BAB 5
KESIMPULAN DAN SARAN

5.1. Kesimpulan

Berdasarkan hasil *Design Expert* terhadap mutu fisik granul pembawa didapatkan solusi terbaik yaitu formula B dengan jumlah Vivasol pada tingkat tinggi (+1) yaitu 7,5 gram dan jumlah laktosa pada tingkat rendah (-1) yaitu 136,5 gram.

Campuran interaktif dengan granul pembawa yang menggunakan laktosa sebagai pembawa larut air dan vivasol sebagai superdisintegran dapat meningkatkan laju disolusi dan campuran interaktif dengan granul pembawa dapat meningkatkan homogenitas campuran interaktif.

5.2. Saran

Pada penelitian selanjutnya bisa dicoba membuat campuran interaktif untuk meningkatkan laju disolusi dengan bahan obat yang lain.

DAFTAR PUSTAKA

Anonim, 1995, **Farmakope Indonesia edisi IV**, Dirjen POM Departemen Kesehatan RI, Jakarta, 683.

Anonim, 2001, **Test Sieving : Principles and Procedures**, Advantech Manufacturing, Inc.

Anonim, 2003, **Guidelines on Method Validation to be Performed in Support of Analytical Methods for Agrochemical Formulations,** 11.

Anonim[a], 2006, **USP29-NF24**, General Information Chapter '<1174> Powder Flow', US Pharmacopeial Convention, Rockville, MD, USA.

Anonim[b], 2006, **USP29-NF24**, General Information Chapter '<786> Particle Size Distribution Estimation by Analytical Sieving', US Pharmacopeial Convention, Rockville, MD, USA,

Banakar, U. V., 1992, **Pharmaceutical Dissolution Testing, Drug and the Pharmaceutical Science**, Vol. 49, Marcel Dekker, Inc., 21-22, 133-180.

Bhowmik, D., B. Chiranjib, Krishnakanth, Pankaj, dan R.M. Chandira, 2009, Fast Dissolving Tablet: An Overview, **Journal of Chemical and Pharmaceutical Research,** 1(1): 163-177.

Bolton, S. dan C. Bon, 2004, **Pharmaceutical Statistics**, Practical and Clinical Applications, 4th Edition, Marcel Dekker, Inc., New York, 265-281.

Brittain, H. G., 2001, Particle-Size Distribution, Part I: Representations of Particle Shape and Size, **Pharm. Technol**. **25** (12), 38–45.

Carter, J. C., 2006, The Role of Disintegrants in Solid Oral Dosage Manufacturing,http://www.carterpharmaceuticalconsulting.com/articles/The-role-of-disintergrants.html, Carter Pharmaceutical Consulting, Inc., diakses tanggal 29 Juli 2013.

Chhaprel, P., A. Talesara, dan A. K. Jain, 2012, Solubility Enhancement of Poorly Water Soluble Drug Using Spray Drying Technique**, International Journal Pharm Studies and Research**, Vol 3, Issue 2.

Dash, S., P. N. Murthy, L. Nath, dan P. Chowdhury, 2010, Kinetic Modeling on Drug Release from Controlled Drug Delivery Systems, **Acta Poloniae Pharmaceutica – Drug Research**, Vol. 67, No. 3, 217-233.

Dhage, M. A., G. S. Chhabra, dan S. K. Banerjee, 2011, Development and Evaluation of UV-Spectrophotometric Method for Piroxicam in Bulk and Pharmaceutical Formulation, **J. Chem. Pharm. Res.**, 3(2), 765.

Folttmann, H. dan A. Quadir, 2008, Polyvinylpyrrolidone (PVP) – One of the Most Widely Used Excipients in Pharmaceuticals: An Overview, **Drug Delivery Technology**, Vol. 8, No. 6.

Gordon, R. E., T. W. Rosanske, D. E. Fonner, N. R. Anderson, dan G. S. Banker, 1990, Granulation Technology and Tablet Characterization, dalam : **Pharmaceutical Dosage Forms : Tablet**, Lieberman, H. A., L. Lachman, dan J. B. Schwartz (Eds.), Volume 2, 2nd Edition, Marcel Dekker, Inc., New York, 259-330.

Jafvert, C. T., 1996, **Surfactants / Cosolvents**, Ground-Water Remediation Technologies Analysis Center, E Series: TE-96-02, 4.

Javadzadeh, Y., B. Jafari-Navimipour dan A. Nokhodchi, 2007, Liquisolid Technique for Dissolution Rate Enhancement of a High Dose Water-insoluble Drug (Carbamazepine)**, Int. J. Pharm.** 341, 26–34.

Kaur, T., B. Gill, S. Kumar, dan G. D.Gupta, 2011, Mouth Dissolving Tablets : A Novel Approach to Drug Delivery, **International Journal of Current Pharmaceutical Research,** Vol. 3, Issue 1, 1-7.

Kerns, E. H. dan L. Di, 2008, Solubility, dalam : **Drug Like Properties: Concept, Structure, Design and Methods, from ADME to Toxicity Optimization**, Elsevier, 78.

Kumar, A., S. K. Sahoo, K. Padhee, P. P. S. Kochar, A. Satapathy dan N. Pathak, 2011, Review On Solubility Enhancement Techniques for Hydrophobic Drugs, **Pharmacie Globale Int. J. Comprehensive Pharmacy**.

Lachman, L., H. A. Lieberman, dan J. L. Kanig, 1986, **The Theory and Practice of Industrial Pharmacy**, 3th edition, Lea & Febiger, Philadelphia, 184.

Lacy, C. F., L. L. Amstrong, M. P. Goldman, dan L. L. Lance, 2008-2009, **Drug Information Handbook**, 17 edition, Lexi-Comp's Drug Reference Handbook.

Lipinski, C. A., F. Lombardo, B. W. Dominy, dan P. J. Feeney, 2001, Experimental and Computational Approaches to Estimate Solubility and Permeability in Drug Discovery and Development Settings, **Advanced Drug Delivery Reviews** 46 , 3–26.

Mangal, M., S. Thakral, M. Goswami, P. Ghai, 2012, Superdisintegrants: An Updated Review, **Int. J. of Pharmacy and Pharmaceutical Science Research,** 2(2) 26-35.

McEvoy, G. K., 2011, **AHFS Drug Information Essentials**, Bethesda : American Society of Health-System Pharmacists, Inc.

Mohanachandran, P. S., P. G. Sindhumol, dan T. S Kiran, 2010, Enhancement of Solubility and Dissolution Rate : An Overview, **Pharmacie Globale, Int. J. Comprehensive Pharmacy**, 4 (11).

Pahwa, R. dan N. Gupta, 2011, Superdisintegrants in The Development of Orally Disintegrating Tablets : A Review**, Int. J. Pharm. Sci. and Research**, Vol. 2(11): 2767-2780.

