

Kolbe Academy Home School

HIGH SCHOOL ASTRONOMY

Descriptive Astronomy by John Charlesworth

TABLE OF CONTENTS

I. Syllabus	2
A. Diploma Requirements	3
B. Semester Reporting Requirements	3
II. Course Plan	
A. Semester 1	4
B. Semester 2	9
III. Exams (1-3)	
IV. Answer Keys	

NOTE: The last half of the second semester is spent doing a term paper.

COURSE TITLE: Astronomy**COURSE DESCRIPTION:**

The course is designed to give students an appreciation of the order and complexity of creation, and of the order and complexity in the cosmos. Revelation and science complement each other in illuminating God's glory. The course covers the different kinds of celestial objects, their characteristics, how they formed and developed, and their eventual fates. This includes a discussion of stars (including our sun), star groups, black holes, asteroids and comets, the earth, moon, and planets. It also covers the theories of the origin, development, and future of the universe, as well as whether other planets and life forms exist in space. You will study, and have the opportunity to observe, the main stars and constellations for both summer and winter.

Please note: The workload may vary somewhat week to week. The course plans encourage the student to cover material by topic, which may provide a more thorough understanding of the concept. While some topics may be more simple and covered in less time, others are more complex and may require more of the student's time. Please remember that above all, the student is encouraged to cover material at the pace that works for him/her.

SCOPE AND SEQUENCE:

1. History of astronomy, modern astronomy, electromagnetic waves, the Universe
2. Cosmology and Theology, stars and constellations, sky observations
3. The Solar System: comets, meteors, asteroids, the moon, the earth, the planets
4. A final research paper and oral presentation on an astronomy topic

SKILLS TO BE DEVELOPED:

- Although arithmetical concepts may be used, no advanced mathematics is required
- Students will practice reading and analyzing scientific information; and determining which issues belong properly to science (the mechanics of creation), and which belong properly to philosophy and religion (the meaning of creation)
- Students will gain an understanding of celestial objects and their characteristics, and will have an opportunity to observe various constellations
- Students will learn the steps involved in composing a research paper and oral presentation on a scientific topic

COURSE TEXTS/MATERIALS: *Descriptive Astronomy*, by Mr. John Charlesworth
A Student Guide to Writing a Research Paper, by Phyllis Goldenberg (optional)
 The Edmund Scientific *Star and Planet Locator*

DIPLOMA REQUIREMENTS:

Summa Cum Laude diploma candidates using Astronomy to fulfill their fourth year of science are required to fulfill the Kolbe Core course (K) requirements by following the course plan as laid out. ***Magna Cum Laude*** and ***Standard*** diploma candidates may choose to pursue the (K) designation, but are not required to do so, and instead have the option of altering the course plan as they choose. Astronomy counts toward the physical science requirement for both the Magna and Standard diplomas. Lab credit is not available for the Astronomy course. For a student pursuing the ***Magna Cum Laude*** diploma, the science requirement dictates that lab work is incorporated into two of the following three courses: Biology, Chemistry or Physics. There is no lab requirement for the ***Standard*** diploma. Please see below for specific course titles, semester reporting requirements and transcript designations for Astronomy.

REQUIRED SAMPLE WORK:

Designation*		K
Course Title	Astronomy	Astronomy
Semester 1	1. Any two written samples	1. Complete Midterm 1 Exam 2. Complete Semester 1 Exam
Semester 2	1. Any two written samples	1. Complete Midterm 2 Exam 2. Research Paper

*Designation refers to designation type on transcript. K designates a Kolbe Academy Core course.

If the student wishes to have the course distinguished on the transcript with a (K) as a Kolbe Academy Core course, please be sure to send the correct exams and components each semester for verification as specified above. **If no designation on the transcript is desired, parents may alter the lesson plan and any written sample work is acceptable to receive credit for the course each semester.** If you have any questions regarding what is required for the (K) designation or diploma type status, please contact the academic advisory department at 707-255-6499 ext. 5 or by email at advisors@kolbe.org.

COURSE PLAN METHODOLOGY:

Because there are no comprehension questions at the end of the sections, it may seem to be a simple assignment to do the reading. The exams, however, cover the reading in great detail. The student is encouraged to understand and be able to define the key points in detail. It is recommended that the student study each section the week that it is presented, so that he/she will not have to be burdened with excessive study the week before the exam. The student may wish to keep a notebook of key definitions, formulas, concepts, and examples; or highlight them in the text.

Assignments have been recommended for each week to further emphasize and expand upon the topics presented that week. These assignments are marked as optional). The parent may opt to include them in certain weeks, and may choose to omit them in other weeks. To the parent: there is no right or wrong way to do these assignments. Grade them based upon how the student meets your expectations.

