ClassAction: A Powerful Tool for Active-Learning Sequences

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CATS Collaboration of Astronomy Teaching Scholars
An NSF Funded Center for Astronomy Education (CAE) Program

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Acknowledgments

- This material is based upon work supported by the National Science Foundation under Grants No. 0404988 and No. 0715517, a CCLI Phase III Grant for the Collaboration of Astronomy Teaching Scholars (CATS). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

- CAE is funded through the generous contributions of the NASA JPL Exoplanet Exploration Public Engagement Program and the Spitzer Education and Public Outreach Program.

Peer Instruction: Example Question

If tonight the phase is full when the Moon rises, what will be the phase when the Moon sets?

A. full
B. waning gibbous
C. third quarter
D. waxing gibbous
E. new

ClassAction

Lunar Cycles: Phase Evolution

Adapt Question: Phase Later Tonight

If tonight the phase is full when the moon rises, what will be the phase when the moon sets?

A) full
B) waning gibbous
C) last (third) quarter
D) waxing gibbous
E) new

Show Answer

ClassAction

Lunar Cycles: Identify Phase from Picture

Change Phase

In the picture to the right,
the phase of the moon is ...

(A) waxing crescent
(B) waxing gibbous
(C) full
(D) waning gibbous
(E) first quarter

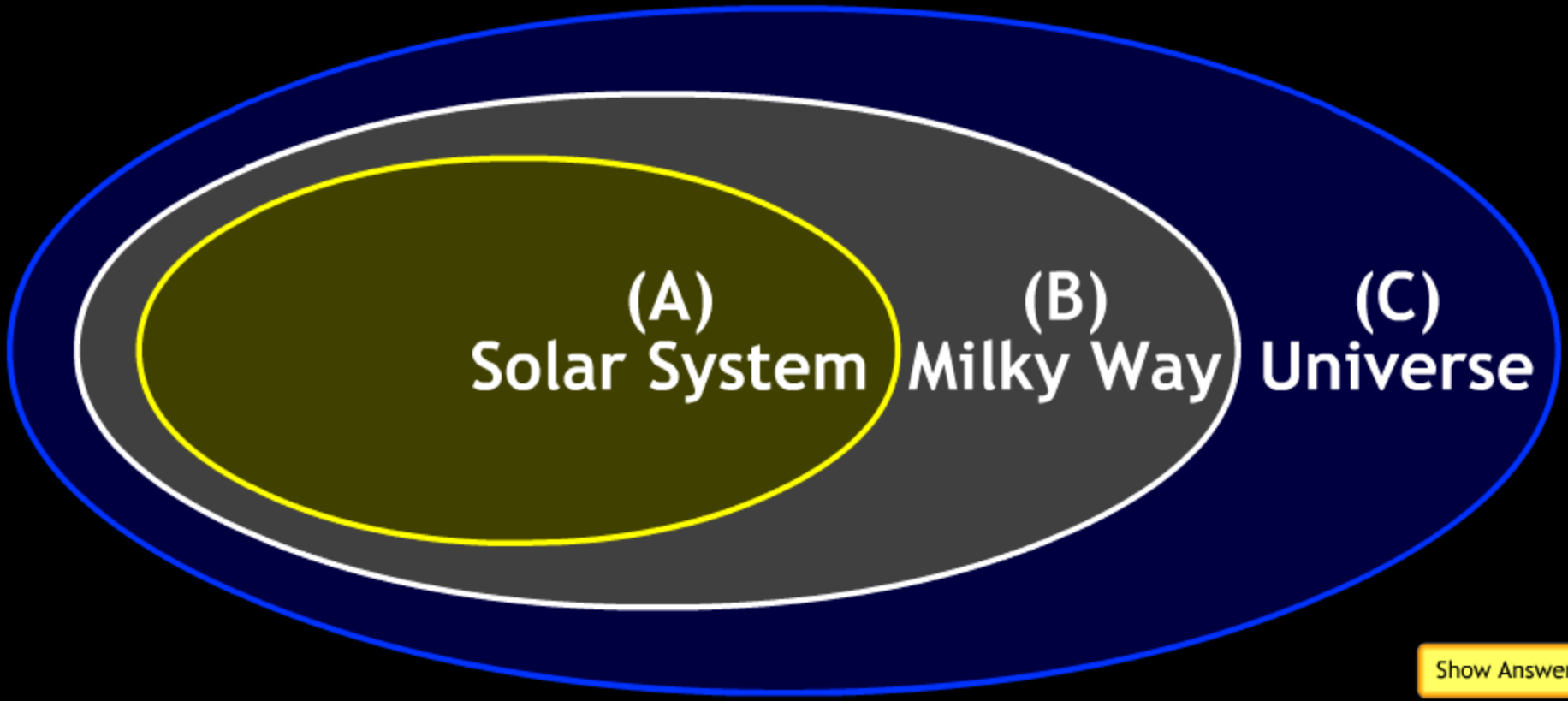
Show Answer

ClassAction

Introductory Concepts: Scale

Adapt Question: Jupiter

In the organizational diagram below, the term **Jupiter** would most appropriately fit in the area labeled...?