Patil, S. K., K. S. Wagh, V. B. Parik, A. M. Akarte, dan D. T. Baviskar, 2011, Strategies for Solubility Enhancement of Poorly Soluble Drugs, **Int. J. Pharm. Sci. Rev. and Res.,** Vol 8, Issue 2.

Rowe, R. C., P. J. Sheskey, dan M. E. Quinn, 2009, **Handbook of Pharmaceutical Excipients**, Sixth Edition, London : The Pharmaceutical Press, 196-197, 206-207, 364-368, 651-652.

Saharan, V. A., V. Kukkar, M. Kataria, V. Kharb dan P. Choudhury, 2008, Ordered Mixing: Mechanism, Process and Applications in Pharmaceutical Formulations, **Asian J. Pharm. Sci**. 3, 240–259.

Saharan, V. A., V. Kukkar, M. Kataria, M. Gera, dan P. K. Choudhury, 2009, Dissolution Enhancement of Drugs. Part I: Technologies and Effect of Carriers**, International Journal of Health Research**, 121.

Saharan V. A. dan P. Choudhury, 2011, Dissolution Rate Enhancement of Gliclazide by Ordered Mixing, **Acta Pharm**. 61, 323.

Saharan V. A. dan P. Choudhury, 2012, Dissolution Rate Enhancement of Piroxicam by Ordered Mixing, **Pak. J. Pharm. Sci**., Vol.25, No.3, 521-533.

Shaikh, S., R. V. Khirsagar, dan A. Quazi, 2010, Fast Disintegrating Tablets : An Overview of Formulation and Technology**, International Journal of Pharmacy and Pharmaceutical Sciences**, Vol 2, Issue 3.

Siregar, C. J. P., 1992, Proses Validasi Manufaktur Sediaan Tablet, dalam : **Proceedings Seminar Validasi di Industri Farmasi Sebagai Pendukung Pelaksanaan CPOB**, Siregar, C., G. Agoes, dan B. Logawa (penilai), Jurusan Farmasi, FMIPA, ITB, 38 - 39.

Voigt, R., 1984, **Buku Pelajaran Teknologi Farmasi,** (S. Noerono dan Reksohadiprojo, penerjemah), Edisi 5, Gadjah Mada University Press, Yogyakarta, 160.

Wells, J. I., 1988, **Pharmaceutical Preformulation The Physicochemical Properties of Drug Substances,** Ellis Horwood Limited, Great Britain.

Zakeri-Milani, P., H. Tajerzadeh, Z. Islambolchilar, S. Barzegar, dan H. Valizadeh, 2006, The Relation Between Molecular Properties of Drugs and Their Transport Across the Intestinal Membrane, **DARU** Vol. 14, No. 4.

LAMPIRAN A
HASIL UJI MUTU FISIK GRANUL PEMBAWA

SUDUT DIAM

Pengujian	Formula 1	Formula 2	Formula 3	Formula 4
Replikasi 1	28,07	28,81	29,89	30,04
Replikasi 2	31,14	29,66	29,74	31.12
Replikasi 3	30,16	30,45	29,7	31,32
Rata-rata ± SD	29,79 ± 1,57	29,64 ± 0,82	29,77 ± 0,10	30,83 ± 0,68

CARR'S INDEX

Pengujian	Formula 1	Formula 2	Formula 3	Formula 4
Replikasi 1	15,9	15,99	29,89	30,04
Replikasi 2	19,95	15	29,74	31,12
Replikasi 3	15,8	19,9	29,7	31,32
Rata-rata ± SD	17,21 ± 2,37	16,96 ± 2,59	29,77 ± 0,10	30,82 ± 0,68

HAUSNER RATIO

Pengujian	Formula 1	Formula 2	Formula 3	Formula 4
Replikasi 1	1,19	1,19	1,17	1,17
Replikasi 2	1,25	1,17	1,23	1,25
Replikasi 3	1,18	1,25	1,25	1,25
Rata-rata ± SD	1,20 ± 0,04	1,20 ± 0,04	1,22 ± 0,04	1,22 ± 0,05

UKURAN PARTIKEL

Pengujian	Formula 1	Formula 2	Formula 3	Formula 4
Replikasi 1	206,21	230,03	202,26	191,25
Replikasi 2	198,06	158,24	230,29	199,84
Replikasi 3	239,48	237,27	266,68	236,42
Rata-rata ± SD	214,58± 21,94	208,51 ± 43,68	233,04 ± 32,24	209,17± 23,98

UKURAN PARTIKEL FORMULA A

REPLIKASI 1

Nomor ayakan	Diameter (µm)	Berat tertinggal (gram)	% berat	FKA	FKB	Z	dg (µm)	σ_g
20	850	2,74	5,5	5,5	94,5	1,6	dg $_{50\%}$	
40	425	12,38	24,8	30,3	69,7	0,51	=	
60	250	6,97	13,9	44,2	55,8	0,15	206,21	
80	180	6,3	12,8	57	43	-0,02		2,422
100	150	3,01	6,1	63,1	36,9	-0,27	dg $_{84\%}$	
120	125	5,42	10,9	74	26	-0,55	=	
Pan	0	12,99	26	100	0	-3,31	543,88	

REPLIKASI 2

Nomor ayakan	Diameter (µm)	Berat tertinggal (gram)	% berat	FKA	FKB	Z	dg (µm)	σ_g
20	850	1,56	3,2	3,2	96,8	1,85	dg $_{50\%}$	
40	425	12,53	25,3	28,5	71,5	0,57	=	
60	250	7,35	14,8	43,3	56,7	0,17	198,06	
80	180	5,55	11,2	54,5	45,5	-0,09		2,422
100	150	2,35	4,7	59,2	40,8	-0,17	dg $_{84\%}$	
120	125	4,90	9,9	69,1	30,9	-0,5	=	
Pan	0	15,38	30,9	100	0	-3,31	479,78	

REPLIKASI 3

Nomor ayakan	Diameter (µm)	Berat tertinggal (gram)	% berat	FKA	FKB	Z	dg (µm)	σ_g
20	850	0,96	1,9	1,9	98,1	2,08		
40	425	17,33	34,7	36,6	63,4	0,34	dg $_{50\%}$ =	
60	250	9,33	18,7	55,3	44,7	-0,06	239,48	
80	180	6,80	13,6	68,9	31,1	-0,31		2,028
100	150	2,61	5,3	74,2	25,8	-0,55	dg $_{84\%}$ =	
120	125	4,54	9,2	83,4	16,6	-0,83	490,08	
Pan	0	8,28	1,6	100	0	-3,31		

