HISTORY OF SCIENCE II
CALENDAR

DATE	NOTES	HISTORICAL CONTEXTS
DAY 0 Jan. 5	Course Introduction. For *historical contexts* refer to syllabus. Sign up for Historical Contexts for DAY 1 and DAY 2	Classroom activities in preparation for the course. Syllabus and Historical Contexts discussed.
DAY 1 Jan. 12	**PART A:** **The Beginnings of Modern Chemistry and Physics** **(**From 1800 to about 1860) **Early Chemistry and physics:** Newton's experiment with a prism Young's interference of light experiment Faraday's electrolysis experiments **ASSIGNMENT II: 1** Contexts 1, 2, and 3	**CONTEXT 1: Early Modern Chemistry** •The law of definite proportions •Dalton's atomic theory •Avogadro's Hypothesis •Davy's hypothesis of 'combining volumes of gases'. •Proust's conjecture about atomic structure **CONTEXT 2: Early Modern Physics** **I. Light** •William Herschel and the discovery infrared radiation •Young's interference experiment of light •Fizeau's experiment to find the speed of light. **II. Heat, work, electricity and the Conservation of Energy Principle** ·The heat experiments of Rumford ·Hemholtz: the Law of Conservation of Energy ·Faraday's electrolysis experiments: the Faraday constant (F) ·Joule's experiments: The mechanical equivalent of heat and electricity ·The laws of thermodynamics: Helmholtz and Lord Kelvin

DAY 2 Jan. 19	**ASSIGNMENT II:1 cont.**..	**CONTEXT 3: Microphysics** ·Brownian motion ·The kinetic molecular theory of gases ·The determination of Lohschmidt's number **Special Presentation:** ·The Confrontation Between Modern Physics and ·Geology and Biology ·Charles Lyell: Principles of Geology ·Darwin: Origin of Species ·The Bible and the age of the earth ·The age-of-the-earth debate
DAY 3 Jan. 26	**ASSIGNMENT II: 2** Context 4 **PART B: Prelude to the "New Physics":** **From about 1860 - to about 1910:** ●Hand in Assignment 1	**CONTEXT 4: Spectroscopy and Cathode Ray Physics** <u>I. Spectroscopy</u> •Early flame tests in chemistry •Kirchhoff's spectroscopy •The Doppler effect •The discovery of helium <u>II. Cathode Ray Physics</u> •The history of the cathode ray tube •The physics of the radiometer. •The discovery of x-rays **Special Presentation:** •Mendeleev's periodic table of the elements

DAY 4 Febr. 2	**ASSIGNMENTT II: 3** Contexts 5 and 6 ●Hand in Assignment 2.	**CONTEXT 5: Black Body Radiation and Planck's Quantum Theory** •Stephan's law of radiation: empirical •Boltzmann's solution: theoretical •Wien's law of displacement •Raleigh- Jean's law of radiation •Planck and the idea of the quantum **CONTEXT 6: Surprising New Discoveries** I. <u>Anticipating the "New Physics"</u> ·The Michelson and Morley experiment ·Hertz and the photoelectric effect ·Maxwell's theoretical model of E-M radiation ·Hertz's experiments with electromagnetic radiation (radio waves). <u>II. The last decade of the 19th century:</u> ·The discovery of x-rays ·The discovery of radioactivity ·The discovery of the electron: the charge to mass ratio (e / m) ·Planck and the beginning of quantum theory
DAY 5 Febr. 9	. **ASSIGNMENT II: 4** Contexts 7, 8 and 9 ●Hand in Assignment 3	**Midterm test: 1 hour. (15%)** **CONTEXT 7: *Annus Mirabilis:* Einstein's Three Papers of 1905:** **Special Presentation**: *Brownian motion,* *The Photoelectric Effect, and* *The Special Theory of Relativity*