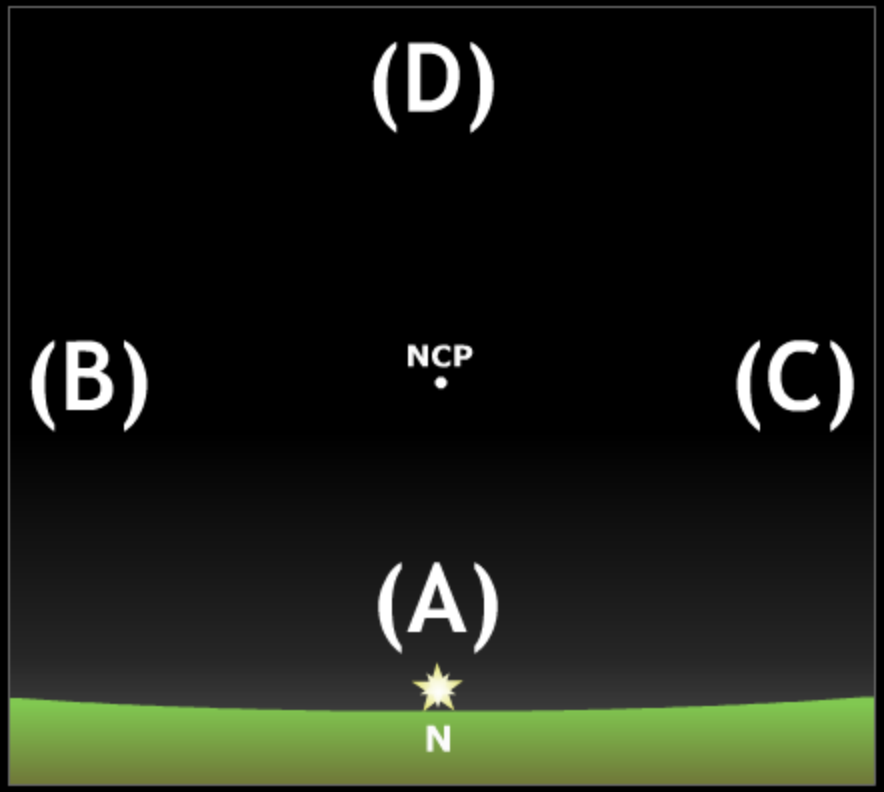
Show Answer

ClassAction

Basic Motions: Star on North Point

Adapt Question: 6 hours later

A star is on the north point of the horizon. Where will the star be in 6 hours?



(E) none of these points

Show Answer

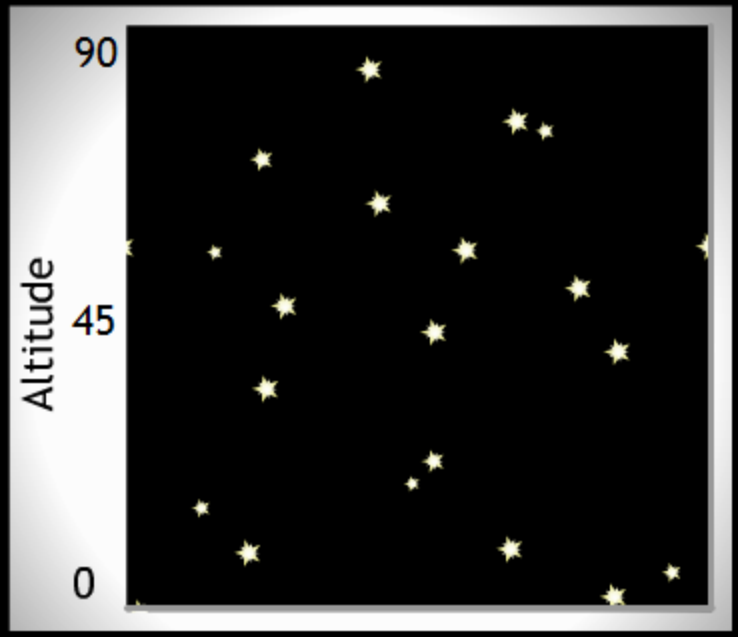
ClassAction

Coordinates and Motion: Star Trails

Adapt Question: East/West | Option 1

The following animation represents star trails as seen by a mid-latitude observer in the _____ hemisphere looking _____.

A) Northern, East
B) Northern, West
C) Southern, East
D) Southern, West



Start Animation

Show Answer

ClassAction

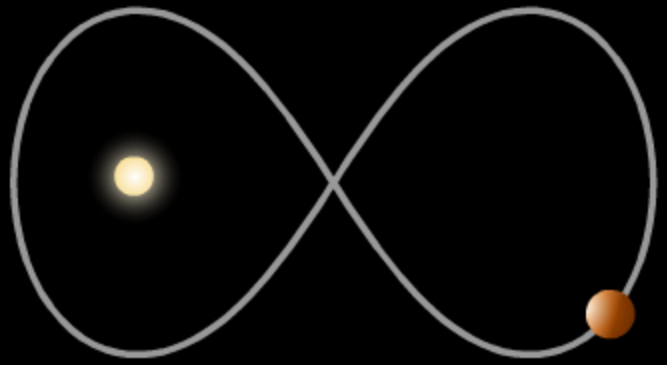
Renaissance Astronomy: Animations of Orbits

Adapt Question: Option 1

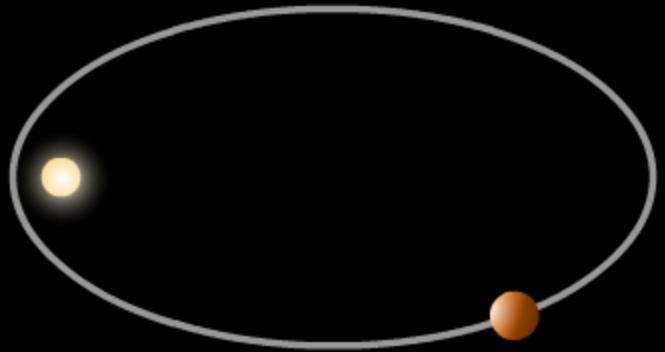
Which of these animations, showing a planet orbiting around a star, is physically realistic?