Rata-rata ± SD = 214,58 ± 21,94

UKURAN PARTIKEL FORMULA B

REPLIKASI 1

Nomor ayakan	Diameter (µm)	Berat tertinggal (gram)	% berat	FKA	FKB	Z	dg (µm)	σ_g
20	850	0,85	1,7	1,7	98,3	2,12		
40	425	15,63	31,4	33,1	66,9	0,44	dg $_{50\%}$ =	
60	250	8,52	17,1	50,2	49,8	0,01	230,03	
80	180	7,30	14,7	64,9	35,1	-0,22		2,028
100	150	3,11	6,3	71,2	28,8	-0,44	dg $_{84\%}$ =	
120	125	5,33	10,7	81,9	18,1	-0,89	466,6	
Pan	0	9,00	18,1	100	0	-3,31		

REPLIKASI 2

Nomor ayakan	Diameter (µm)	Berat tertinggal (gram)	% berat	FKA	FKB	Z	dg (µm)	σ_g
20	850	0,55	1,1	1,1	98,9	2,29		
40	425	9,68	19,4	21,5	79,5	0,82	dg $_{50\%}$ =	
60	250	6,43	12,9	33,4	66,6	0,43	158,24	
80	180	5,43	10,9	44,3	55,7	0,14		2,3006
100	150	2,61	5,3	49,6	5,4	0,01	dg $_{84\%}$ =	
120	125	5,51	11,1	60,7	39,3	-0,13	364,05	
Pan	0	19,59	39,3	100	0	-3,31		

REPLIKASI 3

Nomor ayakan	Diameter (µm)	Berat tertinggal (gram)	% berat	FKA	FKB	Z	dg (µm)	σ$_g$
20	850	1,09	2,2	2,2	97,8	2,01		
40	425	15,8	31,8	34	66	0,41	dg $_{50\%}$ =	
60	250	8,75	17,6	51,6	48,4	0,04	237,27	
80	180	7,08	14,2	65,8	34,2	-0,39		2,0617
100	150	2,88	5,8	72,6	28,4	-0,43	dg $_{84\%}$ =	
120	125	4,93	9,9	81,5	18,5	-0,9	489,18	
Pan	0	9,22	18,5	100	0	-3,31		

Rata-rata ± SD = 208,51 ± 43,68

UKURAN PARTIKEL FORMULA C

REPLIKASI 1

Nomor ayakan	Diameter (µm)	Berat tertinggal (gram)	% berat	FKA	FKB	Z	dg (µm)	σ$_g$
20	850	1,26	2,5	2,5	97,5	1,96		
40	425	10,88	21,8	24,3	75,7	0,7	dg $_{50\%}$ =	
60	250	7,92	15,9	40,2	59,8	0,25	202,26	
80	180	7,81	15,7	55,9	44,1	-0,05		2,194
100	150	3,74	7,5	63,4	36,6	-0,26	dg $_{84\%}$ =	
120	125	6,24	12,5	75,9	24,1	-0,7	443,84	
Pan	0	12	24,1	100	0	-3,31		

REPLIKASI 2

Nomor ayakan	Diameter (µm)	Berat tertinggal (gram)	% berat	FKA	FKB	Z	dg (µm)	σ$_g$
20	850	2,71	5,5	5,5	94,5	1,6	dg $_{50\%}$ =	2,499
40	425	14,68	29,4	34,9	65,1	0,39	230,29	
60	250	7,5	15,1	50	50	0		
80	180	5,47	10,9	60,9	39,1	-0,12	dg $_{84\%}$ =	
100	150	2,44	4,9	65,8	34,2	-0,39	575,67	
120	125	4,68	9,4	75,2	24,8	-0,7		
Pan	0	12,39	24,8	100	0	-3,31		

REPLIKASI 3

Nomor ayakan	Diameter (µm)	Berat tertinggal (gram)	% berat	FKA	FKB	Z	dg (µm)	σ_g
20	850	3,16	6,4	6,4	93,6	1,52		
40	425	17,15	34,5	40,9	59,1	0,23	dg $_{50\%}$ =	
60	250	8,24	16,6	57,5	42,5	-0,01	266,58	
80	180	5,89	11,8	69,3	30,7	-0,5		2,3648
100	150	2,38	4,8	74,1	25,9	-0,55	dg $_{84\%}$ =	
120	125	4	8	82,1	17,9	-0,88	630,43	
Pan	0	8,94	17,9	100	0	-3,31		

Rata-rata ± SD = 233,04 ± 32,24

UKURAN PARTIKEL FORMULA D

REPLIKASI 1

Nomor ayakan	Diameter (µm)	Berat tertinggal (gram)	% berat	FKA	FKB	Z	dg (µm)	σ_g
20	850	1,30	2,6	2,6	97,4	1,94		
40	425	12,53	25,2	27,8	72,2	0,59	dg $_{50\%}$ =	
60	250	7,32	14,7	42,5	57,5	0,19	191,25	
80	180	6,09	12,3	54,8	45,2	-0,08		2,399
100	150	2,95	5,9	60,7	39,3	-0,13	dg $_{84\%}$ =	
120	125	5,61	11,3	72	28	-0,42	458,88	
Pan	0	13,91	28	100	0	-3,31		

REPLIKASI 2

Nomor ayakan	Diameter (µm)	Berat tertinggal (gram)	% berat	FKA	FKB	Z	dg (µm)	σ_g
20	850	1,12	2,3	2,3	97,7	2,0		
40	425	12,57	25,4	27,7	72,3	0,59	dg $_{50\%}$ =	
60	250	7,67	15,5	43,2	56,8	0,17	199,84	
80	180	6,7	13,5	56,7	43,3	-0,03		2,26
100	150	3,10	6,3	63	37	-0,26	dg $_{84\%}$ =	
120	125	5,59	11,3	74,3	25,7	-0,55	451,65	
Pan	0	12,69	25,7	100	0	-3,31		

REPLIKASI 3

Nomor ayakan	Diameter (μm)	Berat tertinggal (gram)	% berat	FKA	FKB	Z	dg (μm)	σ_g
20	850	2,26	4,5	4,5	95,5	1,7		
40	425	15,20	30,5	35	65	0,39	dg $_{50\%}$ =	
60	250	8	16,1	51,1	48,9	0,03	236,42	
80	180	6,57	13,2	64,3	35,7	-0,23		2,325
100	150	2,90	5,8	70,1	29,9	-0,47	dg $_{84\%}$ =	
120	125	4,89	9,8	79,9	20,1	-0,76	549,72	
Pan	0	9,99	20,1	100	0	-3,31		

Rata-rata ± SD = 209,17 ± 23,98

HASIL PENETAPAN KADAR DAN DISOLUSI

HASIL PENETAPAN KADAR DAN HOMOGENITAS

1. Campuran Interaktif dengan Granul Pembawa

Replikasi 1

No.	Absorbansi	Kadar Piroksikam (%)
1	0,685	99,559
2	0,672	97,678
3	0,668	97,098
4	0,678	98,546
5	0,664	96,520
6	0,67	97,388
Rata-rata ± SD		97,798 ± 1,09
KV		1,12

