

Study Questions on 2 World Views (Kearney 96-104; Cohen 24-52; 53-80)

(Kearney 96-104)

1. According to Kearney, what explains Copernicus' revolutionary outlook?
2. What was the basis for the neo-Platonic emphasis on the sun?
3. According to Kearney, how does the neo-Platonic background of Copernicus explain why his theories were almost universally rejected through the 16th century?

(Cohen pp. 24-52)

4. What is an epicycle? What is a deferent? What type of planetary motion can they account for?
5. What is an equant? What type of planetary motion can it account for?
6. Why should the Copernican system be referred to as "heliostatic" instead of "heliocentric"?
7. Why is it wrong to claim that the Copernican system was simpler than the Ptolemaic system?
8. How does the Copernican system account for retrograde motion? In what sense is its account better than the Ptolemaic account?
9. How does the Copernican system account for the fact that Venus is never seen at midnight? How does the Ptolemaic system account for this fact?
10. Do you think it is an advantage for the Copernican system that it allows one to calculate relative distances from the planets to the sun? How might a Ptolemaic sympathizer respond to this alleged advantage?
11. What is the phenomenon of stellar parallax? How is the absence of observed stellar parallax a count against the Copernican system?

Study Questions on Galileo and the Telescope (Cohen 53-80)

1. Describe one of the arguments against the claim that the Earth is in motion. What was Copernicus' response? Do you think it's effective?
2. Describe three observations made by Galileo that he interpreted as indicating that the heavens are imperfect.
3. Describe an observation made by Galileo that he interpreted as indicating the Earth is not unique.
4. What is the significance of Galileo's observations of the phases of Venus? How do you think a dedicated Aristotelian (ie, a Ptolemaic sympathizer) could have responded?

Study Questions on Galileo & Aristotle on Motion (Cohen 2-24; 81-126)

1. If a 1 pound ball and a 10 pound ball are dropped simultaneously from a tower, which will hit the ground first according to the "elementary textbook" account? Why is this account wrong?
2. According to Aristotle, what is the relation between the speed of an object and the resistance of the medium through which it travels?
3. According to Aristotle, what is the relation between speed and motive force?
4. In what respects is the formula $V \propto F/R$ an inaccurate representation of Aristotle's views?
5. What is uniform motion according to Galileo? What does the thought experiment of dropping objects from the masts of moving ships and ships at rest supposed to demonstrate?
6. How can the ship experiments referred to in #5 be used as support for the Copernican system of the world?
7. Why does Galileo choose the relation $V \propto T$ to describe uniformly accelerated motion?
8. According to Cohen, what are the steps in Galileo's reasoning from the definition of uniformly accelerated motion $V \propto T$, to his Law of Freely Falling Bodies $D \propto T^2$?
9. How does Galileo's Law of Freely Falling Bodies $D \propto T^2$ explain the empirical fact that a 1 pound ball and a 10 pound ball, dropped simultaneously from a tower, will hit the ground simultaneously (given no air resistance)?
10. How does Galileo describe the motion of a projectile?
11. Newton's principle of inertia states that an object, initially at rest or in uniform motion in a straight line, will continue to be at rest or in uniform motion along a straight line in the absence of an external net force. How is Galileo's description of a falling object experiencing an air resistance equal to its weight a limited statement of this principle?
12. How is Galileo's description of the motion of a ball on an infinite plane a limited statement of the principle of inertia? Why does Galileo consider motion on such infinite planes physically impossible?
13. What aspects of Galileo's views on motion are Aristotelian?

Study Questions on Kepler (Kearney 130-140; Cohen 127-147)

(Kearney 130-140)

1. According to Kearney, what two factors made Kepler's role within the magical tradition distinctive?

2. Why did Tycho Brahe keep his astronomical observations private?
3. How did Kepler extend Gilbert's notion of the Earth as a giant magnet?
4. What were the two radical innovations that Kepler introduced in *Astronomia Nova*?
5. What two Copernican assumptions did Kepler modify?
6. What characterizes Kepler's *Harmonice Mundi*?
7. According to Kearny, did Kepler and Robert Fludd have more in common than they appeared to themselves and their contemporaries?

(Cohen 127-147)

1. In what sense is a circle a special type of ellipse?
2. Why does Cohen characterize Kepler as a "sleepwalker"?
3. What is the relation between the 5 Platonic solids and the orbits of the planets according to Kepler?
4. What are Kepler's first and second laws of planetary motion?
5. What is Kepler's third law of planetary motion? What does it indicate about the nature of the sun?
6. What aspects of Kepler's description of planetary motion were unacceptable to Galileo's Mechanistic inclinations? What aspects of Kepler were unacceptable to Galileo's Aristotelian inclinations?

Study Questions on Descartes and the Mechanical Philosophy (Westfall 25-42)

1. According to Westfall, how was Galileo's attitude towards experiments different from Gilbert's?
2. According to Gilbert, what are the differences between electricity and magnetism?
3. How does Gilbert explain the motion of the earth with respect to the sun?
4. According to Westfall, how was the "Renaissance Naturalism" of Gilbert more sympathetic with empirical methods of investigation than "Scholastic Aristotelianism"?
5. How did van Helmont use his tree experiment to argue that water was the matter from which all things are formed?
6. How is Cartesian dualism a reaction to Renaissance Naturalism?
7. What was Descartes' method of doubt? What single claim did he think could be known with complete certainty?
8. Did Descartes think the physical world can be known with certainty through the senses?
9. What is Descartes' principle of inertia? Why was it essential to the mechanical philosophy?
10. How does Descartes' and Gassendi's concept of inertia differ from Galileo's?
11. Why can there be no vacuum, according to Descartes?
12. Why do centrifugal pressures exist in the universe, according to Descartes?
13. How does Descartes explain the motions of the planets with respect to the sun?
14. What is the mechanical basis of light, according to Descartes? What is the mechanical basis of magnetism?
15. How did the atomism of Gassendi differ from the corpuscularianism of Descartes?
16. How does Westfall characterize Gassendi's view of science? How is this view different from the view of Descartes and Aristotle?
17. According to Boyle, what are the two "catholic principles" of the mechanical philosophy?