

LABORATORIUM KIMIA FISIKA
Jurusan Kimia - FMIPA
Universitas Gadjah Mada (UGM)

TERMODINAMIKA KIMIA (KIMIA FISIK 1)

Informasi Kuliah

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INFORMASI KULIAH

Judul kuliah : **Termodinamika Kimia (Kimia Fisik 1)**
Kode : MKK-2301
SKS : 3 SKS
Sifat : Wajib
Kelas : C
Jadwal : Rabu, jam 11-13 di ruang S2. 504
Kamis, jam 11-12 di ruang S2. 505
Dosen : 1. Dr. lip Izul Falah
2. Drs. Iqmal Tahir, M.Si.


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Manajemen waktu kuliah

KALENDER AKADEMIK 2012/2013
FMIPA UGM

No	Tanggal	Semester I (Ganjil)	Kegiatan
1	30 Juli 2012 - 03 Agustus 2012		Herregistrasi Mahasiswa Lama
2	06 Agustus 2012 - 10 Agustus 2012		Pengambilan KMS dan Key-in bagi mahasiswa
3	13 Agustus 2012		Pengumuman Matakuliah Pilihan yang tidak terselektora
4	13 Agustus 2012 - 16 Agustus 2012		Perubahan KRS & Key-in perubahan matakuliah yang tidak terselektora
5	30 Agustus 2012 - 02 September 2012		Upacara Penyerahan Calon Mahasiswa Baru dan PPSMB Jantung Rajasa dan Dignia
6	03 September 2012 - 28 Desember 2012		Kuliah/Praktikum/Ujian Sisipan
7	08 Oktober 2012 - 19 Oktober 2012		Pengambilan Kartu Ujian Tengah Semester
8	22 Oktober 2012 - 03 November 2012		Ujian Tengah Semester
9	17 Desember 2012 - 28 Desember 2012		Pengambilan Kartu Ujian Akhir Semester
10	24 Desember 2012 - 28 Desember 2012		Minggu Tenang
11	31 Desember 2012 - 12 Januari 2013		Ujian Akhir Semester
12	14 Januari 2013 - 25 Februari 2013		Libur Semester/Pengumuman Hasil Ujian (KHS)

Sebelum ujian sisipan:
Drs. Iqmal Tahir, M.Si.



Setelah ujian sisipan :
Prof. Dr. lip Izul Falah



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Materi kuliah

- Sistem gas dan persamaan keadaan sistem.
- Tinjauan hukum-hukum termodinamika terhadap proses volume konstan, tekanan konstan, adiabatik, isothermal untuk sistem komposisi tetap, terisolasi, tertutup, terbuka, gas, cairan, dan padatan.
- Panas, kerja, perubahan energi dakhil, perubahan entalpi dan perubahan entropi dari suatu proses.

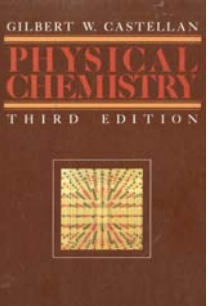
Buku pegangan

- Atkins, P. W., 1990, **Physical Chemistry**, edisi ke-4, Oxford University Press, Oxford.
Edisi terjemahan :
Atkins, P. W., 1997, **Kimia Fisika**, jilid 1, edisi ke-4, (diterjemahkan oleh Kartohadiprojo, I.), penerbit Erlangga, Jakarta.
- Castellan, G. W., 1983, **Physical Chemistry**, edisi ke-3, Addison-Wesley Publishing Company, Singapore.

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Buku pegangan

Castellan, G. W., 1983, **Physical Chemistry**, edisi ke-3, Addison-Wesley Publishing Company, Singapore.



2 Empirical Properties of Gases

- Boyle's law; Charles's law
- Molar mass of a gas. Avogadro's law; The ideal gas law
- The equation of state; Extensive and intensive properties
- Properties of the ideal gas
- Determination of molar masses of gases and volatile substances
- Mixtures; Composition variables
- Equations of state for a gas mixture; Dalton's law
- The partial-pressure concept
- The barometric distribution law

Questions
Problems

3 Real Gases

- Deviations from ideal behavior
- Modifying the ideal gas equation; The van der Waals equation
- Implications of the van der Waals equation
- The isotherms of a real gas
- Continuity of states
- The isotherms of the van der Waals equation
- The critical state
- The law of corresponding states
- Other equations of state

Questions
Problems

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6 The Laws of Thermodynamics: Generalities and the Zeroth Law

