

Multiple Choice Solutions for Mid-Term Exam #1:

Each correct answer worth 1.5 points [mis-stated on Cabanela midterm].

Cabanela Exam

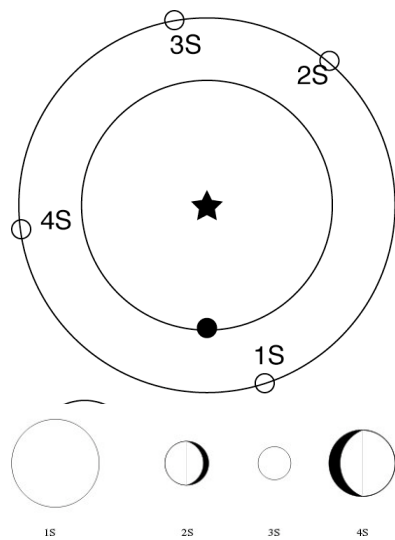
1. B
2. B
3. B
4. A
5. C
6. E
7. D
8. A
9. B
10. C
11. A
12. B
13. D
14. C
15. A
16. Was meant to be D, but a reasonable case could be made for C as well, everyone got a point.
17. Was meant to be A, but a reasonable case could be made for D. Everyone got a point.
18. B
19. B
20. B

Craig Exam

1. B
2. E
3. B
4. D
5. B
6. A
7. B
8. A
9. B
10. C
11. A
12. C
13. C
14. C
15. A
16. C
17. NOT GRADED
18. B
19. B
20. B

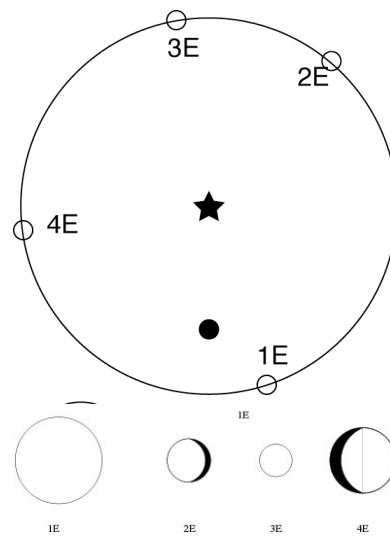
Short Answer Solutions for Mid-Term Exam #1:

1. The figure below shows Earth (the black dot) and the orbit of Mars in both a Sun-centered and an Earth-centered picture.
- For each of the marked positions indicate in the circles below what Mars would look like through a telescope.
 - Compare and contrast the predictions made in the Sun-centered and the Earth-centered picture.
 - Could these observations be used to decide which model is incorrect, as was the case for Venus? Why or why not?



Sun-Centered Model:

Pretend the Earth does not move to make the drawing less complicated.



Earth-Centered Model:

Although the Earth is obviously not at the center above, the orbit shown for Mars is the path predicted for Mars when you add up all the epicycles in the best Earth-centered model.

- (a) The correct answers are indicated above.**
- (b) There are no obvious differences between the predictions for the phases of Mars in these two models. They are in fact identical predictions!**
- (c) Unlike the case for Venus, the phases of Mars are no different for an Earth-centered versus Sun-centered picture of the solar system. The key difference is that Venus is closer to the Sun than Earth and Mars is farther from the Sun than Earth. So the result is that examining the phases of Mars would NOT be a very good test for distinguishing the heliocentric and geocentric models.**

- 4 points for phases (0.5 points each), with fairly liberal standards for accepting phases. As long as the correct side is shaded we will take it.
- 2 points for concluding the difference is slight.
- 2 points for explanation.
- 2 points for clarity

2. The idea of “intelligent design” has been in the news a lot over the last few years. According to intelligent design:

[C]ertain features of the universe and living things are best explained by an intelligent cause. One of its fundamental premises is that "information" which is complex... and specified...is not produced by naturally occurring events... but rather this sort of observable information and complexity is best explained as the product of intelligent action. Intelligent design implies that life is here as a result of the purposeful action of an intelligent designer...

This quote is from a document titled "Intelligent Design Theory in a Nutshell." Is intelligent design a theory, or even a scientific idea, as defined in class? Explain why or why not.

It is not scientific. First, it is not clear how it would make any new predictions or how you would test it. If the idea is not testable it is not scientific. Second, science is the endeavor of finding natural causes for events, and intelligent design asserts a supernatural cause—the intelligent designer. Finally, the word “theory” is used in science to mean a very, very well tested framework for understanding a wide range of observations. Intelligent design is not well tested.

- *2 points for recognizing it as non-scientific.*
- *5 points for either the supernatural or non-testable explanations.*
- *3 points for clarity*

3. Pick the observation of Galileo that you think best undermines the Earth-at-the-center picture of the solar system and explain why you picked that observation. (10 points)

There are two possible answers here:

- 1. phases of Venus because it demonstrates Earth and Venus go around the Sun,*
- 2. moons of Jupiter because it demonstrates not everything goes around Earth*

In either case, you must clearly explain why that observation undermines the “Earth-at-the-center” picture of the Solar System.

- *2 points if the observation was one of Galileo’s*
- *4 points for either of the two observations above and another 3 points for explanation.*
- *3 points for clarity.*

Note: There may be other reasonable arguments to be made beyond the two above.