

LAMPIRAN

1. Data Temperatur kecepatan udara 1,5 m/s

Waktu (menit)	Temperatur pasir (°C)	Temperatur reaktor (°C)
0	31.5	31.9
2	34.8	36.7
4	38.9	41.2
6	43.8	55.9
8	46.8	65.9
10	56.2	66.3
12	54.6	92.8
14	60.2	104.5
16	72.1	116.7
18	76.1	127.8
20	69.9	130.2
22	72.3	142.3
24	77.8	158.4
26	82.4	165.7
28	85.3	178.5
30	89.8	182.7
32	93.1	192.7
34	97	203
36	102.9	220.4
38	104.8	230.3
40	120.3	259.5
42	129.5	289.9
44	130.5	299.9
46	130.8	304.4
48	135.7	305.5
50	148.2	346.7
52	152.1	354.5
54	169.9	364.5
56	159.2	385.6
58	157.2	378.7
60	154.5	368.7

2. Data Temperatur kecepatan udara 2 m/s

Waktu (menit)	Temperatur pasir (°C)	Temperatur reaktor (°C)
0	31.6	32.9
2	37.3	44
4	47.7	56.5
6	75.6	94
8	80.4	106.5
10	91.6	119
12	92.4	135.8
14	98.4	145.8
16	89.8	155.7
18	93.2	170.8
20	85.8	178.9
22	91.3	180.9
24	96.8	181.5
26	112.3	184
28	117.8	196
30	123.3	228
32	128.8	231.5
34	134.3	254
36	129.8	259.5
38	135.3	269
40	150.8	335.9
42	167.8	367.5
44	194.8	381.5
46	238.3	394
48	235.8	429.5
50	228.3	439
52	221.8	431.5
54	211.3	412.8

3. Data Temperatur kecepatan udara 2,5 m/s

Menit (menit)	Temperatur pasir (°C)	Temperatur reaktor (°C)
0	31.2	32.3
2	39.3	40.8
4	47.8	50.6
6	56.3	60.8
8	64.8	93.5
10	73.3	109
12	81.8	124.5
14	90.3	140
16	115.3	200.5
18	118.9	216
20	115.8	231.5
22	124.3	247
24	132.8	262.5
26	141.3	278
28	149.8	293.5
30	158.3	355.5
32	166.8	371
34	175.3	386.5
36	183.8	402
38	222.3	417.5
40	265.9	433
42	275.6	485
44	260.2	477.8
46	257.8	469.2
48	245.3	452.4

4. Data Temperatur Panas Api Pada Kecepatan Udara 1,5 m/s

Waktu (menit)	Temperatur panas api (°C)
0	30
2	31
4	31
6	32
8	39
10	56
12	86
14	119
16	138
18	124.6
20	126.4
22	145.9
24	157.8
26	175
28	168.4
30	169.6
32	188.5
34	179.8
36	177.3
38	195.5
40	269.7
42	304.4
44	337.6
46	348.5
48	312.4
50	290.2
52	280.9
54	275.7
56	268.6
58	242.3
60	218.4

5. Data Temperatur Panas Api Pada Kecepatan Udara 2 m/s

Waktu (menit)	Temperatur panas api (°C)
0	30
2	30
4	30
6	35
8	48
10	75
12	85.8
14	128.8
16	159.2
18	165.6
20	197.4
22	185.9
24	197.8
26	205
28	208.4
30	225.6
32	280.5
34	324.8
36	370.3
38	405.5
40	415.7
42	424.4
44	417.6
46	378.5
48	362.4
50	355.2
52	325.9
54	305.7

6. Data Temperatur Panas Api Pada Kecepatan Udara 2,5 m/s

Waktu (menit)	Temperatur panas api (°C)
0	30
2	30
4	47
6	68
8	85
10	98.8
12	151.8
14	197.2
16	246.6
18	277.4
20	295.9
22	297.8
24	345
26	378.4
28	348.6
30	355.5
32	374.8
34	423.3
36	525.5
38	530.7
40	524.4
42	507.6
44	488.5
46	472.4
48	445.2