(A)

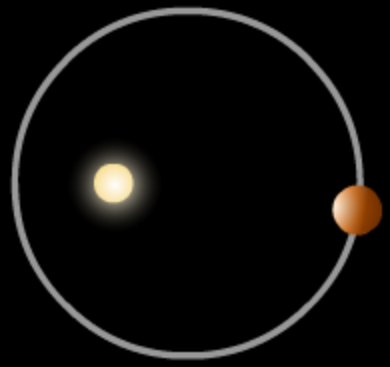
(C)



(B)



(D)



Show Answer

Overview

- 21 modules
  - 400+ multiple-choice questions
  - 60+ simulations and animations
  - dozens of topic outlines and images
- Dynamically flexible
  - recast questions and incorporate follow-ups
  - instructional resources within modules

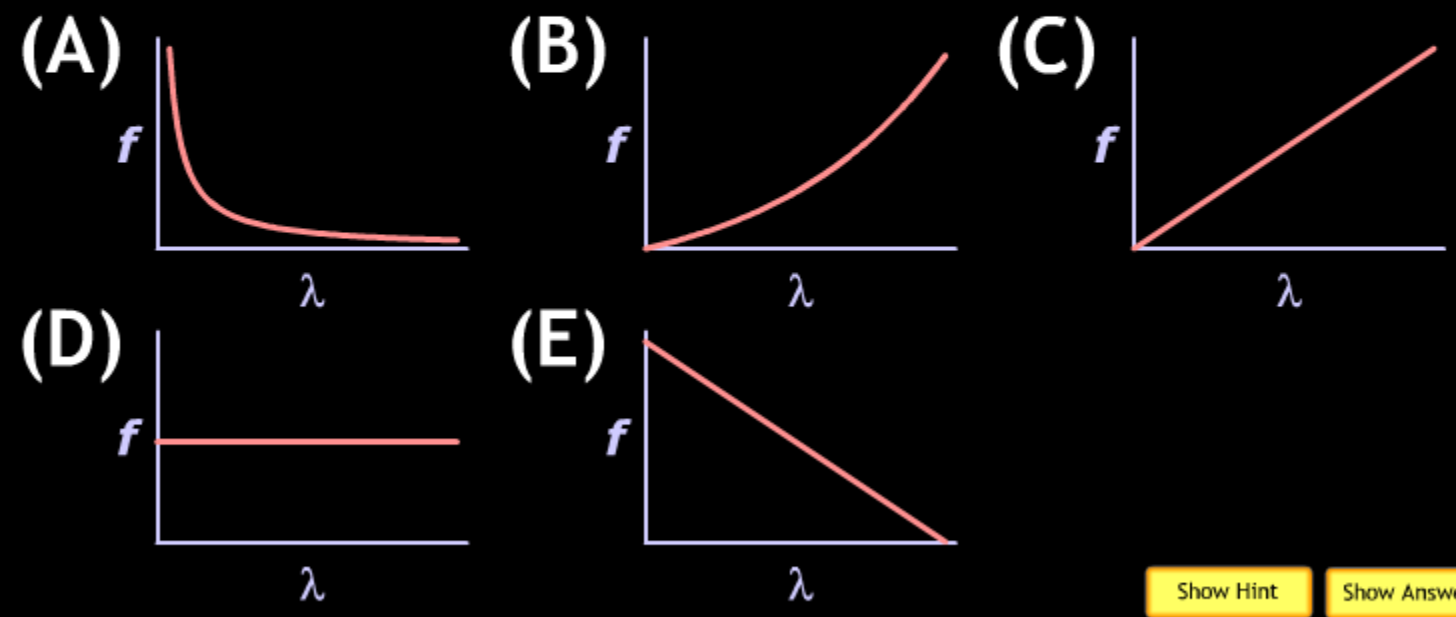
Functional Dependencies

ClassAction

Select a Question: 1 - Graph: EM Spectrum Parameters

Adapt Question: wavelength | frequency

Which of the following graphs represents the relationship between wavelength (λ) and frequency (*f*)?



Show Hint | Show Answer

Animations | Images | Outlines

Light & Spectra

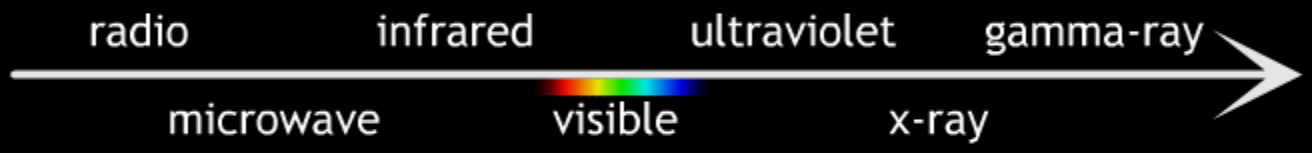
Number Lines

ClassAction

Select a Question: 4 - Number Line: EM Spectrum

Adapt Question: Option 1 - increasing to right

The number line below has increasing values going to the **right**.
Which parameter(s) could this number line represent?



(A) λ

(B) f

(C) E

(D) λ and E

(E) f and E

Show Hint | Show Answer

Animations | Images | Outlines

Light & Spectra

Data Tables

ClassAction

Select a Question: 3 - Table: Kepler's 3rd Law

Adapt Question: Unknown P | Asteroid Baade

The table below illustrates data on Kepler's 3rd Law for the first six planets. Use it to estimate the **orbital period** of **Asteroid Baade** which has a **semi-major axis** of **2.55 AU**.

