

COMPONENTS: (1) Cesium dihydrogenphosphate; CsH_2PO_4 ; [18649-05-3] (2) Cesium oxide; Cs_2O ; [20281-00-9] (3) Phosphoric acid; H_3PO_4 ; [7664-38-2] (4) Water; H_2O ; [7732-18-5]	ORIGINAL MEASUREMENTS: Rashkovich, L.N.; Meteva, K.B.; Shevchik, J.E. <i>Zh. Neorg. Khim.</i> <u>1977</u> , 22, 1982-8.																																																																																																																																																							
VARIABLES: Temperature and composition.	PREPARED BY: J. Eysseltová																																																																																																																																																							
EXPERIMENTAL VALUES: Composition of saturated solutions in the $\text{Cs}_2\text{O}-\text{P}_2\text{O}_5-\text{H}_2\text{O}$ system. <table border="1" data-bbox="251 531 1007 1103"> <thead> <tr> <th rowspan="2">Nr</th> <th rowspan="2">pH</th> <th colspan="2">Cs_2O</th> <th colspan="2">P_2O_5</th> <th rowspan="2">solid phase</th> </tr> <tr> <th>mass%</th> <th>mol%</th> <th>mass%</th> <th>mol%</th> </tr> </thead> <tbody> <tr> <td colspan="7" style="text-align: center;">temp. = 25°C.</td> </tr> <tr><td>1</td><td>7.7</td><td>51.6</td><td>9.12</td><td>17.8</td><td>6.24</td><td>CsH_2PO_4</td></tr> <tr><td>2</td><td>7.2</td><td>48.2</td><td>7.80</td><td>17.6</td><td>5.65</td><td>"</td></tr> <tr><td>3</td><td>6.65</td><td>45.0</td><td>6.76</td><td>17.5</td><td>5.20</td><td>"</td></tr> <tr><td>4</td><td>6.4</td><td>43.4</td><td>6.29</td><td>17.4</td><td>5.00</td><td>"</td></tr> <tr><td>5</td><td>6.05</td><td>41.8</td><td>5.85</td><td>17.4</td><td>4.83</td><td>"</td></tr> <tr><td>6</td><td>5.6</td><td>39.5</td><td>5.28</td><td>17.5</td><td>4.64</td><td>"</td></tr> <tr><td>7</td><td>5.1</td><td>37.9</td><td>4.95</td><td>17.8</td><td>4.61</td><td>"</td></tr> <tr><td>8</td><td>5.0</td><td>37.3</td><td>4.80</td><td>17.6</td><td>4.49</td><td>"</td></tr> <tr><td>9</td><td>5.0</td><td>37.2</td><td>4.81</td><td>17.9</td><td>4.61</td><td>"</td></tr> <tr><td>10</td><td>4.1</td><td>36.1</td><td>4.61</td><td>18.5</td><td>4.69</td><td>"</td></tr> <tr><td>11</td><td>3.9</td><td>36.0</td><td>4.61</td><td>18.9</td><td>4.81</td><td>"</td></tr> <tr><td>12</td><td>3.6</td><td>36.4