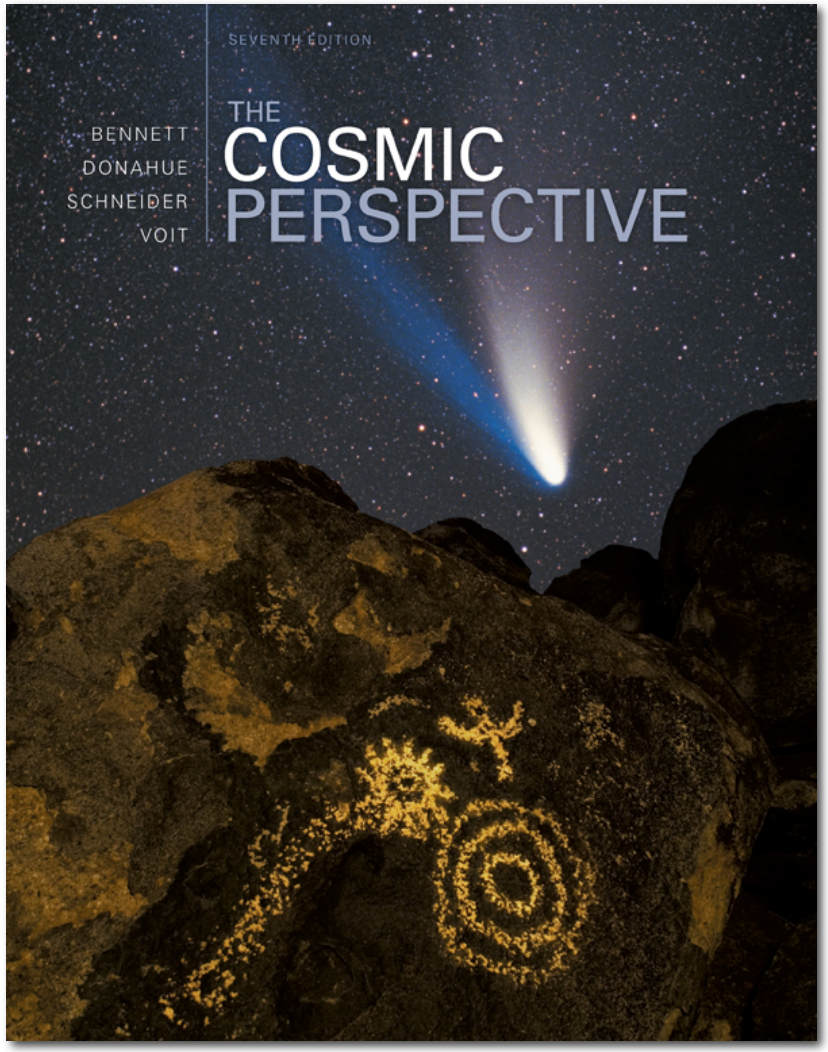
Chapter 3 Review Clickers

The Cosmic Perspective

Seventh Edition



The Science of Astronomy

How was careful observation of the sky used in early cultures?

a) to determine the seasons
b) to decide when to plant crops
c) to navigate on long voyages
d) all of the above
e) A and B only

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b) in ancient Greece
c) at the start of the Renaissance
d) in the early 17th century
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In what ways do most people employ scientific thinking in everyday life?

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b) They use trial and error–experiments – to test ideas.
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What characterizes a *scientific* explanation?