(A) 19.2 years

(B) 4.07 years

(C) 0.77 years

(D) 50.2 years

(E) 1.67 years

	P (years)	P^2	a^3	a (AU)
Mercury	0.24	0.058	0.058	0.39
Venus	0.62	0.38	0.38	0.72
Earth	1.00	1.00	1.00	1.00
Mars	1.88	3.54	3.54	1.52
Jupiter	11.9	141	141	5.20
Saturn	29.5	868	868	9.54

Show Answ

Animations | Images | Outlines

Renaissance Astronomy

ClassAction

Select a Question: 3 - Table: Blackbody Descriptions

Adapt Question: Table 1 | smallest temperature

Which of the following blackbody spectra has the **smallest temperature**?

Blackbody	Temperature	Total Flux	Peak Wavelength
(A)		4.3×10^7 W/m^2	552 nm
(B)	6750 K		429 nm
(C)		1.9×10^7 W/m^2	
(D)			469 nm

Show Answer

Animations | Images | Outlines

Light & Spectra

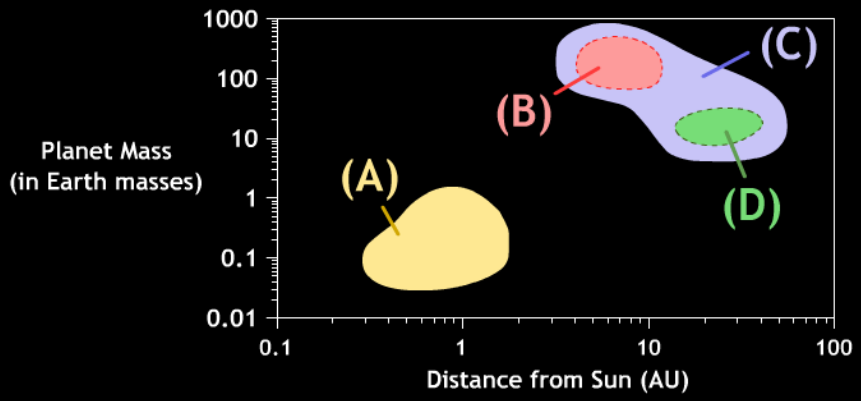
Region & Parameter Plots

ClassAction

Select a Question: 15 - Mass vs. Distance Graph

Adapt Question: Terrestrial Planets

Which region best identifies where the terrestrial planets are found?



Animations Outlines

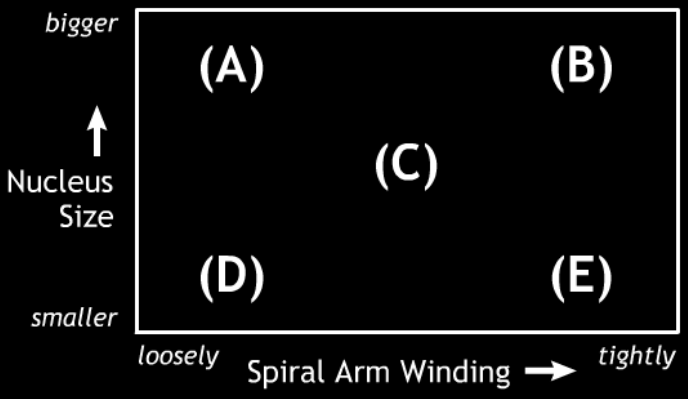
Solar System Characteris

ClassAction

Select a Question: 5 - Spiral Galaxy Classification

Adapt Question: SA

Which region describes galaxies classified as SA?



Show Answer

Outlines

Galaxies

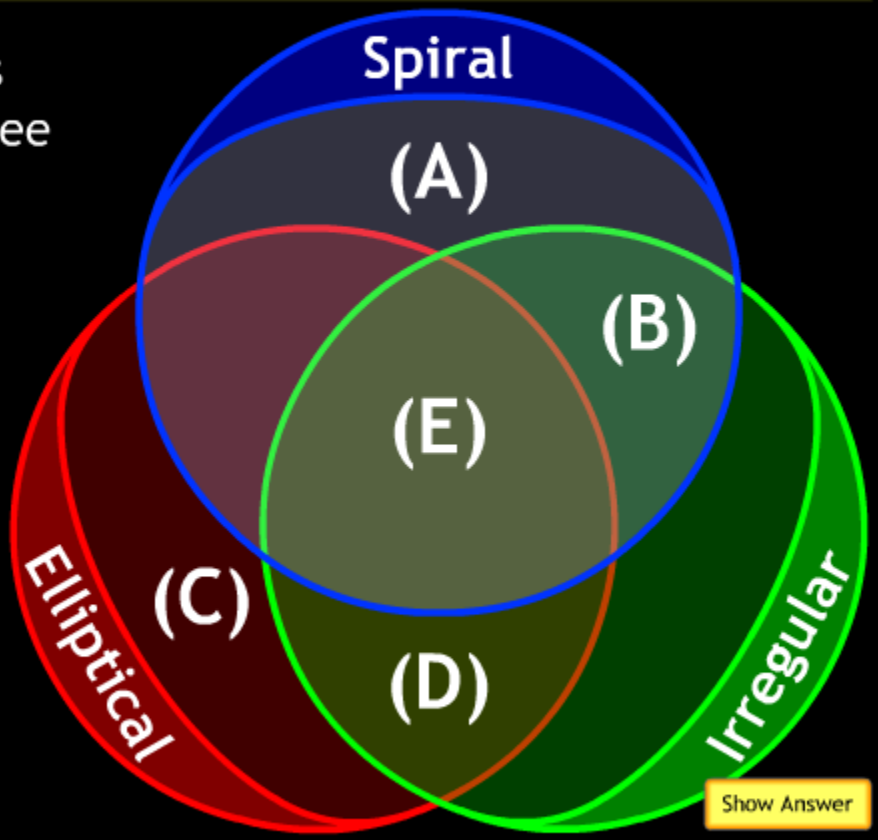
Venn Diagrams

ClassAction

Select a Question: 3 - Galaxy Characteristics

Adapt Question: Active Star Formation

This Venn Diagram illustrates the characteristics of the three major types of galaxies. The characteristic **Active Star Formation** would most appropriately be categorized in position...