</td><td>4.80</td><td>20.0</td><td>5.23</td><td>"</td></tr> <tr><td>13</td><td>2.85</td><td>38.5</td><td>5.77</td><td>24.5</td><td>7.31</td><td>"</td></tr> <tr><td>14</td><td>2.7</td><td>38.2</td><td>5.73</td><td>24.8</td><td>7.39</td><td>"</td></tr> <tr><td>15</td><td>2.6</td><td>38.9</td><td>6.09</td><td>26.2</td><td>8.14</td><td>"</td></tr> <tr><td>16</td><td>2.2</td><td>39.9</td><td>6.82</td><td>28.8</td><td>9.77</td><td>"</td></tr> <tr><td>17</td><td>2.1</td><td>38.9</td><td>6.48</td><td>28.8</td><td>9.52</td><td>$\text{CsH}_5(\text{PO}_4)_2$</td></tr> <tr><td>18</td><td>1.7</td><td>34.8</td><td>5.23</td><td>28.4</td><td>8.47</td><td>"</td></tr> <tr><td>19</td><td>1.3</td><td>29.9</td><td>3.98</td><td>27.9</td><td>7.34</td><td>"</td></tr> </tbody> </table> <p style="text-align: right;">(continued next page)</p>		Nr	pH	Cs_2O		P_2O_5		solid phase	mass%	mol%	mass%	mol%	temp. = 25°C.							1	7.7	51.6	9.12	17.8	6.24	CsH_2PO_4	2	7.2	48.2	7.80	17.6	5.65	"	3	6.65	45.0	6.76	17.5	5.20	"	4	6.4	43.4	6.29	17.4	5.00	"	5	6.05	41.8	5.85	17.4	4.83	"	6	5.6	39.5	5.28	17.5	4.64	"	7	5.1	37.9	4.95	17.8	4.61	"	8	5.0	37.3	4.80	17.6	4.49	"	9	5.0	37.2	4.81	17.9	4.61	"	10	4.1	36.1	4.61	18.5	4.69	"	11	3.9	36.0	4.61	18.9	4.81	"	12	3.6	36.4	4.80	20.0	5.23	"	13	2.85	38.5	5.77	24.5	7.31	"	14	2.7	38.2	5.73	24.8	7.39	"	15	2.6	38.9	6.09	26.2	8.14	"	16	2.2	39.9	6.82	28.8	9.77	"	17	2.1	38.9	6.48	28.8	9.52	$\text{CsH}_5(\text{PO}_4)_2$	18	1.7	34.8	5.23	28.4	8.47	"	19	1.3	29.9	3.98	27.9	7.34	"
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METHOD/APPARATUS/PROCEDURE: The mixtures were equilibrated isothermally by shaking twice daily for 10-15 days. They were thermostated for a month. Analysis was done by a potentiometric titration using KOH and H_3PO_4 solutions. The solid phases were identified crystallographically.	SOURCE AND PURITY OF MATERIALS: The Cs_2CO_3 and H_3PO_4 were used as received. The amount of impurities was less than 0.05 mass%. ESTIMATED ERROR: The temperature was controlled to within ± 0.05 K. The precision of the analyses for Cs_2O and P_2O_5 was ± 0.2 mass% REFERENCES:																																																																																																																																																							