7. Data Temperatur Air Kecepatan Udara 1,5 m/s

Waktu (menit)	Temperatur air (°C)
0	27
2	30
4	35
6	44
8	54
10	61
12	65
14	68
16	72
18	75
20	80
22	86
24	91
25	96
26	100
28	100
30	100
32	100
34	100
36	100
38	100
40	100
42	100
44	100
46	100
48	100
50	100
52	100
54	100
56	100
58	100
60	100

Volume air mula-mula = 1000 ml

Volume air setelah didihkan = 680 ml

8. Data Temperatur Air Kecepatan Udara 2 m/s

Waktu (menit)	Temperatur air (°C)
0	29
2	42
4	47
6	55
8	66
10	72
12	78
14	86
16	92
17	96
18	100
20	100
22	100
24	100
26	100
28	100
30	100
32	100
34	100
36	100
38	100
40	100
42	100
44	100
46	100
48	100
50	100
52	100
54	100

Volume air mula-mula = 1000 ml

Volume air setelah dididihkan = 590 ml

9. Data Temperatur Air Kecepatan Udara 2,5 m/s

Waktu (menit)	Temperatur air (°C)
0	30
2	48
4	62
6	70
8	85
9	96
10	100
12	100
14	100
16	100
18	100
20	100
22	100
24	100
26	100
28	100
30	100
32	100
34	100
36	100
38	100
40	100
42	100
44	100
46	100
48	100