Replikasi 2

No.	Absorbansi	Kadar Piroksikam (%)
1	0,68	98,835
2	0,669	97,244
3	0,664	96,520
4	0,675	98,112
5	0,67	97,388
6	0,672	97,678
Rata-rata ± SD		97,630 ± 0,71
KV		0,810

Replikasi 3

No.	Absorbansi	Kadar Piroksikam (%)
1	0,677	98,401
2	0,679	97,691
3	0,668	97,099
4	0,665	98,665
5	0,661	96,086
6	0,671	97,533
Rata-rata ± SD		97,412 ± 1,004
KV		1,031

2. Campuran Interaktif Tanpa Granul Pembawa

Replikasi 1

No.	Absorbansi	Kadar Piroksikam (%)
1	0,631	91,745
2	0,664	96,520
3	0,672	97,678
4	0,613	89,140
5	0,608	88,416
6	0,678	98,546
Rata-rata ± SD		93,674 ± 4,467
KV		4,769

Replikasi 2

No.	Absorbansi	Kadar Piroksikam (%)
1	0,677	92,034
2	0,679	85,378
3	0,668	95,362
4	0,665	88,851
5	0,661	87,982
6	0,671	96,954
Rata-rata ± SD		91,094 ± 4,491
KV		4,930

Replikasi 3

No.	Absorbansi	Kadar Piroksikam (%)
1	0,677	87,548
2	0,679	99,550
3	0,668	97,244
4	0,665	96,954
5	0,661	95,362
6	0,671	95,507
Rata-rata ± SD		95,362 ± 4,117
KV		4,318

HASIL UJI DISOLUSI CAMPURAN INTERAKTIF PIROKSIKAM DENGAN GRANUL PEMBAWA

Replikasi 1

No	Waktu (menit)	Abs.	Kons. (µg/mL)	Jumlah obat lepas (mg)	% Obat terlepas
1	2	0,670	19,477	17,529	87,649
2	5	0,726	21,098	18,988	94,943
3	10	0,744	21,619	19,457	97,287
4	15	0,726	21,098	18,988	94,943
5	30	0,734	21,329	19,197	95,985
6	45	0,710	20,635	18,572	92,859
7	60	0,686	19,940	17,946	89,733

Replikasi 2

No	Waktu (menit)	Abs.	Kons. (µg/mL)	Jumlah obat lepas (mg)	% Obat terlepas
1	2	0,657	19,101	17,192	85,956
2	5	0,737	21,417	19,275	96,375
3	10	0,749	21,764	19,587	97,938
4	15	0,757	21,995	19,796	98,980
5	30	0,745	21,648	19,483	97,417
6	45	0,721	20,956	18,858	94,291
7	60	0,690	20,056	18,050	90,254

Replikasi 3

No	Waktu (menit)	Abs.	Kons. (µg/mL)	Jumlah obat lepas (mg)	% Obat terlepas
1	2	0,668	19,419	17,477	87,389
2	5	0,717	20,837	18,754	93,770
3	10	0,743	21,590	19,431	97,157
4	15	0,731	21,243	19,118	95,594
5	30	0,704	20,462	18,416	92,077
6	45	0,691	20,085	18,077	90,385
7	60	0,684	19,883	17,894	89,473

HASIL UJI DISOLUSI CAMPURAN INTERAKTIF PIROKSIKAM TANPA GRANUL PEMBAWA

REPLIKASI 1

No	Waktu (menit)	Abs.	Kons. (µg/mL)	Jumlah obat lepas (mg)	% Obat terlepas
1	2	0,660	19,188	17,269	86,347
2	5	0,701	20,375	18,337	91,687
3	10	0,698	20,288	18,259	91,296
4	15	0,718	20,867	18,780	93,944
5	30	0,696	20,230	18,207	91,036
6	45	0,678	19,709	17,738	88,691
7	60	0,672	19,536	17,582	87,910

REPLIKASI 2

No	Waktu (menit)	Abs.	Kons. (µg/mL)	Jumlah obat lepas (mg)	% Obat terlepas
1	2	0,659	19,159	17,243	86,217
2	5	0,702	20,404	18,363	91,817
3	10	0,711	20,664	18,598	92,989
4	15	0,717	20,838	18,754	93,771
5	30	0,704	20,462	18,416	92,078
6	45	0,691	20,085	18,077	90,385
7	60	0,684	19,883	17,895	89,473

REPLIKASI 3

No	Waktu (menit)	Abs.	Kons. (µg/mL)	Jumlah obat lepas (mg)	% Obat terlepas
1	2	0,648	18,841	16,957	84,784
2	5	0,692	20,114	18,103	90,515
3	10	0,701	20,375	18,337	91,687
4	15	0,726	21,098	18,989	94,943
5	30	0,712	20,693	18,624	93,119
6	45	0,707	20,549	18,494	92,468
7	60	0,680	19,767	17,790	88,952

HASIL UJI DISOLUSI PIROKSIKAM DARI SERBUK KAPSUL KONVENSIONAL

REPLIKASI 1

No	Waktu (menit)	Abs.	Kons. (µg/mL)	Jumlah obat lepas (mg)	% Obat terlepas
1	2	0,557	16,207	14,586	72,932
2	5	0,606	17,625	15,863	79,313
3	10	0,644	18,725	16,853	84,263
4	15	0,631	18,349	16,514	82,571
5	30	0,640	18,609	16,748	83,741
6	45	0,643	18,696	16,826	84,132
7	60	0,642	18,667	16,800	84,002

REPLIKASI 2

No	Waktu (menit)	Abs.	Kons. (µg/mL)	Jumlah obat lepas (mg)	% Obat terlepas
1	2	0,636	18,493	16,644	83,223
2	5	0,667	19,390	17,452	87,260
3	10	0,682	19,825	17,842	89,213
4	15	0,680	19,767	17,790	88,952
5	30	0,684	19,883	17,895	89,474
6	45	0,666	19,362	17,426	87,129
7	60	0,659	19,159	17,243	86,216

REPLIKASI 3

No	Waktu (menit)	Abs.	Kons. (µg/mL)	Jumlah obat lepas (mg)	% Obat terlepas
1	2	0,657	19,101	17,191	85,955
2	5	0,654	19,015	17,113	85,568
3	10	0,642	18,667	16,800	84,002
4	15	0,660	19,188	17,269	86,346
5	30	0,646	18,783	16,905	84,524
6	45	0,613	17,828	16,045	80,226
7	60	0,605	17,596	15,836	79,182

LAMPIRAN C
CARA PERHITUNGAN

MUTU FISIK GRANUL PEMBAWA

Misalnya formula A replikasi 1.

1. Sudut diam

   Luas kertas A4 = 623,7 cm^2, berat kertas A4= 4,65 gram

   Tinggi puncak gundukan granul yang dialirkan lewat corong adalah 3,6 cm; kemudian dibuat lingkaran berdasarkan lingkaran yang terbentuk dari gundukan granul tersebut dan digunting mengikuti bentuk lingkaran tersebut, lalu kertas yang berbentuk lingkaran ditimbang.