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cesium dihydrogenphosphate; CsH_2PO_4 ; [18649-05-3]	Rashkovich, L.N.; Meteva, K.B. Shevchik, J.E. <i>Zh. Neorg. Khim.</i> <u>1977</u> , 22, 1982-8.
(2) Cesium oxide; Cs_2O ; [20281-00-9]	
(3) Phosphoric acid; H_3PO_4 ; [7664-38-2]	
(4) Water; H_2O ; [7732-18-5]	

EXPERIMENTAL VALUES, cont'd:

Composition of saturated solutions in the $\text{Cs}_2\text{O}-\text{P}_2\text{O}_5-\text{H}_2\text{O}$ system.

Nr	t/°C.	Cs_2O		P_2O_5		solid phase
		mass%	mol%	mass%	mol%	
20	33.2	42.2	6.00	17.8	5.03	CsH_2PO_4
21	33.2	37.2	4.89	19.0	4.96	"
22	33.2	31.6	4.52	29.5	8.38	$\text{CsH}_5(\text{PO}_4)_2$
23	39.0	42.8	6.22	18.3	5.28	CsH_2PO_4
24	39.0	38.2	5.16	19.4	5.21	"
25	39.0	32.4	4.82	30.6	9.04	$\text{CsH}_5(\text{PO}_4)_2$
26	44.7	43.5	6.47	18.7	5.53	CsH_2PO_4
27	44.7	39.0	5.41	19.9	5.48	"
28	44.7	33.4	5.20	31.7	9.80	$\text{CsH}_5(\text{PO}_4)_2$
29	50	61.1	151	19.4	95.2	CsH_2PO_4
30	50	53.3	102	19.1	72.3	"
31	50	50.6	89.8	19.1	67.2	"
32	50	47.9	79.8	19.2	63.5	"
33	50	44.0	66.6	19.0	57.1	"
34	50	43.0	64.5	19.6	58.3	"
35	50	42.3	62.8	19.8	58.5	"
36	50	40.7	57.9	19.4	54.8	"
37	50	40.2	57.8	20.5	58.5	"
38	50	40.4	59.0	21.1	61.2	"
39	50	40.6	59.8	21.3	62.3	"
40	50	40.8	61.0	21.9	65.0	"
41	50	41.5	69.3	26.2	86.9 ^a	"
42	50	41.3	76.1	29.2	10.5 ^a	"
43	50	39.9	74.0	32.3	11.9 ^a	$\text{CsH}_5(\text{PO}_4)_2$
44	50	38.6	69.6	32.4	11.6 ^a	"

^aFor the 50°C isotherm, these values are correct. All the other mol% values for Cs_2O and P_2O_5 are too large by a factor of ten.

The compiler has recalculated the above values to convert them to the following values for the $\text{CsH}_2\text{PO}_4-\text{Cs}_2\text{O}-\text{H}_2\text{O}$ system.

Nr	Cs_2O		H_3PO_4		CsH_2PO_4	
	mass%	mol%	mass%	mol%	mass%	mol%
1	16.3	2.22	-----	-----	57.7	9.63
2	13.3	1.59	-----	-----	57.0	8.35
3	10.3	1.10	-----	-----	56.7	7.47
4	8.88	0.91	-----	-----	56.4	7.06
5	7.28	0.71	-----	-----	56.4	6.75
6	4.78	0.44	-----	-----	56.7	6.40
7	2.58	0.23	-----	-----	57.7	6.31
8	2.38	0.21	-----	-----	57.0	6.11
9	1.67	0.15	-----	-----	58.0	6.26
10	-----	-----	0.40	0.19	58.9	6.29
11	-----	-----	1.02	0.26	58.7	6.35
12	-----	-----	2.27	0.60	59.4	6.74
13	-----	-----	7.01	2.37	62.8	9.06
14	-----	-----	7.64	2.60	62.3	9.03
15	-----	-----	9.08	3.38	63.5	10.1
16	-----	-----	12.0	5.33	65.1	12.3
17	-----	-----	12.7	5.42	63.5	11.6
18	-----	-----	15.0	5.41	56.8	8.74
19	-----	-----	17.7	5.39	48.8	4.87

(continued next page)

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cesium dihydrogenphosphate; CsH_2PO_4 ; [18649-05-3]	Rashkovich, L.N.; Meteva, K.B.; Shevchik, J.E.
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(3) Phosphoric acid; H_3PO_4 ; [7664-38-2]	
(4) Water; H_2O ; [7732-18-5]	

EXPERIMENTAL VALUES cont'd:

Nr	Cs_2O		H_3PO_4		CsH_2PO_4	
	mass%	mol%	mass%	mol%	mass%	mol%
20	6.88	0.69	----	----	57.7	7.08
21	----	----	0.33	0.09	60.7	6.77
22	----	----	18.7	6.43	51.6	7.55
23	6.49	0.67	----	----	59.3	7.54
24	----	----	0.33	0.05	62.3	7.23
25	----	----	19.7	7.31	52.9	8.37
26	6.40	0.69	----	----	60.7	7.98
27	----	----	0.32	0.09	63.6	7.68
28	----	----	20.5	8.37	52.9	8.37
29	22.9	5.71	----	----	62.9	19.2
30	15.4	2.41	----	----	61.9	11.8
31	12.7	1.77	----	----	61.9	10.6
32	9.81	1.24	----	----	62.2	9.67
33	6.30	0.70	----	----	61.6	8.33
34	4.11	0.45	----	----	63.5	8.53
35	3.02	0.33	----	----	64.2	8.50
36	2.21	0.22	----	----	62.9	7.83
37	----	----	0.31	0.09	65.6	8.37
38	----	----	1.00	0.30	65.9	8.67
39	----	----	1.14	0.36	66.2	8.83
40	----	----	1.83	0.59	66.6	9.16
41	----	----	7.27	2.96	67.7	11.8
42	----	----	11.6	5.59	67.4	13.9
43	----	----	16.8	9.47	65.1	15.6
44	----	----	17.8	9.50	63.0	14.3