Volume air mula-mula = 1000 ml

Volume air setelah didihkan = 480 ml

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TABLE A-9

Properties of saturated water

Temp., T, °C	Saturation Pressure, P _{sat} , kPa	Density, ρ, kg/m ³		Specific Volume, v _g , m ³ /kg	Enthalpy, h, kJ/kg		Internal Energy, u, kJ/kg		Entropy, s, kJ/kg·K		Prandtl Number, Pr		Thermal Expansion Coefficient, β, 1/K
		ρ, kg/m ³			h, kJ/kg		u, kJ/kg		s, kJ/kg·K		Pr		
		Liquid	Vapor		Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	
0.01	0.6113	999.8	0.0008	2501	4217	1854	0.561	0.0171	1.792 × 10 ⁻⁴	8.822 × 10 ⁻⁴	11.3	1.00	-0.008 × 10 ⁻³
5	0.8721	999.7	0.0008	2480	4205	1857	0.571	0.0173	1.519 × 10 ⁻⁴	8.933 × 10 ⁻⁴	11.3	1.00	-0.015 × 10 ⁻³
10	1.2276	999.7	0.0008	2478	4194	1862	0.580	0.0175	1.307 × 10 ⁻⁴	9.043 × 10 ⁻⁴	11.3	1.00	-0.023 × 10 ⁻³
15	1.7051	999.1	0.0008	2466	4186	1863	0.589	0.0179	1.138 × 10 ⁻⁴	9.153 × 10 ⁻⁴	11.3	1.00	-0.030 × 10 ⁻³
20	2.339	998.1	0.0008	2454	4182	1867	0.598	0.0183	1.002 × 10 ⁻⁴	9.262 × 10 ⁻⁴	11.3	1.00	-0.039 × 10 ⁻³
25	3.169	997.0	0.0008	2442	4180	1870	0.607	0.0186	8.891 × 10 ⁻⁵	9.370 × 10 ⁻⁴	11.3	1.00	-0.047 × 10 ⁻³
30	4.246	995.0	0.0008	2431	4178	1875	0.615	0.0189	7.998 × 10 ⁻⁵	9.478 × 10 ⁻⁴	11.3	1.00	-0.054 × 10 ⁻³
35	5.628	993.0	0.0008	2419	4178	1880	0.623	0.0192	7.20 × 10 ⁻⁵	9.585 × 10 ⁻⁴	11.3	1.00	-0.061 × 10 ⁻³
40	7.384	991.1	0.0008	2407	4179	1885	0.631	0.0196	6.53 × 10 ⁻⁵	9.691 × 10 ⁻⁴	11.3	1.00	-0.067 × 10 ⁻³
45	9.593	989.1	0.0008	2395	4180	1892	0.637	0.0200	5.96 × 10 ⁻⁵	9.795 × 10 ⁻⁴	11.3	1.00	-0.072 × 10 ⁻³
50	12.35	988.1	0.0008	2383	4181	1900	0.644	0.0204	5.47 × 10 ⁻⁵	9.897 × 10 ⁻⁴	11.3	1.00	-0.076 × 10 ⁻³
55	15.76	985.2	0.0008	2371	4183	1908	0.649	0.0208	5.04 × 10 ⁻⁵	9.997 × 10 ⁻⁴	11.3	1.00	-0.080 × 10 ⁻³
60	19.94	983.3	0.0008	2359	4185	1916	0.654	0.0212	4.67 × 10 ⁻⁵	1.009 × 10 ⁻³	11.3	1.00	-0.083 × 10 ⁻³
65	25.03	980.4	0.0008	2346	4187	1926	0.659	0.0216	4.33 × 10 ⁻⁵	1.021 × 10 ⁻³	11.3	1.00	-0.086 × 10 ⁻³
70	31.19	977.5	0.0008	2334	4190	1936	0.663	0.0221	4.04 × 10 ⁻⁵	1.033 × 10 ⁻³	11.3	1.00	-0.089 × 10 ⁻³
75	38.58	974.7	0.0008	2321	4193	1948	0.667	0.0225	3.78 × 10 ⁻⁵	1.045 × 10 ⁻³	11.3	1.00	-0.092 × 10 ⁻³
80	47.39	971.8	0.0008	2309	4197	1962	0.670	0.0230	3.55 × 10 ⁻⁵	1.057 × 10 ⁻³	11.3	1.00	-0.095 × 10 ⁻³
85	57.83	968.1	0.0008	2296	4201	1977	0.673	0.0235	3.33 × 10 ⁻⁵	1.070 × 10 ⁻³	11.3	1.00	-0.097 × 10 ⁻³
90	70.14	965.3	0.0008	2283	4206	1993	0.675	0.0240	3.15 × 10 ⁻⁵	1.083 × 10 ⁻³	11.3	1.00	-0.100 × 10 ⁻³
95	84.35	961.3	0.0008	2270	4212	2010	0.677	0.0246	2.97 × 10 ⁻⁵	1.100 × 10 ⁻³	11.3	1.00	-0.103 × 10 ⁻³
100	101.33	957.3	0.0008	2257	4217	2029	0.679	0.0251	2.82 × 10 ⁻⁵	1.117 × 10 ⁻³	11.3	1.00	-0.106 × 10 ⁻³
110	143.27	950.0	0.0008	2230	4229	2071	0.682	0.0262	2.55 × 10 ⁻⁵	1.261 × 10 ⁻³	11.3	1.00	-0.108 × 10 ⁻³
120	196.53	943.4	0.0008	2203	4244	2120	0.685	0.0275	2.23 × 10 ⁻⁵	1.296 × 10 ⁻³	11.3	1.00	-0.110 × 10 ⁻³
130	270.1	934.6	0.0008	2174	4263	2177	0.688	0.0288	1.83 × 10 ⁻⁵	1.330 × 10 ⁻³	11.3	1.01	-0.113 × 10 ⁻³
140	361.3	921.7	0.0008	2145	4285	2244	0.693	0.0301	1.39 × 10 ⁻⁵	1.365 × 10 ⁻³	11.3	1.02	-0.116 × 10 ⁻³
150	475.8	904.6	0.0008	2114	4311	2314	0.698	0.0316	1.02 × 10 ⁻⁵	1.399 × 10 ⁻³	11.3	1.02	-0.119 × 10 ⁻³
160	617.8	887.4	0.0008	2083	4340	2420	0.698	0.0331	0.70 × 10 ⁻⁵	1.434 × 10 ⁻³	11.3	1.05	-0.122 × 10 ⁻³
170	791.7	867.7	0.0008	2050	4370	2480	0.677	0.0347	0.48 × 10 ⁻⁵	1.468 × 10 ⁻³	11.3	1.05	-0.125 × 10 ⁻³
180	1002.1	847.1	0.0008	2015	4410	2580	0.673	0.0364	0.30 × 10 ⁻⁵	1.502 × 10 ⁻³	11.3	1.07	-0.128 × 10 ⁻³
190	1254.4	824.4	0.0008	1979	4460	2710	0.669	0.0382	0.142 × 10 ⁻⁵	1.537 × 10 ⁻³	11.3	1.09	-0.130 × 10 ⁻³
200	1553.8	804.3	0.0008	1941	4520	2840	0.663	0.0401	0.134 × 10 ⁻⁵	1.571 × 10 ⁻³	11.3	1.11	-0.132 × 10 ⁻³
220	2518	840.2	0.0008	1859	4610	3110	0.650	0.0442	0.122 × 10 ⁻⁵	1.641 × 10 ⁻³	11.3	1.15	-0.135 × 10 ⁻³
240	3344	813.7	0.0008	1767	4760	3320	0.632	0.0467	0.111 × 10 ⁻⁵	1.712 × 10 ⁻³	11.3	1.24	-0.138 × 10 ⁻³
260	4688	783.7	0.0008	1663	4970	4070	0.609	0.0540	0.102 × 10 ⁻⁵	1.786 × 10 ⁻³	11.3	1.35	-0.141 × 10 ⁻³
280	6412	750.8	0.0008	1544	5280	4835	0.581	0.0605	0.094 × 10 ⁻⁵	1.870 × 10 ⁻³	11.3	1.49	-0.144 × 10 ⁻³
300	8581	713.8	0.0008	1409	5750	5980	0.548	0.0695	0.086 × 10 ⁻⁵	1.965 × 10 ⁻³	11.3	1.69	-0.147 × 10 ⁻³
320	11,274	667.1	0.0008	1239	6540	7900	0.509	0.0836	0.078 × 10 ⁻⁵	2.084 × 10 ⁻³	11.3	1.97	-
340	14,586	610.3	0.0008	1028	8240	11,870	0.469	0.110	0.070 × 10 ⁻⁵	2.225 × 10 ⁻³	11.3	2.43	-
360	18,551	528.1	0.0008	720	14,650	25,800	0.427	0.178	0.060 × 10 ⁻⁵	2.571 × 10 ⁻³	11.3	2.06	3.73
374.14	22,090	517.0	0.0008	0	0	0	0	0	0.043 × 10 ⁻⁵	4.313 × 10 ⁻³	11.3	0	-