Show Answer

Outlines

Galaxies

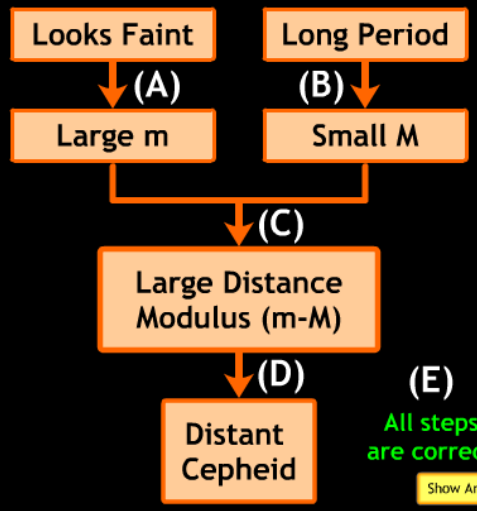
Flowcharts

ClassAction

Select a Question: 10 - Cepheid Flow Chart

Adapt Question: Option 1

This flowchart illustrates the process by which one might use observations to estimate the distance to a Cepheid variable. Indicate whether one of the lettered logical steps (A,B,C,D) is incorrect or whether all steps are correct (E).



Show Answer

Animations Outlines

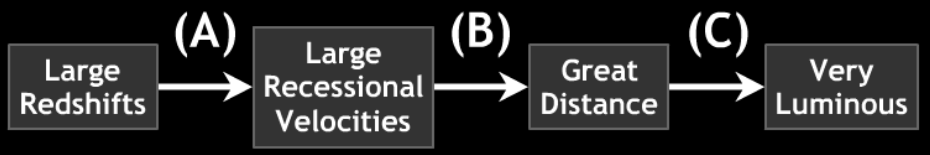
Milky Way Galaxy

ClassAction

Select a Question: 13 - Quasar Logic

Adapt Question: the Hubble law

The diagram below illustrates the chain of logic that follows from quasar spectra. What lettered step is governed by the Hubble law?



Show Answer

Outlines

Galaxies

Concept Maps

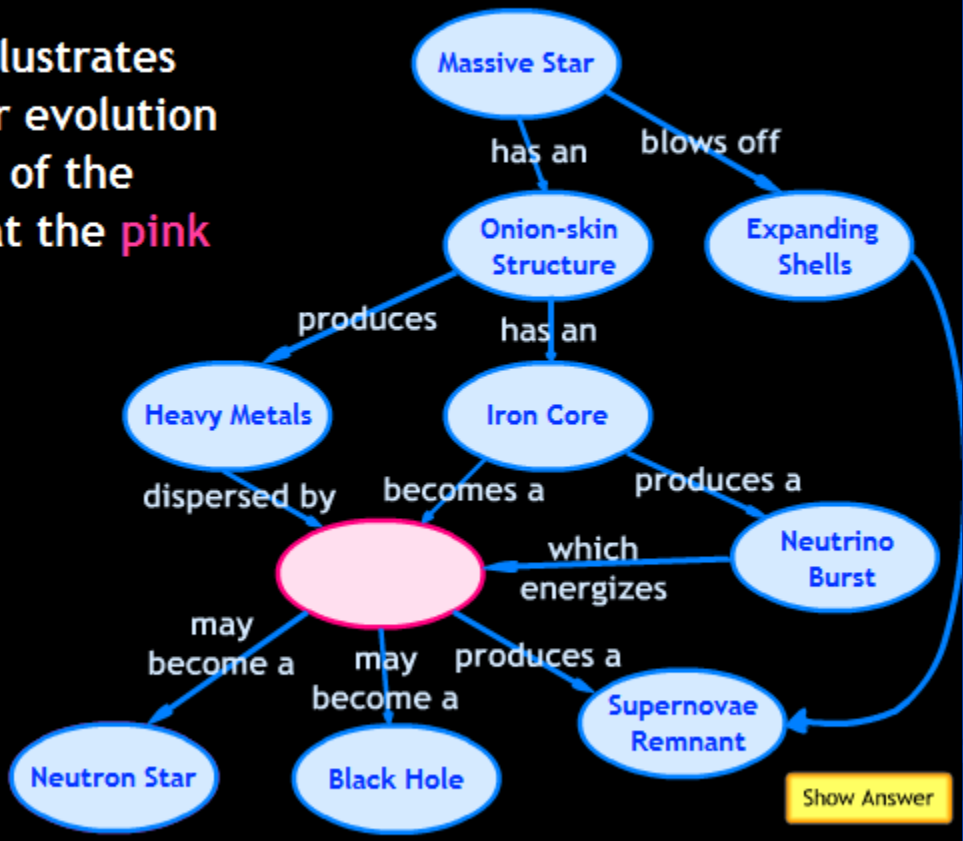
ClassAction

Select a Question: 4 - Massive Star Concept Map

Adapt Question: Option 1

The concept map below illustrates the very end of the stellar evolution for a massive star. Which of the following terms could fit at the pink node?