The authors linearized the data for the region containing H_3PO_4 and give the following equation

$$w_{\text{Cs}_2\text{O}} = a + b w_{\text{P}_2\text{O}_5}$$

At 25°C: $a = 28.8 \pm 0.4$ mass% and $b = 0.39 \pm 0.02$ $\pm\sigma = 0.2$.

At 50°C: $a = 36.6 \pm 0.4$ mass% and $b = 0.19 \pm 0.02$ $\pm\sigma = 0.1$.

COMPONENTS: (1) Cesium dideuteriumphosphate; CsD_2PO_4 ; [28090-46-2] (2) Cesium oxide; Cs_2O ; [20281-00-9] (3) Deuterium phosphate; D_3PO_4 ; [14335-33-2] (4) Water-d ₂ ; D_2O ; [7789-20-0]	ORIGINAL MEASUREMENTS: Rashkovich, L.N.; Meteva, K.B.; Shevchik, J.E. <i>Zh. Neorg. Khim.</i> <u>1977</u> , <i>22</i> , 1982-8.																																																																																																																																																																					
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EXPERIMENTAL VALUES: The original experimental data are expressed for the $\text{Cs}_2\text{O}-\text{P}_2\text{O}_5-\text{H}_2\text{O}$ system. These data are in the four left hand columns below. The compiler has converted these data to values for the $\text{CsD}_2\text{PO}_4-\text{D}_3\text{PO}_4-\text{D}_2\text{O}$ system. These values are in columns 5 to 10 below. <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="4" style="text-align: left;">a u t h o r s ' d a t a</th> <th colspan="6" style="text-align: left;">c o m p i l e r ' s c a l c u l a t i o n s</th> <th></th> </tr> <tr> <th colspan="2" style="text-align: center;">Cs_2O</th> <th colspan="2" style="text-align: center;">P_2O_5</th> <th colspan="2" style="text-align: center;">CsD_2PO_4</th> <th colspan="2" style="text-align: center;">D_3PO_4</th> <th colspan="2" style="text-align: center;">Cs_2O</th> <th style="text-align: center;">solid</th> </tr> <tr> <th style="text-align: center;">mass%</th> <th style="text-align: center;">mol%</th> <th style="text-align: center;">mass%</th> <th style="text-align: center;">mol%</th> <th style="text-align: center;">mass%</th> <th style="text-align: center;">mol%</th> <th style="text-align: center;">mass%</th> <th style="text-align: center;">mol%</th> <th 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25°C.											46.2	7.81	17.6	5.91	57.5	7.95	----	----	11.3	1.29	CsD_2PO_4	39.7	5.87	17.6	5.17	57.5	6.58	----	----	4.78	0.45	"	38.3	5.54	17.9	5.14	58.5	6.52	----	----	2.79	0.26	"	36.8	5.45	20.8	6.11	60.6	7.21	3.22	0.88	-----	----	"	37.6	5.86	22.7	7.02	61.9	8.15	5.35	1.62	-----	----	"	37.7	5.97	23.5	7.39	62.0	8.48	6.42	2.02	-----	----	"	37.9	6.05	23.7	7.52	62.4	8.66	6.56	2.10	-----	----	"	38.0	6.14	24.2	7.77	62.5	8.93	7.20	2.37	-----	----	"	37.9	6.13	24.3	7.80	62.4	8.90	7.42	2.43	-----	----	"	38.6	6.53	25.8	8.66	63.5	9.98	9.04	3.26	-----	----	"	36.8	6.29	28.3	9.61	60.6	10.2	13.9	5.40	-----	----	$\text{CsD}_5(\text{PO}_4)_2$
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METHOD/APPARATUS/PROCEDURE: The mixtures were equilibrated isothermally in sealed vessels. They were shaken twice daily for 10-15 days and were thermostated for a month. The solutions were analyzed by means of a potentiometric titration using solutions of KOH and of H_3PO_4 . No details are given. The content of deuterium in the saturated solutions was determined by a method described elsewhere (1).	SOURCE AND PURITY OF MATERIALS: Cs_2CO_3 and D_3PO_4 were used as received. The amount of impurities in each was less than 0.05%. The extent of deuteration was 96% for D_3PO_4 , 99.7% for D_2O , and 98 ±1% for the saturated solutions. ESTIMATED ERROR: The temperature was controlled to within ± 0.05°C. The analyses for Cs_2O and P_2O_5 had a precision of ± 0.2 mass%. REFERENCES: 1. Volkova, E.N.; Podshivalov, J.S.; Rashkovich, L.N.; Strukov, B.A. <i>Izv. AN SSSR, Ser. fiz.</i> <u>1975</u> , <i>39</i> , 288.																																																																																																																																																																					

