	22	-80.5	-77.0a
allo-hydroxyproline	$C_5H_9NO_3$	131.1	45.80	6.92	10.68	-	-	-69.5	2.0	water		-18.8	-90.0
isoleucine	$C_6H_{13}NO_2$	131.2	54.94	9.99	10.68	4.12	6.08*	+40.6	5.1	6.1N HCl	20	+40.8	+49.0
allo-isoleucine	$C_6H_{13}NO_2$	131.2	54.94	9.99	10.68	-	-	-				+40.5	+43.2
isovaline	$C_5H_{11}NO_2$	117.1	51.26	9.47	11.96	-	-	-				+8.3	+22.4
lanthionine	$C_6H_{12}N_2O_4S$	208.3	34.59	5.81	13.45	-	-	-				-	
leucine	$C_6H_{13}NO_2$	131.2	54.94	9.99	10.68	2.19	6.04*	+15.1	2.0	6N HCl	26	+16.0	+22.5
tert-leucine	$C_6H_{13}NO_2$	131.2	54.94	9.99	10.68	-	-	-				+9.0	+36.0
lysine	$C_6H_{14}N_2O_2$	146.2	49.29	9.65	19.16	v.s.	9.47	+25.9	2.0	6N HCl	23	+25.9	
lysine.HCl	$C_6H_{15}N_2O_2Cl$	182.7	39.45	8.28	15.34	-	-	+20.7 (calc.)				-	
methionine	$C_5H_{11}NO_2S$	149.2	40.24	7.43	9.39	3.38*	5.74*	+21.2	0.8	0.2N HCl	25	+23.2	+20.0
1-methylhistidine	$C_7H_{11}N_3O_2$	169.2	49.69	6.55	24.84	-	-	-				-	
norleucine	$C_6H_{13}NO_2$	131.2	54.94	9.99	10.68	1.18*	6.00*	+21.3	4.3	6N HCl	20	+24.5	+36.5
norvaline	$C_5H_{11}NO_2$	117.1	51.26	9.47	11.96	v.s.	-	-				+24.9	+35.0
ornithine	$C_5H_{12}N_2O_2$	132.2	45.42	9.15	21.19	v.s.	-	+16.5	4.0	water	27	+28.3	
phenylalanine	$C_9H_{11}NO_2$	165.2	65.44	6.71	8.48	2.97	5.91*	-36.1	1.9	water	20	-4.5	-7.5
phenylglycine	$C_8H_9NO_2$	151.2	63.56	6.00	9.27	1.	-	-				+168.	
β-phenylserine (erythro)	$C_9H_{11}NO_3$	181.2	59.66	6.12	7.73	-	-	-				+81.3	+59.9
β-phenylserine (threo)	$C_9H_{11}NO_3$	181.2	59.66	6.12	7.73	-	-	-				-48.6	-51.1
pipecolic acid	$C_6H_{11}NO_2$	129.2	55.80	8.58	10.84	v.s.	-	-24.6	4.4	water	23	-	
pipecolic acid.HCl	$C_6H_{12}NO_2Cl$	165.6	43.51	7.30	8.46	-	-	-				-	
proline	$C_5H_9NO_2$	115.1	52.16	7.80	12.17	162.3	6.3	-52.6	0.6	0.5N HCl	20	-60.4	-80.0
sarcosine	$C_3H_7NO_2$	89.1	40.44	7.92	15.72	v.s.	6.00	0					
serine	$C_3H_7NO_3$	105.1	34.28	6.71	13.33	5.02*	5.68*	+14.5	9.3	1.0N HCl	25	+15.1	
2-thiolhistidine	$C_6H_9N_3O_2S$	187.2	38.49	4.85	22.45	-	-	-9.5	1.0	1.0N HCl	25	-	
threonine	$C_4H_9NO_3$	119.1	40.33	7.62	11.76	20.5*	5.59	-28.4	1.0	water	26	-15.0	-90.0
allo-threonine	$C_4H_9NO_3$	119.1	40.33	7.62	11.76	-	-	-				+29.6	+38.0a
tryptophan	$C_{11}H_{12}N_2O_2$	204.2	64.69	5.93	13.72	1.14	5.88	-31.5	1.0	water	25	-	-34.0
tyrosine	$C_9H_{11}NO_3$	181.2	59.66	6.12	7.73	0.06	5.63	-8.6	4.4	6.3N HCl	29	-10.0	
valine	$C_5H_{11}NO_2$	117.1	51.26	9.47	11.96	8.85	6.00*	+28.8	3.4	6.0N HCl	20	+28.2	+62.0

DETERMINACION DE HIERRO

1,10 Fenantrolina: 0.2 gramos en 100 ml de agua caliente.

Clorhidrato de Hidroxilamina: 5 gramos en 100 ml de agua destilada.

Acetato de Sodio 1M : Disolver 14 gramos en 100 ml de agua destilada.

Solución Patrón de Hierro (100 ppm): Disolver 0.702 gramos de $FeSO_4(NH_4)_2SO_4.6H_2O$ (P.M.=392.14) en 100 ml de Acido Sulfurico - 0.1M y luego aforar a un litro con el mismo- ácido.

ELECTROFORESIS

Aminoácidos: Acido aspártico, Histidina, Lisina y una mezcla de los tres en Amortiguador Tris-Acetato 0.07M pH 7.6 que contenga 10 g/l de Glucosa.

Ninhidrina: Disolver 0.2 gramos en 100 ml de acetona.

Anilina-Difenilamina-Acido Fosfórico (5:5:1): Mezclar en las proporciones - - indicadas las siguientes soluciones: Anilina 10 g/l en acetona, Difenilamina - 10 g/l en acetona y Acido Fosfórico 85%.