A) Nova
B) Type I Supernova Explosion
C) Type II Supernova Explosion
D) Gamma-Ray Burst



Outlines

Stellar Evolution

ClassAction is Very Visual!

ClassAction

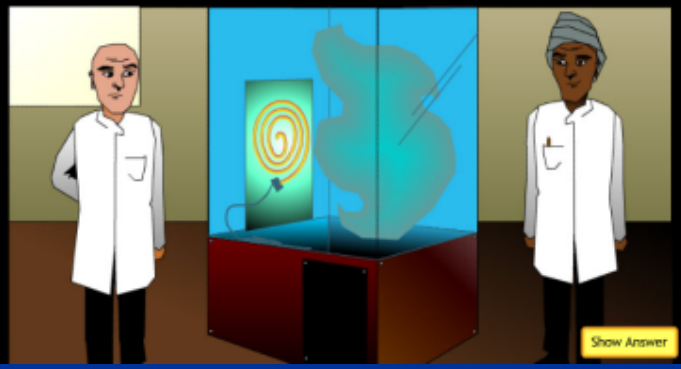
Light: Experimental Chamber

Adapt Question: Dr. Jones

Dr. Jones (left) and Dr. Singh (right) are learning how to use an experimental chamber for heating gases. They presently disagree on the type of spectrum produced by the gas.

What type of spectrum would Dr. Jones observe?

A) Continuous
B) Absorption
C) Emission



Show Answer

ClassAction

Adapt a Question: Vernal Equinox

Select a Question: 1 - Seasons at the Union

The four images of the Nebraska Student Union are shown in chronological order. The pictures were taken at noon, facing east. Which corresponds to the Vernal Equinox?

A)

B)

C)

D)

Animations | Images | Outlines

Hide Answer

Coordinates and Motions Module

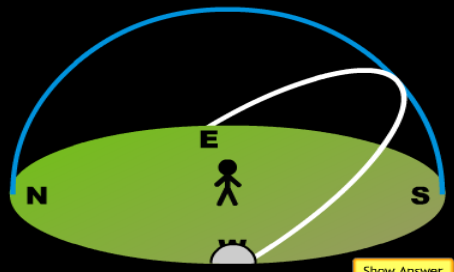
ClassAction

Adapt a Question: western horizon / midnight

Select a Question: 13 - Horizon Diagram: Identify Phase

In the diagram below, the moon is on the western horizon and is indicated by a simple gray circle with no phase information. If it is midnight, what is the phase of the moon?

A) new
B) first quarter
C) full
D) third quarter



Animations | Images | Outlines

Show Answer

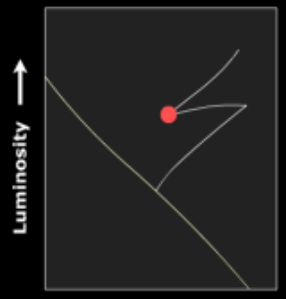
Lunar Cycles Module

ClassAction

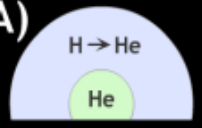
Stellar Evolution: Core Fusion Stages

Adapt Question: Option 3

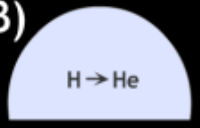
The evolutionary track of a medium mass star is shown below. Which cut-away core diagram correctly illustrates the source of fusion energy when the star is at the indicated position?



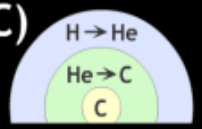
(A)



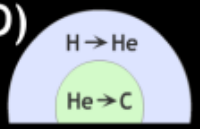
(B)



(C)



(D)