COMPONENTS:

- (1) Cesium dideuteriumphosphate; CsD_2PO_4 ; [28090-46-2]
 (2) Cesium oxide; Cs_2O ; [20281-00-9]
 (3) Deuterium phosphate; D_3PO_4 ; [14335-33-2]
 (4) Water- d_2 ; D_2O ; [7789-20-0]

ORIGINAL MEASUREMENTS:

Rashkovich, L.N.; Meteva, K.B.; Shevchik, J.E.
 Zh. Neorg. Khim. 1977, 22, 1982-8.

EXPERIMENTAL VALUES cont'd:

a u t h o r s ' d a t a				c o m p i l e r ' s c a l c u l a t i o n s						solid phase
Cs_2O		P_2O_5		CsD_2PO_4		D_3PO_4		Cs_2O		
mass%	mol%	mass%	mol%	mass%	mol%	mass%	mol%	mass%	mol%	
temp. = 50°C.										
42.2	6.75	19.1	6.06	62.4	8.08	----	----	4.32	0.46	CsD_2PO_4
40.0	6.17	19.6	6.00	64.0	7.91	----	----	1.11	0.11	"
39.5	6.27	21.8	6.87	65.0	8.67	2.71	0.84	----	----	"
39.6	6.33	21.9	6.95	65.2	8.78	2.73	0.86	----	----	"
39.5	6.39	22.6	7.26	65.0	9.00	3.05	1.23	----	----	"
40.3	6.89	24.5	8.32	66.3	10.3	5.98	1.15	----	----	"
40.5	7.03	25.0	8.61	66.7	10.7	6.55	2.43	----	----	"
40.4	7.01	25.1	8.65	66.5	10.7	6.76	2.51	----	----	"
40.8	7.35	26.4	9.44	67.1	11.8	8.33	3.37	----	----	"
38.0	7.20	31.7	11.9	62.5	13.8	17.9	9.04	----	----	$\text{CsD}_5(\text{PO}_4)_2$

The authors linearized the data in the region where $\text{P}/\text{Cs} > 1$ as follows

$$w_{\text{Cs}_2\text{O}} = a + b w_{\text{P}_2\text{O}_5}$$

At 25°C., $a = 29.7 \pm 0.6$ and $b = 0.34 \pm 0.02 \pm \sigma = 0.1$

At 50°C., $a = 32.9 \pm 0.8$ and $b = 0.30 \pm 0.03 \pm \sigma = 0.1$