DAY 6 Febr. 23	**Part C:** **The Beginnings of the "New Physics". From about 1913 to 1924. ASSIGNMENT II:4 cont...** ●Sign up for CASE STUDIES (Assignment IV) **Note: Case Studies commitments must be established by DAY 7!** Remember: <u>Three</u> students per Case Study. However, there may be one case study with two students necessary. But never four!	**CONTEXT 8: The Background to Bohr's Model of the Hydrogen Atom** ·The determination of Avogadro's number (A_o) ·The relationship between A_o, electron charge, e and Faraday's constant, F. ·Rutherford's gold foil experiment ·Rutherford's 'mouse trap' to detect alpha particles · Spectroscopy before Bohr: The Balmer formula for the hydrogen spectrum · Millikan's Oil drop experiment: The charge of the electron **Special Presentation:** ·Bohr's atomic model of the hydrogen atom. **CONTEXT 9: Activities After the Bohr Model** I: <u>Four important experiments in the second decade of the 20th century</u> ·The Franck-Herz experiment ·Moseley's experiments ·Bragg's diffraction of x-rays ·The discovery of isotopes <u>II: Theoretical work to improve the Bohr model of the atom</u> ·Sommerfeld's model of the atom ·Explaining the Zeeman effect ·Einstein predicts the LASER **Special Presentation:** ·Bohr revises the periodic table of the elements

DAY 7 March 1.	. **PART D:** **The New Quantum Mechanics** **ASSIGNMENT II:5** Context 10 and 11 ●Hand in assignment 4. ●Hand in CASE STUDY PROPOSAL	**CONTEXT 10: Using Quantum Mechanics to Explain Key Experiments** ·The Compton effect ·The Stern-Gerlach experiment ·Thomson and Davisson experiment : Electron diffraction in crystals **CONTEXT 11: A New Generation of Physicists Create Quantum Mechanics.** ·De Broglie's matter-wave theory ·Heisenberg's quantum mechanics ·Schroedinger's quantum mechanics ·Pauli's exclusion principle ·Heisenberg's uncertainty principle ·Fermi and his theory of beta decay: neutrinos ·Dirac's argument for antiparticles ·Beta decay
DAY 8 Marc	**ASSIGNMENT II: 5 cont...**	**CONTEXT 12** **<u>An expected and an unexpected discovery</u>** ·The discovery of the neutron ·The discovery of the antiproton **Special Presentation** ·The birth of nuclear physics**:** ·*The four forces of nature* **Special Presentation** ·The electron theory of crystals ·The invention of the transistor **Special Presentation:**

		·The modern periodic table

DAY 9 March 15	.●Hand in assignment 5.	**BOOK REPORT PRESENTATIONS (10%)** 10 MINUTES PER BOOK REPORT **CASE STUDIES PREPARATION**
DAY 10 March 22	●Hand in book report	**CASE STUDIES PRESENTATIONS (25%)** (30 MINUTES PER PRESENTATION)
DAY 11 March 29 ----------	---------- **Date to be determined**	**CASE STUDIES PRESENTATIONS** **FINAL EXAM (25%)** ---------- **FINAL EXAM 2 HOURS**
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CONTEXT 1: Early Modern Chemistry

•The law of definite proportions
•Dalton's atomic theory
•Avogadro's Hypothesis
•Davy's hypothesis of 'combining volumes of gases'.
•Proust's conjecture about atomic structure

CONTEXT 2: Early Modern Physics

I. Light
•William Herschel and the discovery infrared radiation
•Young's interference experiment of light
•Fizeau's experiment to find the speed of light.

II. Heat, work, electricity and the Conservation of Energy Principle
·The heat experiments of Rumford
·Hemholtz: the Law of Conservation of Energy
·Faraday's electrolysis experiments: the Faraday constant (F)
·Joule's experiments: The mechanical equivalent of heat and electricity

·The laws of thermodynamics: Helmholtz and Lord Kelvin

DAY 3 Jan. 26	**ASSIGNMENT II: 2** Context 4 **PART B: Prelude to the "New Physics":** **From about 1860 - to about 1910:** **●Hand in Assignment 1 by next Wednesday**	**CONTEXT 4: Spectroscopy and Cathode Ray Physics** **<u>I. Spectroscopy</u>** **•Early flame tests in chemistry** **•Kirchhoff's spectroscopy** **•The Doppler effect** **•The discovery of helium** **<u>II. Cathode Ray Physics</u>** **•The history of the cathode ray tube** **•The physics of the radiometer.** **•The discovery of x-rays** **Special Presentation:** **•Mendeleev's periodic table of the elements**