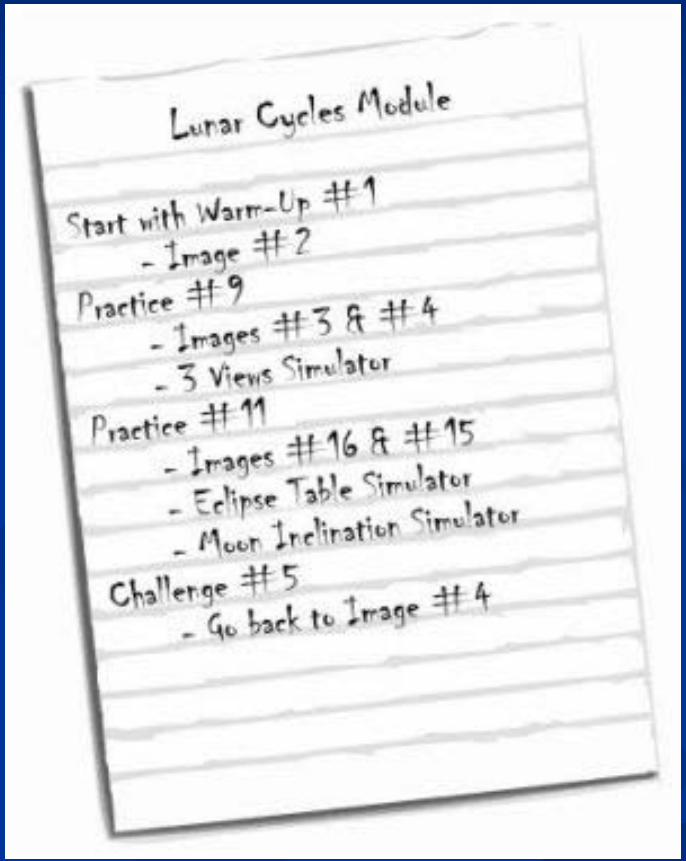
Show Answer

Demonstration

- Sample learning sequence on Doppler shift

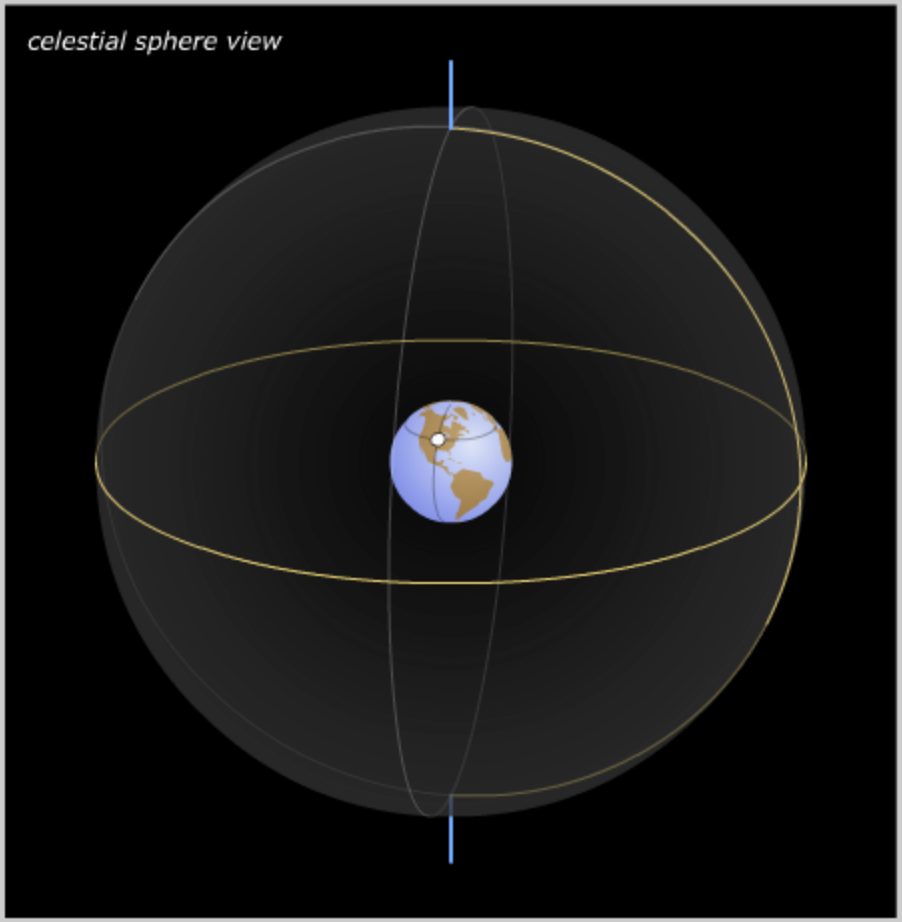
Implementation

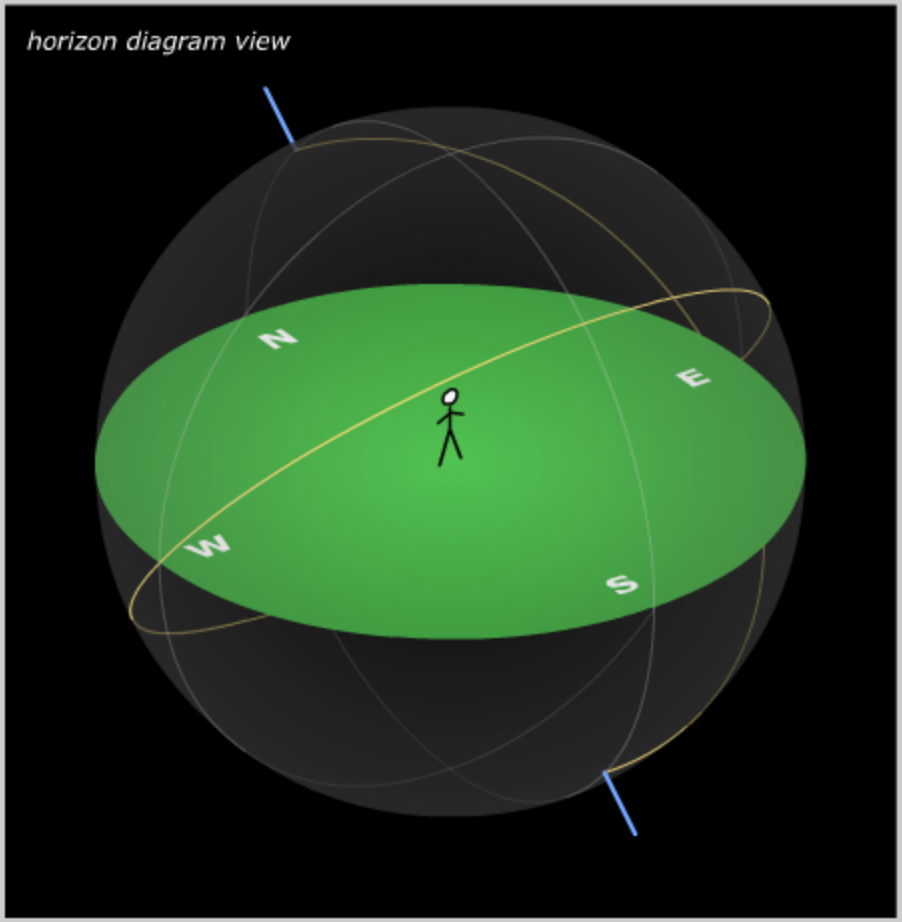
- Do your homework!
  - know what resources are available and how they work
- Have a plan
  - write it down