   Luas lingkaran = (berat kertas lingkaran : berat kertas A4) X luas kertas A4 = (1,08 : 4,65) X 623,7 = 144,86 cm^2

   Jari-jari lingkaran = (luas / π)$^{\frac{1}{2}}$ = 6,79 cm.

   tan α = tinggi : jari-jari = 3,6 : 6,79 = 0,53

   inv. tan α = 27,9°.

   Pada pengujian sudut diam dilakukan sebanyak 3 replikasi dengan hasil replikasi 1 = 27,9; 28,04; dan 28,28. rata-rata dari ketiga data tersebut adalah 28,07.

2. *Carr's index*

   Berat gelas ukur 100 mL kosong = 102,14 gram.

   Berat gelas ukur 100 mL + granul pembawa = 151,04 gram.

   Berat granul pembawa = 48,9 gram.

   Setelah di *tapped* diperoleh hasil pemampatan granul pembawa pada 84 mL.

   ρ_{bulk} = 48,9 : 100 = 0,489 g/mL

   ρ_{tapped} = 48,9 : 84 = 0,582 g/mL

Carr's Index = (ρ_{tapped} - ρ_{bulk}) : ρ_{tapped} X 100% = (0,582 – 0,489) : 0,582 X 100% = 15,9%.

3. *Hausner Ratio*

Hausner ratio = ρ_{tapped} : ρ_{bulk} = 0,582 : 0,489 = 1,19.

4. Ukuran Partikel

Ditimbang berat granul yang tertinggal di masing-masing pengayak, lalu dijumlahkan beratnya. Dihitung % berat, contoh (2,74 : 49,81) X 100% = 5,5 %.

FKA dihitung dengan cara % berat dikumulatifkan, contoh 5,5; 5,5 + 24,8 = 30,3; 30,3 + 13,9 = 44,2; dan seterusnya.

FKB dihitung dengan cara 100 kurang masing-masing nilai FKA.

Nilai FKB masing-masing kemudian dibagi 100, dan dilihat di tabel Z. Contoh : 94,5 : 100 = 0,945; angka ini dilihat di tabel Z dengan nilai yang sama atau mendekati nilai tersebut. Carilah angka 0,945 pada deretan angka. Apabila tidak dapat menemukan angka yang persis sebesar 0,945, maka carilah angka yang paling mendekati angka 0,945. Angka yang paling mendekati 0.05 pada tabel adalah 0,9452. Dari angka 0,9452, tariklah garis ke kiri terlebih dahulu hingga mencapai deretan angka pada kolom paling kiri dan catatlah angkanya. Dalam kasus ini adalah 1,6. Kemudian kembali ke posisi angka 0,9452, tariklah garis ke atas hingga mencapai deretan ujung kolom bagian atas dan catatlah angkanya, dalam kasus ini adalah 0,0.

Nilai Z yang dicari adalah 1,6 + 0,0 = 1,6.

Di regresikan antara diameter dan nilai z, dengan diameter sebagai sumbu x dan nilai z sebagai sumbu y, lalu akan diperoleh persamaan y = a + bx.

$dg_{50\%}$ diperoleh dari : angka 0 dimasukkan kedalam persamaan y = a + bx.

dg$_{84\%}$ diperoleh dari : angka 1 dimasukkan ke dalam persamaan y = a + bx.

σ$_g$ diperoleh dari dg$_{84\%}$ dibagi dg$_{50\%}$.

CARA PERHITUNGAN F$_{HITUNG}$

Baku	No	Kons. (µg/mL)	Abs.	X^2	XY	Y^2	n	Residual SS	Residual DF
	1	10,6	0,328	112,36	3,4768	0,1076			
	2	15,9	0,536	252,81	8,5224	0,2873			
	3	21,2	0,697	449,44	14,7764	0,4858			
I	4	26,5	0,893	702,25	23,6645	0,7975	5	$1,415 \times 10^{-3}$	3
	5	31,8	1,088	1011,24	34,5984	1,1837			
		Total		2528,1	85,0385	2,86188			
	1	10,6	0,336	112,36	3,5616	0,1129			
	2	15,9	0,527	252,81	8,3793	0,2777			
	3	21,2	0,690	449,44	15,0096	0,4761			
II	4	26,5	0,895	702,25	23,7175	0,8010	5	$7,01 \times 10^{-4}$	3
	5	31,8	1,061	1011,24	33,0084	1,1257			
		Total		2528,1	83,6764	2,77035			
	1	10,5	0,369	110,25	3,8745	0,1362			
	2	15,75	0,534	248,0625	8,4105	0,2852			
	3	21	0,715	441	15,015	0,5112			
III	4	26,25	0,904	689,0625	23,73	0,8172	5	$2,31 \times 10^{-4}$	3
	5	31,5	1,091	992,25	34,3665	1,1903			
		Total		2480,625	85,3965	2,94003			
		Pooled Regression						$2,435 \times 10^{-3}$	9
		Common Regression						$4,175 \times 10^{-3}$	11

$$SS = \sum Y^2 - (\sum XY^2 / \sum X^2)$$

Pooled Regression $= SS_1 + SS_2 + SS_3$

Common Regression $=$ total $\sum Y^2 -$ (total $(\sum XY)^2$ / total $\sum X^2$)

$F_{hitung} = \{($*Common Regression - Pooled Regression*$) / 3\text{-}1\} : ($*Pooled Regression* $/ 9)$

$= \{(4,175 \times 10^{-3} - 2,435 \times 10^{-3}) / 2\} : (2,435 \times 10^{-3} / 9) = 3,506 <$ $F_{tabel\ 0,05\ (2;9)} = 4,26$.

CARA PERHITUNGAN AKURASI PRESISI

Dari hasil pembacaan absorbansi terhadap larutan sampel akurasi presisi kemudian di ekstrapolasikan ke dalam persamaan kurva baku sehingga diperoleh konsentrasi obat. Untuk mendapatkan % perolehan kembali maka konsentrasi obat ang diperoleh di bagi dengan knsentrasi teoritis dari penimbangan bahan aktif.

Contoh : akurasi presisi pada penetapan kadar (Tabel 4.6)

Rep.	Kons.	Penimbangan bahan aktif (mg)	Abs.	Kons. (µg/mL)	Teoritis (µg/mL)	Perolehan Kembali (%)	Rata-rata	SD	KV (%)
I	50%	10,1	0,343	10,014	10,1	99,15			
II	50%	10,2	0,353	10,30	10,2	101,01	99,38	1,52	1,53
III	50%	10,1	0,339	9,89	10,1	98,00			

$Y = 0,0345X – 0,003$

$0,343 = 0,0345X – 0,003$

$X = 10,014$ µg/mL.

Konsentrasi teoritis = 10,1 µg/mL.

