

Astronomy Ranking Task: Star Evolution & Lookback Time

Exercise #1

Description: Imagine that the four stars listed below all became Main Sequence (MS) stars at exactly the same time 10 billion years ago but in different locations of the universe.

Cosmo Star is an O spectral class star with a MS lifetime of 3 million years. Its life will eventually end as a SN type II and become a black hole. Cosmo Star is located in a galaxy 10 billion light years (ly) from Earth.

Ollie Star is a K spectral class star with a MS lifetime of 30 billion years. Its life will eventually end as a slowly cooling white dwarf. Ollie Star is located in the MW at a distance of 10,000 ly from Earth.

Sullivan Star is an F spectral class star that is part of a binary star system. It has a MS lifetime of 5 billion years. Its life will eventually end in a SN type I that completely destroys Sullivan Star. Sullivan Star is located in a galaxy 6 billion ly from Earth.

Sliver Star is a B spectral class star with a MS lifetime of 20 million years. Its life will eventually end as a SN type II and become a neutron star. Sliver is located in the MW at a distance of 40,000 ly from Earth.

A. Ranking Instructions: Rank the stars (from first to last) based on when they became main sequence stars.

Ranking Order: First 1 2 3 4 Last

Or, all the stars became main sequence stars at the same time. (indicate with check mark).

Carefully explain your reasoning for ranking this way:

B. Ranking Instructions: Rank the stars (from first to last) based on when they reach(ed) their final end state.

Ranking Order: First 1 2 3 4 Last

Or, all the stars reach(ed) their final end state at the same time. (indicate with check mark).

Carefully explain your reasoning for ranking this way:

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M Walker



Astronomy Ranking Task Star Evolution Lookback Time:

Bulletin of the Atomic Scientists, 1967-03 The Bulletin of the Atomic Scientists is the premier public resource on scientific and technological developments that impact global security Founded by Manhattan Project Scientists the Bulletin's iconic Doomsday Clock stimulates solutions for a safer world *Evolution of Stars and Stellar Populations* Maurizio Salaris, Santi Cassisi, 2005-12-13 Evolution of Stars and Stellar Populations is a comprehensive presentation of the theory of stellar evolution and its application to the study of stellar populations in galaxies Taking a unique approach to the subject this self contained text introduces first the theory of stellar evolution in a clear and accessible manner with particular emphasis placed on explaining the evolution with time of observable stellar properties such as luminosities and surface chemical abundances This is followed by a detailed presentation and discussion of a broad range of related techniques that are widely applied by researchers in the field to investigate the formation and evolution of galaxies This book will be invaluable for undergraduates and graduate students in astronomy and astrophysics and will also be of interest to researchers working in the field of Galactic extragalactic astronomy and cosmology comprehensive presentation of stellar evolution theory introduces the concept of stellar population and describes stellar population synthesis methods to study ages and star formation histories of star clusters and galaxies presents stellar evolution as a tool for investigating the evolution of galaxies and of the universe in general **Birth, Evolution And Death Of Stars** James Lequeux, 2013-08-22 It has been known for a long time that stars are similar to our Sun But it was only in 1810 that they were shown to be made of an incandescent gas The chemical composition of this gas began to be determined in 1860 In 1940 it was demonstrated that the energy radiated by the stars is of thermonuclear origin How stars form from interstellar matter and how they evolve and die was understood only recently with our knowledge still incomplete It was also realized recently that close double stars present a wide variety of extraordinary phenomena which are far from being completely explored This book explains all these aspects and also discusses how the evolution of stars determine that of galaxies The most interesting observations are illustrated by spectacular images while the theory is explained as simply as possible without however avoiding some mathematical or physical developments when they are necessary for a good understanding of what happens in stars Without being a textbook for specialists this book can be profitably read by students or amateurs possessing some basic scientific knowledge who would like to be initiated in depth to the fascinating world of stars The author an emeritus astronomer of the Paris Observatory worked in various domains of astronomy connected with the subject of this book interstellar matter and evolution of stars and galaxies He directed the Marseilles observatory from 1983 to 1988 and served for fifteen years as Chief Editor of the professional European journal Astronomy Astrophysics He has written many articles and books about physics and astronomy at different levels *From Dust To Stars* Norbert S. Schulz, 2005-02-14 Studies of stellar formation in galaxies have a profound impact on our understanding of the present and the early universe The book describes complex

physical processes involved in the creation of stars and during their young lives It illustrates how these processes reveal themselves from radio wavelengths to high energy X rays and gamma rays with special reference towards high energy signatures Several sections devoted to key analysis techniques demonstrate how modern research in this field is pursued

Understanding Stellar Evolution Henny J. G. L. M. Lamers, Emily M. Levesque, 2018-02-28 Understanding Stellar Evolution is based on a series of graduate level courses taught at the University of Washington since 2004 and is written for physics and astronomy students and for anyone with a physics background who is interested in stars It describes the structure and evolution of stars with emphasis on the basic physical principles and the interplay between the different processes inside stars such as nuclear reactions energy transport chemical mixing pulsation mass loss and rotation Based on these principles the evolution of low and high mass stars is explained from their formation to their death In addition to homework exercises for each chapter the text contains a large number of questions that are meant to stimulate the understanding of the physical principles An extensive set of accompanying lecture slides is available for teachers in both Keynote R and PowerPoint R formats

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