

THERMODYNAMICS

ACADEMIC YEAR 2019/20, SPRING SEMESTER

SUBJECT CODE: TERMOFI7EA

INFORMATION

Dear Students,

Here I summarize information needed to accomplish the thermodynamics lecture. You will receive two marks, one for the practice and one for the oral exam. For the first you have to solve exercises in a written form (with handwriting), scan it and submit it via email. The problems to be solved are listed below. The oral exam will take place online, I will send the details later.

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Webpage: ispanovity.web.elte.hu/teaching/2019_2020/thermodynamics/
Textbook: <http://metal.elte.hu/~ispanovity/thermodynamics/book.pdf>

TOPICS

1. Temperature

Concept of temperature and thermal equilibrium; The zeroth law of thermodynamics; Thermometers; Temperature scales; Gas thermometers and the Kelvin scale; Thermal stress
Textbook pages: 570-582

2. Heat

Heat and its units; Specific heat; Molar heat capacity; Phases and phase changes; Latent heat; Calorimetry; Heat transfer: conduction, convection and radiation
Textbook pages: 582-597

3. Equations of state and their kinetic model

Equations of state; The ideal gas; The van der Waals gas; Molecules and interactions; Kinetic model of an ideal gas; Temperature and kinetic energy;
Textbook pages: 610-623

4. Thermal properties

Heat capacity of gases and its temperature dependence; Heat capacity of solids; The Maxwell-Boltzmann distribution; Phases of matter; Phase diagram; Triple point; Critical point
Textbook pages: 626-634

5. The first law of thermodynamics

Thermodynamic systems and processes; Mechanical work; Internal energy; The first law of thermodynamics; Cyclic processes
Textbook pages: 646-656

6. Thermodynamic processes

Specific processes: adiabatic, isochoric, isobaric and isothermal; Ideal gas: energy and heat capacities; Adiabatic process of an ideal gas;
Textbook pages: 656-664

7. The second law of thermodynamics

Reversible and irreversible processes; Heat engines; Efficiency; Refrigerators; Heat pumps; The second law of thermodynamics: Kelvin-Planck and Clausius statements
Textbook pages: 673-684

8. The Carnot cycle and the entropy

The Carnot cycle; Efficiency of the Carnot cycle for an ideal gas; Entropy in reversible and irreversible processes; Microscopic interpretation of the entropy
Textbook pages: 684-699

PROBLEMS

Exercise list #1: 17.2, 17.12, 17.15, 17.22, 17.26, 17.30, 17.36, 17.38, 17.44, 17.54, 17.72, 17.76

Exercise list #2: 18.2, 18.12, 18.14, 18.16, 18.24, 18.28, 18.36, 18.42, 18.48, 18.51

Exercise list #3: 19.6, 19.8, 19.11, 19.17, 19.22, 19.30, 19.32, 19.34

Exercise list #4: 20.4, 20.10, 20.12, 20.14, 20.22, 20.28, 20.35

The problems must be solved on sheets of A4 paper then scanned and sent via email to ispanovity@metal.elte.hu

ORAL EXAM

The oral exams will take place online, you one of the 8 topics will be randomly assigned to you and you will have to summarize it. Then you will also have to answer a couple of questions about the entire subject.