% perolehan kembali = (10,014 / 10,1) X 100% = 99,15%.

Masing-masing replikasi dihiitung % perolehan kembali, kemudian cari rata-rata, standar deviasi, dan koefisien variasi (KV).

CARA PERHITUNGAN PERSEN EFISIENSI DISOLUSI (% ED)

%ED = {AUC_{total} / (waktu x Wt)} x 100%

dimana AUC_{total} adalah total jumlah obat yang terlepas (Wt).

Contoh pada uji disolusi campuran interaktif dengan granul pembawa replikasi 1 :

%ED = {130,6799 / (60 x 17,946)} x 100% = 12,136%.

HASIL UJI STATISTIK

UJI STATISTIK DENGAN ONEWAY ANOVA

1. Hasil O*neway* ANOVA untuk sudut diam.

Descriptives

sudut_diam

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
formula A	3	29.7900	1.56809	.90534	25.8947	33.6853	28.07	31.14
formula B	3	29.6400	.82018	.47353	27.6026	31.6774	28.81	30.45
formula C	3	29.7767	.10017	.05783	29.5278	30.0255	29.70	29.89
formula D	3	30.8267	.68857	.39755	29.1162	32.5372	30.04	31.32
Total	12	30.0083	.95115	.27457	29.4040	30.6127	28.07	31.32

Test of Homogeneity of Variances

sudut_diam

Levene Statistic	df1	df2	Sig.
3.036	3	8	.093

ANOVA

sudut_diam

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.720	3	.907	1.003	.440
Within Groups	7.232	8	.904		
Total	9.952	11			

a. Hasil O*neway* ANOVA untuk *Carr's Index*

Descriptives

carrs_index

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
formula A	3	17.2167	2.36766	1.36697	11.3351	23.0983	15.80	19.95
formula B	3	17.9933	2.64953	1.52971	11.4115	24.5751	14.99	20.00
formula C	3	16.9633	2.59095	1.49589	10.5271	23.3996	15.00	19.90
formula D	3	18.2633	2.91308	1.68187	11.0268	25.4998	14.90	19.99
Total	12	17.6092	2.31772	.66907	16.1366	19.0818	14.90	20.00

Test of Homogeneity of Variances

carrs_index

Levene Statistic	df1	df2	Sig.
.104	3	8	.956

ANOVA

carrs_index

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.440	3	1.147	.165	.917
Within Groups	55.650	8	6.956		
Total	59.090	11			

3. Hasil O*neway* ANOVA untuk *Hausner Ratio*

Descriptives

hausner_ratio

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
formula A	3	1.2067	.03786	.02186	1.1126	1.3007	1.18	1.25
formula B	3	1.2167	.04163	.02404	1.1132	1.3201	1.17	1.25
formula C	3	1.2033	.04163	.02404	1.0999	1.3068	1.17	1.25
formula D	3	1.2233	.04619	.02667	1.1086	1.3381	1.17	1.25
Total	12	1.2125	.03671	.01060	1.1892	1.2358	1.17	1.25

Test of Homogeneity of Variances

hausner_ratio

Levene Statistic	df1	df2	Sig.
.096	3	8	.960

ANOVA

hausner_ratio

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.001	3	.000	.144	.931
Within Groups	.014	8	.002		
Total	.015	11			

4. Hasil O*neway* ANOVA untuk ukuran partikel

Descriptives

ukuran_partikel

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
formula A	3	214.5833	21.94285	12.66871	160.0743	269.0924	198.06	239.48
formula B	3	233.0433	32.24827	18.61855	152.9342	313.1525	202.26	266.58
formula C	3	208.5133	43.68822	25.22340	99.9858	317.0409	158.24	237.27
formula D	3	209.1700	23.98685	13.84881	149.5834	268.7566	191.25	236.42
Total	12	216.3275	28.91240	8.34629	197.9574	234.6976	158.24	266.58

Test of Homogeneity of Variances

ukuran_partikel

Levene Statistic	df1	df2	Sig.
1.056	3	8	.420

ANOVA

ukuran_partikel

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1184.257	3	394.752	.394	.761
Within Groups	8010.938	8	1001.367		
Total	9195.195	11			

UJI STATISTIK ONE-SAMPLE T TEST

1. Hasil *one-sample t test* sudut diam

T-Test

[DataSet2] C:\Documents and Settings\czantine\My Documents\sudutdiam t tes.sav

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
sudut_diam	3	29.6400	.82018	.47353

One-Sample Test

	Test Value = 29.64					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
sudut_diam	.000	2	1.000	.00000	-2.0374	2.0374

2. Hasil *one-sample t test Carr's Index*

T-Test

[DataSet3] C:\Documents and Settings\czantine\My Documents\carrs index t test.sav

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
carrs_index	3	16.9633	2.59095	1.49589

One-Sample Test

	Test Value = 16.96					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
carrs_index	.002	2	.998	.00333	-6.4329	6.4396

3. Hasil *one-sample t test Hausner Ratio*

T-Test

[DataSet4] C:\Documents and Settings\czantine\My Documents\hausner ratio t test.sav

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
hausner_ratio	3	1.2033	.04163	.02404

One-Sample Test

	Test Value = 1.2					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
hausner_ratio	.139	2	.902	.00333	-.1001	.1068

4. Hasil *one-sample t test* ukuran partikel

T-Test

[DataSet1] C:\DOCUME~1\czantine\MYDOCU~1\UKPART~1.SAV

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
ukuran_partikel	3	208.5133	43.68822	25.22340

One-Sample Test

	Test Value = 208.15					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
ukuran_partikel	.014	2	.990	.36333	-108.1642	108.8909

LAMPIRAN E

GAMBAR DAN TABEL

南通精华制药股份有限公司检验报告
NANTONG JINGHUA PHARMACEUTICAL CO. LTD.
· CERTIFICATE OF ANALYSIS
APIs.ADD:43 Yaogang Road,Nantong Jiangsu China
Tel:86-513-85609405/85609406

吡 罗 昔 康

PIROXICAM   MICRONIZED

Batch No.	PRX2011045M	Manufacture Date _2011.11.7_
Total Quantity	200.0KG	Report Date _2011.11.8_
Commercial Quantity	200.0KG	Re-test Date _2014.11.6_
Inspection No.	110300298	

TEST	SPECIFICATIONS (USP)	RESULTS
Characteristics	off-white to light tan or light yellow odorless powder	Complies
Identification	A. IR B. UV C. TLC	Complies
Water	≤0.5%	0.27%
Residue on ignition	≤0.3%	0.13%
Heavy metals	≤0.005%	<0.005%
Particle size	D(0.98) ≤13um	11.1 um
Assay	97.0~103.0%	99.62%

Conclusion   The product meets the requirements of USP 34 and the additional items defined by customer

Analyst 李淑娟 2011.11.8   Supervisor 顾晓君 2011.11.8   Chief of Laboratory 2011.11.8

QA Release Date 2011.11.8

TDP

92

JRS PHARMA JRS

THE EXCIPIENT FAMILY
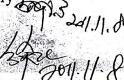
VIVASOL / Ac prod

Croscarmellose Sodium Ph. Eur., NF, JP

CERTIFICATE OF ANALYSIS

Batch-no.: 3201022039
Re-evaluation date: 05 / 2016
Manufacturing date: 05 / 2012

Manufacturing site: Pirna, Germany

Description	Almost white, very hygroscopic powder; practically insoluble in acetone, ethanol, ether and toluene.