Note 1: Kinematic viscosity ν and thermal diffusivity α can be calculated from their definitions, $\nu = \mu/\rho$ and $\alpha = k/\rho C_p = \nu Pr$. The temperatures 0.01°C, 100°C, and 374.14°C are the triple-, boiling-, and critical-point temperatures of water, respectively. The properties listed above (except the vapor density) can be used at any pressure with negligible error except at temperatures near the critical-point value.

Note 2: The unit kJ/kg · °C for specific heat is equivalent to kJ/kg · K, and the unit W/m · °C for thermal conductivity is equivalent to W/m · K.
Source: Viscosity and thermal conductivity data are from J. V. Sengers and J. T. R. Watson, *Journal of Physical and Chemical Reference Data* 15 (1986), pp. 1791-1822. Other data are obtained from various sources or calculated.



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KARTU REVISI UJIAN TUGAS AKHIR

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Tanggal Ujian : 20 Januari 2017 Pembimbing II : Subroto, MT

No	Tanggal	Materi Revisi	Penguji
1.		<ul style="list-style-type: none">- Halaman perambatan disempitkan- Motto → kalimat yg lugas. yg penting saja- Moshaberi list yg dibet tunda.- Dilisnt → direvisi tiap hal di check lagi	<p>hasil direvisi ada 3/2/2017</p> <p><i>[Signature]</i></p> <p>ada 6/2/17</p> <p><i>[Signature]</i></p>

Mengetahui
Ketua Ujian TA

(.....)

Surakarta, 20/01/2017
Sekretaris Ujian TA

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