Rotating Sky Explorer

reset help about

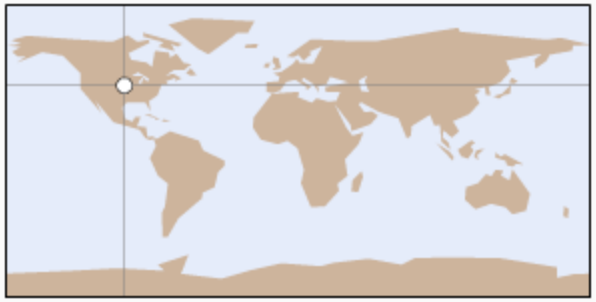




Observer's Location

latitude: 40.8 ° N

longitude: 96.7 ° W



Animation Controls

start animation

animate continuously

animation rate:

slower faster

Appearance Settings

- [ ] show labels
- [x] show 0h circle
- [x] show celestial equator
- [x] show underside of horizon diagram
- [ ] show never rise region
- [ ] show rise and set region
- [ ] show circumpolar region
- [ ] show the angle between the celestial equator and horizon

Star Controls

star patterns...

add star randomly

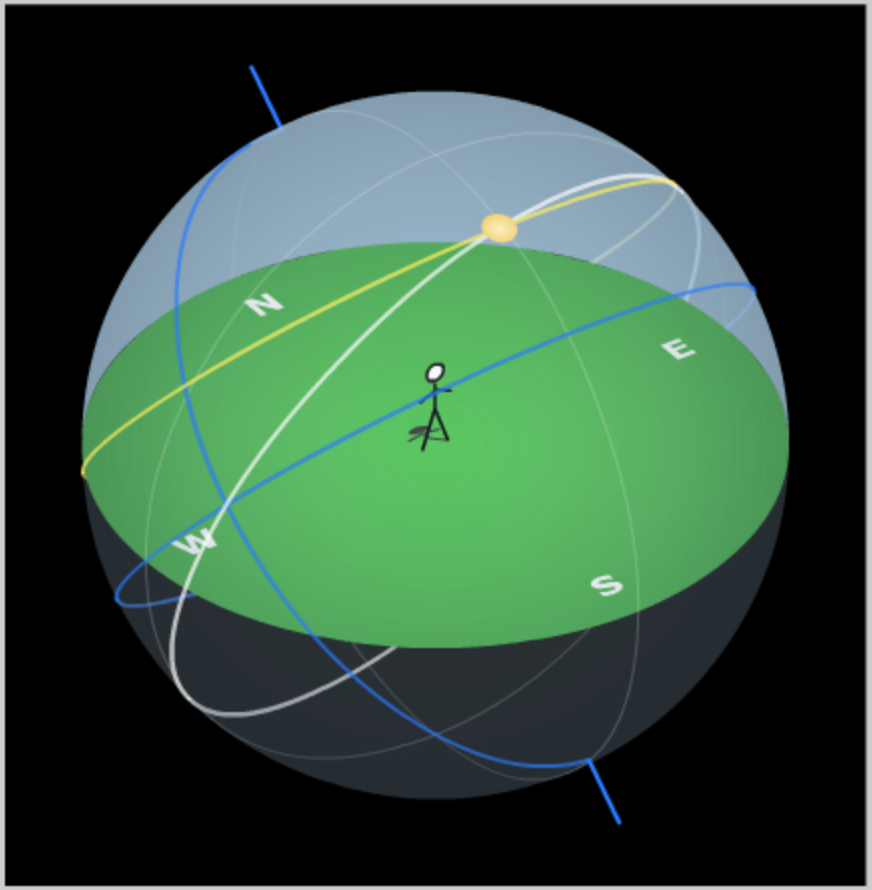
remove all stars

- (•) no star trails
- ( ) short star trails
- ( ) long star trails

reset star trails

Motions of the Sun Simulator

reset help about



Time and Location Controls

the day of year: 27 May

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |

the time of day: 12:00

the observer's latitude: 40.8 ° N

Information

The horizon diagram is shown for an observer at latitude 40.8° N on 27 May at 12:00 (12:00 PM).

advanced

sun's hour angle: 0h 2m
sidereal time: 4h 21m
equation of time: 2:49
☐ show analemma

sun's altitude: 70.6°
sun's azimuth: 182.0°
sun's right ascension: 4h 19m
sun's declination: 21.4°

Animation Controls

start animation

animation mode:
◉ continuous ☐ loop day
○ step by day

animation speed: 3.0 hrs/sec

slower faster

☐ use lower quality graphics when animating to improve performance

General Settings

☑ show the sun's declination circle
☑ show the ecliptic
☐ show month labels
☑ show underside of celestial sphere
☑ show stickfigure and its shadow

dragging the sun's disk changes the ...
◉ time of day
○ day of year

Benefits

- Runs in web browser with Flash plug-in
  - online or locally
- Dynamic flexibility
- Continuously being expanded
- Field-tested and research-validated
- FREE! **http://astro.unl.edu**

Module Editor

- Custom module editor
  - Create your own modules using questions from existing modules
  - Add your own questions to your modules
- Run online or locally
  - your modules survive in either location
- Coming soon...add your own questions!

Resources Available At...

University of Nebraska, Lincoln

http://astro.unl.edu