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b) The more ancient the wisdom, the better the explanation.
c) It is based on observations.
d) It is tested through prediction and experiments.
e) C and D

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What is the difference between the word *theory* as used in everyday speech, and the word *theory* as used in science?

a) A *scientific* theory must be thoroughly tested, while an everyday theory doesn't.
b) A *scientific* theory must be discarded if it fails to explain what is observed in any experiment, while an everyday theory doesn't.
c) A regular theory is more of a hypothesis than a proven explanation.
d) all of the above

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What method or processes do scientists use when they are doing science?

a) observing the world; looking for patterns that can be clues to underlying laws
b) sorting, classifying, or measuring
c) suggesting a hypothesis, which explains what has been seen already *and predicts something not yet seen*
d) doing an experiment or collecting data to test the hypothesis
e) all of the above

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Do you think scientists follow the steps of the scientific method given in the previous slide in order (step 1, then 2, then 3…) ?

a) yes–the *scientific method* is always followed
b) no
c) often, but not always

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If scientists skip a step in the scientific method–for instance, intuitively guessing the answer even before doing the experiment–what happens?

a) They flunk out of science.
b) Real scientists never skip steps.
c) They go back later and do the steps they didn't do.
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Do you think that the scientific method involves much creativity?

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What is special about *scientific* knowledge, compared to other ways of knowing?

a) It is based on data.
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c) Scientists *not* involved with the original discovery test it after a new scientific discovery has been published.
d) Explanations are based on natural causes.
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What is *pseudoscience?*

a) something that looks like science but isn't
b) something that often uses scientific words but not the method of science
c) something that may want the respectability of science but does not actually use the methods of science
d) something that usually doesn't really work, or doesn't work the way claimed
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What are some of the common characteristics of pseudoscience?

a) It explains things people care about that may not have other explanations.
b) It is based on *postdiction* not *prediction.* It explains after the fact.
c) If it fails, there is always an excuse–the theory is *not* discarded.
d) Uses scientific-sounding jargon incorrectly (e.g., energy flows….).
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The great scientist and teacher, Richard Feynman, said science is, "A way of trying not to fool yourself." What do you think he meant?

a) Scientists are very smart. Become a scientist and you will know more.
b) It is natural to believe our own ideas, but not to want them critically tested. Science forces us to test our ideas.
c) Subconsciously, we tend to see evidence that agrees with our ideas and ignore that which doesn't. In science, different groups of scientists repeat experiments, removing some of this bias.
d) all of the above
e) B and C

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a) came up with a theory–elliptical orbits–that explained Tycho's very accurate data.
b) found that planets don't orbit at constant velocity–they speed up when nearer the Sun.
c) discovered the relationship between orbital period and a planets distance from the Sun.
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Could you distinguish between Earth and Sun-centered solar system models by observing Venus with a telescope?

a) yes, it would show phases
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Suppose a comet had a very eccentric orbit that brought it quite close to the Sun at closest approach (perihelion) and beyond Mars when furthest from the Sun (aphelion), but with an average distance of 1 AU. How long would it take to complete an orbit and where would it spend most of its time?

a) one year, mostly beyond Earth's orbit
b) one year, mostly within Earth's orbit
c) more than one year, mostly beyond Earth's orbit
d) less than one year, mostly within Earth's orbit
e) It depends on the exact value of the eccentricity.

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Chapter 3

Consider two asteroids in the inner solar system, one which orbits at an average distance of 3 AU and one which orbits at an average distance of 4 AU. Also consider two comets in the outer solar system, one which orbits at an average distance of 31 AU and one that orbits at an average distance of 32 AU. Which pair will have the larger difference in orbital speeds?

a) The comets.
b) The asteroids.
c) They difference in orbital speeds will be the same for each pair.
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In science, saying that something is a theory means that it is really just a guess.

a) Yes, but a guess by a highly educated person.
b) Yes, but it has strong support by other scientists.
c) No, a hypothesis only becomes a scientific theory after it has been well tested.
d) No, it must have detailed mathematical equations to back it up.
e) No, a theory is published in books, a guess isn't.

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a) Yes, and it was therefore subsequently referred to as the "Copernican revolution."
b) Yes, and it was subsequently used by navigators to explore the New World.
c) Yes, because there was a growing recognition that the Ptolemaic model was inaccurate.
d) No, it was not substantially more accurate than the Ptolemaic model.
e) No, it was only after spacecraft explored the solar system that scientists were convinced of its validity.

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