Standards	Specification	Batch Result	Reference
Particle size (retained on air jet sieve)			T226F (MCW)
> 75 µm (200 mesh)	max. 2 %	< 2 %*	
> 45 µm (325 mesh)	max. 10 %	< 10 %*	

Pharmacopoeial test items	Specification	Batch Result	Reference
Identification (A, B, C), (1, 2, 3)	passes	passes*	Ph. Eur., NF, JP
Degree of Substitution	0.60 – 0.85	0.78*	Ph. Eur., NF, JP
Loss on drying	max. 10.0 %	4.8 %	Ph. Eur., NF, JP
pH	5.0 – 7.0	6.2	Ph. Eur., USP, JP
Content of water-soluble material	1.0 -10.0 %	6.2 %	Ph. Eur., NF, JP
Sulphated ash	14.0 – 28.0 %	passes*	Ph. Eur., JP
Settling volume	10.0 – 30.0 ml	18.5 ml	Ph. Eur., NF, JP
Sodium chloride and Sodium glycolate	max. 0.5 %	< 0.5 %*	Ph. Eur., NF, JP
Heavy metals	max. 10 ppm	< 10 ppm*	T CC 043 (CHP)
Arsenic	max. 2 ppm	< 2 ppm*	T CC 043 (CHP)
Residue of Methanol	max. 1.0 %	< 1.0 %*	T CC 019 (CHP)
Total aerobic microbial count	< 100 CFU / g	< 100 CFU / g*	Ph. Eur., USP
Fungi / molds and yeasts	< 20 CFU / g	< 20 CFU / g*	Ph. Eur., USP
E. coli, Pseudomonas aeruginosa	absent in 10 g	absent*	Ph. Eur., USP
Staph. aureus, Salmonella spec.	absent in 10 g	absent*	Ph. Eur., USP

* Results reported are expected results based on periodic testing.

The batch described by this certificate meets the requirements of Ph. Eur., NF and JP monographs for "Croscarmellose Sodium" current edition. It is released on the basis of the results ascertained.

The raw materials, manufacturing process, and product do not contain any of the solvents listed in the Residual Solvents (Ph. Eur <5.4>, USP<467>) except for Methanol limited to max. 1.0%.

This product may contain raw materials derived from unauthorized genetically modified cotton and is not suitable for the production or marketing of food or dietary supplements in the EC.

Storage recommendation: Protect from excessive heat and moisture. Keep containers closed.

July 27, 2012
AB: 21146101
VSOL P09

Mathias Winkelmann
QUALITY CONTROL
CHP Carbohydrate Pirna

93

□ · BASF
The Chemical Company

Certificate of Analysis

BASF Indonesia

Fax No 00620247627001

PT. BAHTERA ADI JAYA

JL. BETENG NO.108, KRANGGAN

50137 SEMARANG
SEMARANG TENGAH - JAWA TENGAH
Indonesia

2012-11-02
Quality Control
A. Muklis
0218711096
Certificate No 1191
Page 2 of 2

Certificate of Analysis according to DIN 55350-18-4.2.2

Texapon® OC-P / Sod. Lauryl Sulpai

20KG Paper Bags
Purchase Order/Customer Product#
P685/BAJ/SBY/XI/2012

Material	50210676
Order	6000547404 000030
Delivery	6200491467 000030
Lot	0008901774
Lot/Qty	140.000 KG
Total	200.000 KG
Transport	N 9546 UG

PARAMETER	RESULTS	STANDARD
Appearance; -	Pass	white to slightly yellow
Anionic Surfactant (MW 299);% DIN ISO 2271 mod	95.4	Min. 95.0
pH-Value (1%); - ISO 4316	9.3	7.0 - 10.5
Water Content;% ISO 4317	1.0	Max. 1.2
Sodium Sulphate;% Method 940022-01	2.1	Max. 2.5
Sodium Chloride;% Method 930106-01	0.05	Max. 0.2
Bulk Density;g/L Method 920037-01	502	350 - 600
Color APHA (5%); - ASTM D 1209	16	Max. 25
Alkalinity; - GCI A-13	0.10	Max. 0.5
Unsulphated Substance;% HPLC	1.4	Max. 1.5

Manufacturing Date : 13.10.2012
Expiry Date   : 12.10.2013

This is a computer-generated document. No signature is required.

94

PT.BRATACO

HASIL PEMERIKSAAN

Nama Bahan : Lactose
No Batch : J 0825/13 (GX010017)
Ex : DMV Fontera
ED : 01/2016
Grade : Farma

Jenis Pemeriksaan	Persyaratan FI IV	Hasil
Pemerian	Serbuk, putih atau putih krem, tidak berbau, rasa agak manis	Sesuai
Kelarutan	Larut dalam 6 bagian air, 1 bagian air mendidih, sukar larut dalam etanol, praktis tidak larut dalam kloroform dan dalam eter	Sesuai
Kejernihan dan warna larutan	3 g dalam 10 ml air mendidih; terbentuk larutan jernih, tidak berwarna	Sesuai
Susut Pengeringan	Tidak lebih dari 5,5%	0.6 %
pH (10% b/v)	4,0 – 6,5	5.0