A research paper and oral presentation on an astronomy-related topic will be the recommended assignment for the second semester. As the student covers material in the text, he/she is encouraged to be thinking about a topic of interest for the second semester assignment. There are great ideas throughout the text. Pay special attention to the key points. Note, there is no final examination.

◆ ◆ ◆ FIRST SEMESTER ◆ ◆ ◆

WEEK 1		
Reading	Descriptive Astronomy	Introduction, Topic Outline, and pages 13-18.
	Sky Calendar and Thoughts on Buying a Telescope in the "Odds and Ends" section (back of the book). The student will be encouraged to do some sky observing. A telescope is <u>not</u> required for this, but if you are interested in purchasing a telescope, you may find Mr. Charlesworth's suggestions helpful.	
Assignments	Understand and be able to define the key points.	
	Page 18	Review Questions 1 – 4
Optional	Write a short essay (1-2 pages) on influential figures in the history of astronomy and their contributions to the field. (Refer mainly to the text. You may use outside resources)	
Key Points	Highlights from the History of Astronomy: From the Ancient Greeks to Isaac Newton. Incorrect assumptions, origin of the names of the days of the week, Ptolemy and the geocentric model, Arabic contributions, Columbus' observations, Copernicus and the heliocentric solar system, Galileo, Kepler's observations: elliptical orbits, perihelion, aphelion. Isaac Newton: the <i>Principia</i> , Newton's First Law.	
WEEK 2		
Reading	Descriptive Astronomy	Pages 19-30
Assignments	Understand and be able to define the key points.	
	Review questions 5-35.	These will help you to understand the concepts.
Optional	Give a short oral presentation at the end of the week explaining the Law of Gravity, affect of distance, square and inverse square relations and volume relations. Use some of the questions and answers provided in the text as examples of the concepts. You may wish to draw the examples of square and inverse square relations on a poster to aid you in presenting the material. (Refer to Mr. Spencer's article, <i>Speak, Write, Act</i> , located in your Welcome	

◆ COURSE PLAN ◆

	Packet in which he describes Kolbe Academy's Oral Presentation Program. The article may also be found on Kolbe's website, www.kolbe.org , under Resources and Useful Links. This article may help you in preparing a short presentation.)	
Key Points	The Law of Gravity. Determining the force of gravity, how the distance between two objects affects their gravitational force. Square and inverse square relations. Volume relations. Modern Astronomy. Astrology and astronomy. Black holes: escape velocity, event horizon, accretion disk. Black holes and space travel. The nature of the universe: Herschel's observations, Hubble's observations: the galaxy, the universe, and solar systems. Einstein's work regarding gravity and speed.	
WEEK 3		
Reading	Descriptive Astronomy	Summer Sky Observations. An Invitation to the Evening Skies: pages S-2 to S-5. Constellations for Evening Viewing-During Late Spring and Summer, and During Fall: pages S-12 to S-17. Summary and Practice pages S-21 to S-23.
	If you have access to binoculars or a telescope, you may be interested in referring to pages S-24 to S-27 as well. These pages guide you in locating various star clusters using your equipment.	
Assignments	Memorize the summer constellations and their characteristics, page S-21. Complete the Summer Skies: Practice Star Chart, page S-23. Complete page S-22 to quiz yourself. Choose 1-2 evenings of the week and go "sky observing" for 30 minutes. Do this after you've completed pages S-21 to S-23. Try to locate as many of the constellations and stars described on pages S-12 to S-17 as you can. Use your <i>Star and Planet Locator</i> to find out exactly which constellations are visible on the specific day of observation.	
Key Points	The Summer Stars, Asterisms and Constellations.	
WEEK 4		
Reading	Descriptive Astronomy	Pages 31 – 39
Assignments	Understand and be able to define the key points. Memorize the relationship of electromagnetic waves in terms of wavelength, frequency, energy and speed (use formula on page 37). Memorize the colors of visible light, and the spectral classes.	
Optional	On a poster board, chart out the various electromagnetic waves in terms of wavelength. Include descriptions of each type of wave. Indicate their relationship in terms of increasing and decreasing energy/frequency. Use the chart on page 36 to help you. You do not need to learn the specific numbers.	
Key Points	Electromagnetic Waves. Difference in wavelengths. Radiowaves, microwaves, infrared waves, visible light: colors of the spectrum. Ultraviolet waves, X-rays, gamma rays. Frequency and Wavelength. Inverse relation between wavelength and frequency, difference between speed and frequency, energy in relation to frequency, spectral classes.	
WEEK 5		
Reading	Descriptive Astronomy	Pages 40 – 48
Assignments	Understand and be able to define the key points.	