Introduction to
Physics of Fluids and Plasmas

Counsel: **Tuesday & Thursday 11:30 - 13:00**

Office: **Room 532 in the Applied Science Bldg.**

Homepage: **//solardynamicslab.khu.ac.kr/~magara**

Goals:

- **Understand basic properties of plasmas**
- **Derive magnetohydrodynamics (MHD) equations of plasmas**
- **Understand fundamental properties of MHD**
- **Understand MHD waves**

Lecture characteristics:

Theory: 60%, Practical Training: 40%

Instruction methods:

Discussion, Audi-visual Education, Presentation

Evaluation method:

Mid-term Exam... 30%, Final Exam... 30%, Homework/Report... 30%, Attendance... 10%

Textbooks:

- Solar Magnetohydrodynamics (E.R. Priest, D. Reidel Publishing Company, 1984, 9789027718334)
- Introduction to Plasma Physics and Controlled Fusion (Francis F. Chen, Springer, 1984, 9780306413322)
- Plasma Physics (Peter Andrew Sturrock, Cambridge University Press, 1994, 9780521448109)
- Gas dynamics (Frank H. Shu, Univ. Science Books, 1992, 9780935702651)

Assignments:

Each student should submit a report, in addition to taking mid-term and final exams.

What is plasma?

Plasma...

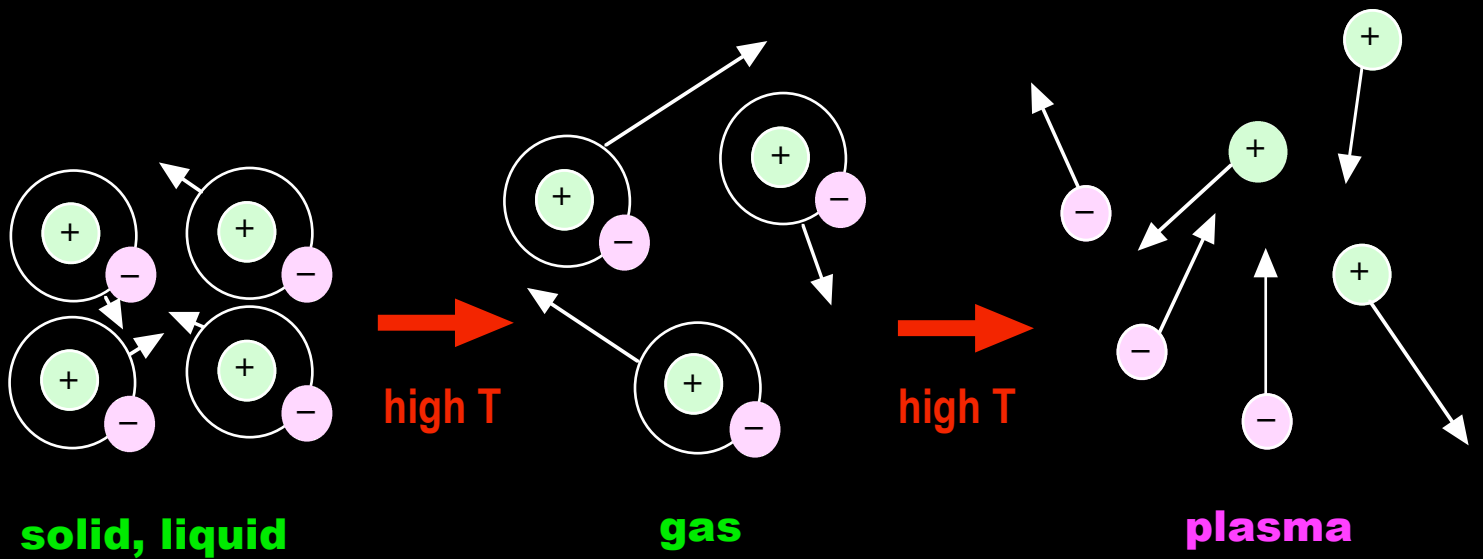
the 4th-state of matter, following solid, liquid, and gas

High temperature ($T \geq 10^4$ K)

→ neutral particles are dissociated into positive ions and negative electrons (ionization)

↓

plasma



Two types of plasma

Cold plasma (partially ionized plasma)...

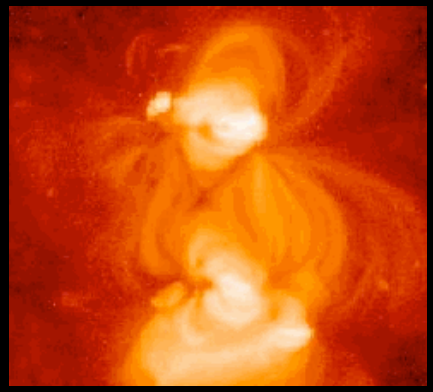
low temperature, only **part** of neutral particles are ionized

T ~ several thousands K

Hot plasma (fully ionized plasma)...