- 6.1 Kinds of energy and the first law of thermodynamics
- 6.2 Restrictions on the conversion of energy from one form to another
- 6.3 The second law of thermodynamics
- 6.4 The Zeroth law of thermodynamics
- 6.5 Thermometry

Questions
Problems

7 Energy and the First Law of Thermodynamics: Thermochemistry

- 7.1 Thermochemical terms: Definitions
- 7.2 Work and heat
- 7.3 Expansion work
- 7.4 Work of compression
- 7.5 Maximum and minimum quantities of work
- 7.6 Reversible and irreversible transformations
- 7.7 Energy and the first law of thermodynamics
- 7.8 Properties of the calorimetric
- 7.9 Mathematical methods: Exact and inexact differentials
- 7.10 Changes in energy in relation to changes in properties of the system
- 7.11 Changes in state at constant volume
- 7.12 Measurement of $\Delta C_{V,m}$; Joule's experiment
- 7.13 Changes in state at constant pressure
- 7.14 The relation between C_p and C_v
- 7.15 The measurement of $\Delta C_{P,m}$; Joule-Thomson experiment
- 7.16 Adiabatic changes in state
- 7.17 A note about problem working
- 7.18 Application of the first law of thermodynamics to chemical reactions: The heat of reaction
- 7.19 The formation reaction
- 7.20 Conventional values of molar enthalpies
- 7.21 The determination of heats of formation
- 7.22 Sequences of reactions; Hess's law
- 7.23 Heats of solution and dilution
- 7.24 Heats of reaction at constant volume
- 7.25 Dependence of the heat of reaction on temperature
- 7.26 Bond enthalpies
- 7.27 Calorimetric measurement

8 Introduction to the Second Law of Thermodynamics

- 8.1 General remarks
- 8.2 The Carnot cycle
- 8.3 The second law of thermodynamics
- 8.4 Characteristics of a reversible cycle
- 8.5 A perpetual-motion machine of the second kind
- 8.6 The efficiency of heat engines
- 8.7 Another impossible engine
- 8.8 The thermodynamic temperature scale
- 8.9 Retrodiction
- 8.10 Carnot cycle with an ideal gas
- 8.11 The Carnot refrigerator
- 8.12 The heat pump
- 8.13 Definition of entropy
- 8.14 General proof
- 8.15 The Clausius inequality
- 8.16 Conclusion

Questions
Problems

9 Properties of the Entropy and the Third Law of Thermodynamics

- 9.1 The properties of entropy
- 9.2 Conditions of thermal and mechanical stability of a system
- 9.3 Entropy changes in isochoric transformations
- 9.4 Mathematical interlude: More properties of exact differentials. The cyclic rule
- 9.5 Entropy changes in relation to changes in the state variables
- 9.6 Entropy as a function of temperature and volume
- 9.7 Entropy as a function of temperature and pressure
- 9.8 The temperature dependence of the entropy
- 9.9 Entropy changes in the ideal gas
- 9.10 The third law of thermodynamics
- 9.11 Entropy changes in chemical reactions
- 9.12 Entropy and probability
- 9.13 General form for entropy
- 9.14 The energy distribution
- 9.15 Entropy of mixing and exceptions to the third law of thermodynamics

Questions
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Buku Pendukung

- Atkins, P dan Paula, J. 2006, Atkin's Physical Chemistry, Oxford University Press, Oxford.
- Levine, I.N., 1995, Physical Chemistry, McGraw Hill International Edition, New York.
- Alberty, R. A., dan Daniels, F. 1984, *Kimia Fisika*, Jilid 2 (terjemahan), Erlangga, Jakarta.
- Dogra, S.K., dan Dogra, S., 1990, Kimia Fisik dan Soal-soal, Penerbit Universitas Indonesia, Jakarta.
- Moore, W. J., 1974, *Physical Chemistry*, edisi ke-4, Prentice-Hall, Inc., Indiana.



Termodinamika

Pengertian asal:

Ilmu yang mengkaji bagaimana transfer panas akan mempengaruhi materi.

Sekarang:

Mengkaji semua aspek yang penting dan memiliki keterkaitan untuk mempengaruhi kondisi materi seperti panas, mekanik, kimia, gravitasi, permukaan, listrik, magnetik, atomik dan lain sebagainya

Tingkatan termodinamika

Phenomenologikal --- fokus pada fenomena bahwa materi dapat patuh setiap dilakukan pengamatan.

Statistikal --- menerangkan dan memprediksi sifat materi dari strukturnya.

Mekanika Quantum --- menerangkan bagaimana struktur materi yang terjadi seperti yang teramati.