

COURSE OUTLINE A S T 1 0 1 SOLAR SYSTEM

Spring 2012 and after

- I. Goals for this course (Intro Notes, Unit I., covered in Foundational Homework Ass't.)
 - A. Increase awareness of, and interest in, your celestial neighborhood
 - B. Improve your "scientific literacy"
 - C. Instill a "Cosmic Perspective" on your world
 - D. Contribute to your personal and professional growth through critical thinking

 - II. Origins of science and astronomy
 - A. Origin of astronomy
 - 1. three human needs
 - a. philosophic backdrop: animism

 - B. Origin of science and the ancient Greek astronomers (ca. 550 B.C.E. to ca. 400 C.E.)
 - 1. fundamental importance: a new way to understanding
 - a. naturalistic vs. supernaturalistic
 - 2. some astronomical contributions
 - a. Eratosthenes
 - b. Hipparchus (textbook)
 - 3. geocentric vs. heliocentric
 - a. Aristotle
 - b. Aristarchus
 - 4. The significance of Aristotle's approach
 - 5. reasons for the demise of the Greek philosopher-scientists

 - C. from the Greeks to the Scientific Revolution — the Islamic Contribution
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- III. The Scientific (Copernican) Revolution (ca. 1600 c.e.)
 - A. Nicolaus Copernicus
 - B. Tycho Brahe
 - C. Johannes Kepler
 - D. Galileo Galilei
 - 1. Telescopic discoveries
 - 2. Clash with the Church
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- IV. Newton and Motion
 - A. Isaac Newton (ca. 1700 C.E.)
 - 1. Laws of Motion
 - a. Inertia
 - b. Force
 - c. Action-reaction
 - 2. Law of Gravity

 - B. Some proofs for the motions of the Earth
 - 1. Stellar parallax
 - 2. Stellar aberration
 - 3. Foucault pendulum

- V. Impact of the Scientific Revolution (Read Historical Note Set.)
- A. Material impact
 - 1. Industrial Revolution--applying scientific principles
 - 2. Machines to do the drudge work
 - 3. Transportation and communication
 - 4. Electricity, electronics, computers
 - 5. Medicine and hygiene
 - a. healthier and live longer, but overpopulation the result?
 - 6. Agriculture
 - a. Without science, billions would starve to death
 - 7. Nuclear Power—mixed blessing
 - 8. Energy
 - a. Rising demand
 - b. About to peak in oil production
 - c. Must conserve and develop alternative energy sources
 - 9. Space
 - a. International cooperation
 - b. Economic development
 - c. The “STAR TREK” philosophy
 - B. Mental impact
 - 1. The Enlightenment — spreading the application of scientific thinking
 - a. Impact on age-old societal norms
 - b. Impact on how we thought about human health
 - c. Impact on how we thought about religion and the nature of deities
 - d. Impact on how we thought about the natural world
 - e. Impact on how we thought about governance
 - f. Impact on the Constitution of the United States
 - C. A listing of resulting attributes of Western Civilization

TEST 1 covers to here and Assignments 1, 2, 3

- VI. And so, SCIENCE IS... The Introductory Course Notes Set (Notes are already in outline form, so only the major units are given here.)
- A. A Personal Statement on Teaching (Intro Notes, Unit II., covered in Foundational Homework Ass't.)
 - B. U.S. Scientific Illiteracy (Intro Notes, Unit III., covered in Foundational Homework Ass't.)
 - C. Science – a learning process (Intro Notes, Unit IV., covered in class)
 - D. Critical Thinking (CT) Skills (Intro Notes, Unit V., covered in class)
 - E. Pseudoscience/Superstition/Anti-intellectualism (Intro Notes, Unit VI., covered in class)
 - F. The Popularity of Pseudoscience (Intro Notes, Unit VII., covered in Foundational Homework Ass't.)
 - G. Dangers of Pseudoscience (Intro Notes, Unit VIII., covered in Foundational Homework Ass't.)
 - H. Non-psychological Reasons for the Acceptance of Pseudoscience (Intro Notes, Unit IX., covered in Foundational Homework Ass't.)
 - I. Psychological Reasons for Acceptance of Pseudoscience (Intro Notes, Unit X., covered in Foundational Homework Ass't.)
 - J. Tests of Psychic Claims (Intro Notes, Unit XI., covered in Foundational Homework Ass't.)

VII. General Description and Origin of the Solar System

- A. Description
 - 1. Outside perspective: stars, galaxies, universe
 - 2. General characteristics--clues to its origin
- B. The age of the solar system (Read Notes Handout)
 - 1. Historical attempts
 - a. Bishop Ussher (17th century)
 - b. The Great Age of Earth Debate (19th century)
 - 2. Relative dating from crater counts, surface geological processes, crustal rock layers, and fossils
 - 3. Absolute dating from radioactive decay of unstable isotopes in rocks
 - 4. Astrophysical estimates of the age of the sun
- C. The "Nebular Hypothesis" or "Solar Nebula Theory"
 - 1. The modern theory & evidence of star/ planetary formation, step by step
 - a. The evidence within solar system
 - b. The evidence outside solar system
- D. Minor objects of the solar system
 - 1. Asteroids
 - 2. Comets

TEST 2 covers to here and Assignments 4, Foundational, 5, 6N

VIII. Planets

- A. Extra-solar planets, Exoplanets for short
 - 1. How we are finally discovering them
 - 2. The growth of our cosmic perspective on the nature of planets
- B. Earth
 - 1. basic data
 - 2. Four stages in planetary (and satellite) development
 - a. early development and resulting structure
 - 3. plate tectonics--the still dynamic earth
 - 4. life – Earth's special feature
 - 5. cosmic perspective on "Spaceship Earth"
 - a. Cosmic influences
 - b. Ecological concerns
 - c. Human overpopulation
- C. Moon
 - 1. basic data
 - 2. geology--surface features & interior structure
 - 3. the mystery of its origin: facts & theories
- D. Mercury
 - 1. basic data
 - 2. The two missions to Mercury
 - 3. density and its inferred internal composition
 - 4. surface features
 - 5. surprises
- E. Venus
 - 1. basic data
 - 2. atmosphere & greenhouse effect
 - 3. the mysterious crust and Venus's past
 - 4. why so similar to, yet different from, earth?

TEST 3 covers to here and Assignments 7, 8, 9N

- F. Mars

1. basic data
 2. History
 3. surface features
 4. life?
 - a. The Viking Orbiters and Landers, 1976
 5. Its moons—Phobos & Deimos
 6. Recent Missions
 - a. Pathfinder mission
 - b. The “Life Rock”
 - c. The Mars Rovers missions
 - d. The Mars Reconnaissance Observer and HiRISE camera
 - e. The Phoenix Lander mission
- G. Jupiter
1. basic data
 2. atmosphere and interior
 3. What is Jupiter?
 4. the Galilean satellites
- H. Saturn
1. basic data
 2. atmosphere and interior
 3. ring system
 4. Titan
 5. Other notable satellites
- I. Uranus
1. Basic data
 2. Post-Voyager 2 wealth of new knowledge
 - a. Atmosphere
 - b. Satellites
 - c. the planet that got knocked on its side?
- J. Neptune and Triton
1. Basic data
 2. Atmosphere
 3. Voyager 2 and the wealth of new knowledge
- K. Pluto – the last unexplored planet. Or is it?
1. Basic data and general information
 2. Charon and the recently discovered moons
 3. Pros and cons regarding its classification as a planet

TEST 4 covers to here and Assignments 10, 11N

Assignment 12 is due with Test 4, but is not part of the tested material.