high temperature, **all** neutral particles are ionized

T >> 10^4 K



Examples of plasmas

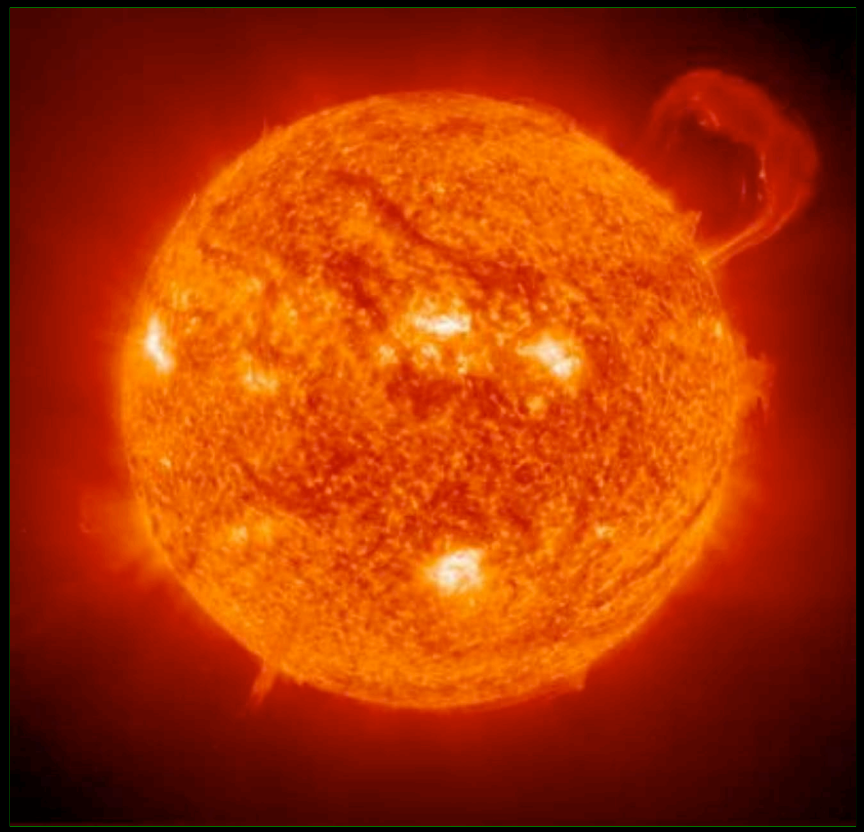
Plasmas in our daily life (cold plasma)

plasma television

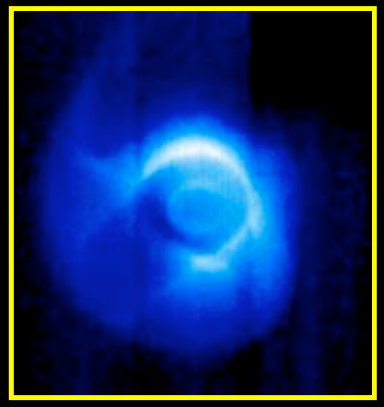
fluorescent lamp

Plasmas in the universe (hot plasma)

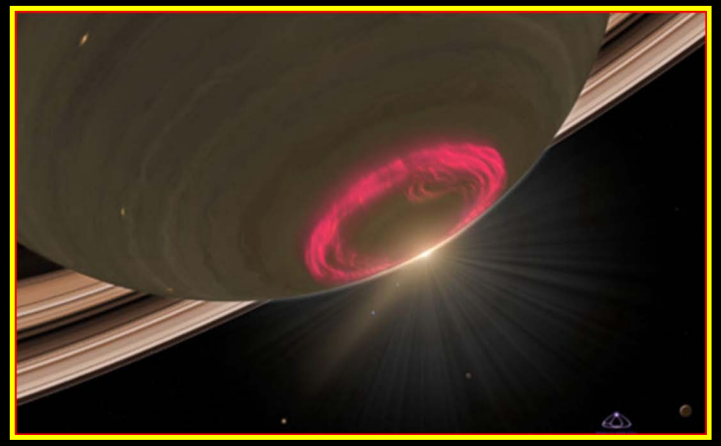
Solar atmosphere (chromosphere)



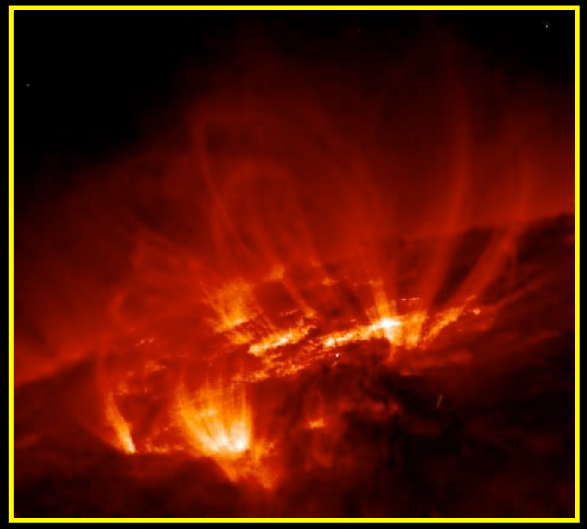
Temperature is higher than 10,000 K.



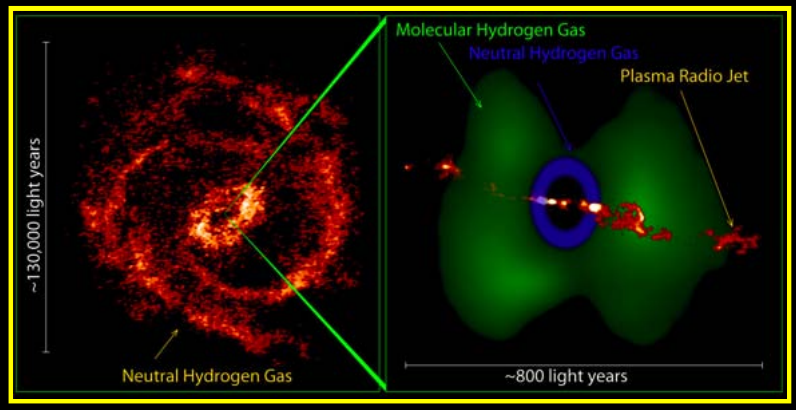
Magnetosphere



Saturn



Active region on the Sun



Jet from an active galactic nucleus (AGN)

Laboratory plasma (hot plasma)

tokamak plasma