Kesimpulan : _Memenuhi Syarat_

Cikarang, 20 – 09 – 2013

Pemeriksa

Putreni
Analis

Penanggung Jawab

Dra. Tri Hartati
Apoteker
SIK.3836/B

95

Critical Values of r

n	2-tailed testing			1-tailed testing		
	α = .1	α = .05	α = .01	α = .1	α = .05	α = .01
5	0.805	0.878	0.959	0.687	0.805	0.934
6	0.729	0.811	0.917	0.608	0.729	0.882
7	0.669	0.754	0.875	0.551	0.669	0.833
8	0.621	0.707	0.834	0.507	0.621	0.789
9	0.582	0.666	0.798	0.472	0.582	0.750
10	0.549	0.632	0.765	0.443	0.549	0.715
11	0.521	0.602	0.735	0.419	0.521	0.685
12	0.497	0.576	0.708	0.398	0.497	0.658
13	0.476	0.553	0.684	0.380	0.476	0.634
14	0.458	0.532	0.661	0.365	0.458	0.612
15	0.441	0.514	0.641	0.351	0.441	0.592
16	0.426	0.497	0.623	0.338	0.426	0.574
17	0.412	0.482	0.606	0.327	0.412	0.558
18	0.400	0.468	0.590	0.317	0.400	0.543
19	0.389	0.456	0.575	0.308	0.389	0.529
20	0.378	0.444	0.561	0.299	0.378	0.516
21	0.369	0.433	0.549	0.291	0.369	0.503
22	0.360	0.423	0.537	0.284	0.360	0.492
23	0.352	0.413	0.526	0.277	0.352	0.482
24	0.344	0.404	0.515	0.271	0.344	0.472
25	0.337	0.396	0.505	0.265	0.337	0.462
26	0.330	0.388	0.496	0.260	0.330	0.453
27	0.323	0.381	0.487	0.255	0.323	0.445
28	0.317	0.374	0.479	0.250	0.317	0.437
29	0.311	0.367	0.471	0.245	0.311	0.430
30	0.306	0.361	0.463	0.241	0.306	0.423
40	0.264	0.312	0.403	0.207	0.264	0.367
50	0.235	0.279	0.361	0.184	0.235	0.328
60	0.214	0.254	0.330	0.168	0.214	0.300
80	0.185	0.220	0.286	0.145	0.185	0.260
100	0.165	0.197	0.256	0.129	0.165	0.232
120	0.151	0.179	0.234	0.118	0.151	0.212
140	0.140	0.166	0.217	0.109	0.140	0.196
160	0.130	0.155	0.203	0.102	0.130	0.184
180	0.123	0.146	0.192	0.096	0.123	0.173
200	0.117	0.139	0.182	0.091	0.117	0.164
300	0.095	0.113	0.149	0.074	0.095	0.134
400	0.082	0.098	0.129	0.064	0.082	0.116
500	0.074	0.088	0.115	0.057	0.074	0.104

Standard Normal Probabilities
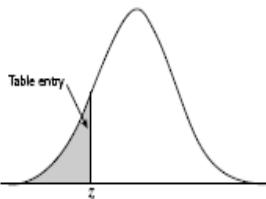
Table entry

Table entry for z is the area under the standard normal curve to the left of z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
−3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
−3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
−3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
−3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
−2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
−2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
−2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
−2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
−2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
−2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
−2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
−2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
−2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
−2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
−1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
−1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
−1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
−1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
−1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
−1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
−1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
−1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
−1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
−1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
−0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
−0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
−0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
−0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
−0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
−0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
−0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
−0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
−0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
−0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641
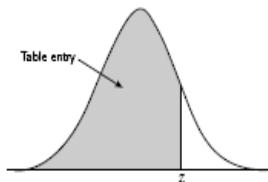
97

Standard Normal Probabilities

Table entry

Table entry for z is the area under the standard normal curve to the left of z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

Tabel Titik Kritis Distribusi t

Titik Persentase Distribusi t (df = 1 – 40)

Pr \ df	0.25 \ 0.50	0.10 \ 0.20	0.05 \ 0.10	0.025 \ 0.050	0.01 \ 0.02	0.005 \ 0.010	0.001 \ 0.002
1	1.00000	3.07768	6.31375	12.70620	31.82052	63.65674	318.30884
2	0.81650	1.88562	2.91999	4.30265	6.96456	9.92484	22.32712
3	0.76489	1.63774	2.35336	3.18245	4.54070	5.84091	10.21453
4	0.74070	1.53321	2.13185	2.77645	3.74695	4.60409	7.17318
5	0.72669	1.47588	2.01505	2.57058	3.36493	4.03214	5.89343
6	0.71756	1.43976	1.94318	2.44691	3.14267	3.70743	5.20763
7	0.71114	1.41492	1.89458	2.36462	2.99795	3.49948	4.78529
8	0.70639	1.39682	1.85955	2.30600	2.89646	3.35539	4.50079
9	0.70272	1.38303	1.83311	2.26216	2.82144	3.24984	4.29681
10	0.69981	1.37218	1.81246	2.22814	2.76377	3.16927	4.14370
11	0.69745	1.36343	1.79588	2.20099	2.71808	3.10581	4.02470
12	0.69548	1.35622	1.78229	2.17881	2.68100	3.05454	3.92963
13	0.69383	1.35017	1.77093	2.16037	2.65031	3.01228	3.85198
14	0.69242	1.34503	1.76131	2.14479	2.62449	2.97684	3.78739
15	0.69120	1.34061	1.75305	2.13145	2.60248	2.94671	3.73283
16	0.69013	1.33676	1.74588	2.11991	2.58349	2.92078	3.68615
17	0.68920	1.33338	1.73961	2.10982	2.56693	2.89823	3.64577
18	0.68836	1.33039	1.73406	2.10092	2.55238	2.87844	3.61048
19	0.68762	1.32773	1.72913	2.09302	2.53948	2.86093	3.57940
20	0.68695	1.32534	1.72472	2.08596	2.52798	2.84534	3.55181
21	0.68635	1.32319	1.72074	2.07961	2.51765	2.83136	3.52715
22	0.68581	1.32124	1.71714	2.07387	2.50832	2.81876	3.50499
23	0.68531	1.31946	1.71387	2.06866	2.49987	2.80734	3.48496
24	0.68485	1.31784	1.71088	2.06390	2.49216	2.79694	3.46678
25	0.68443	1.31635	1.70814	2.05954	2.48511	2.78744	3.45019
26	0.68404	1.31497	1.70562	2.05553	2.47863	2.77871	3.43500
27	0.68368	1.31370	1.70329	2.05183	2.47266	2.77068	3.42103
28	0.68335	1.31253	1.70113	2.04841	2.46714	2.76326	3.40816
29	0.68304	1.31143	1.69913	2.04523	2.46202	2.75639	3.39624
30	0.68276	1.31042	1.69726	2.04227	2.45726	2.75000	3.38518
31	0.68249	1.30946	1.69552	2.03951	2.45282	2.74404	3.37490
32	0.68223	1.30857	1.69389	2.03693	2.44868	2.73848	3.36531
33	0.68200	1.30774	1.69236	2.03452	2.44479	2.73328	3.35634
34	0.68177	1.30695	1.69092	2.03224	2.44115	2.72839	3.34793
35	0.68156	1.30621	1.68957	2.03011	2.43772	2.72381	3.34005
36	0.68137	1.30551	1.68830	2.02809	2.43449	2.71948	3.33262
37	0.68118	1.30485	1.68709	2.02619	2.43145	2.71541	3.32563
38	0.68100	1.30423	1.68595	2.02439	2.42857	2.71156	3.31903
39	0.68083	1.30364	1.68488	2.02269	2.42584	2.70791	3.31279
40	0.68067	1.30308	1.68385	2.02108	2.42326	2.70446	3.30688

F Values for $\alpha = 0.05$

d_2	1	2	3	4	d_1 5	6	7	8	9
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5
2	18.51	19.00	19.16	19.25	19.3	19.33	19.35	19.37	19.38
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96
inf	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88