

Past Semesters' Exam Questions

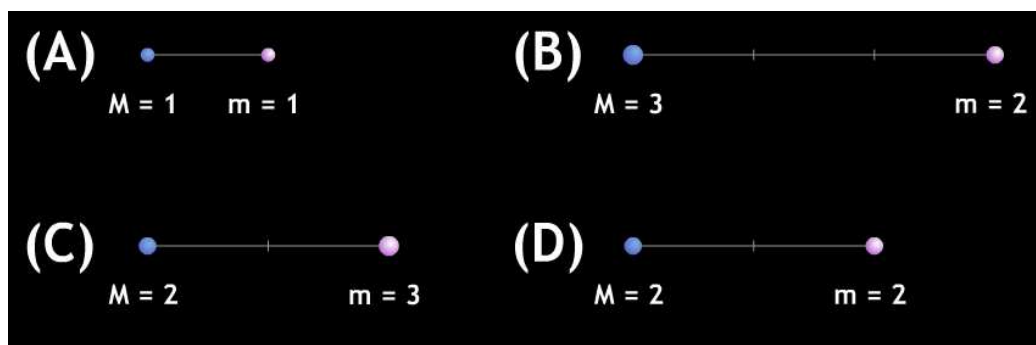
ASTR 220 Discussion # 2

Feb. 6, 2019

Name: _____

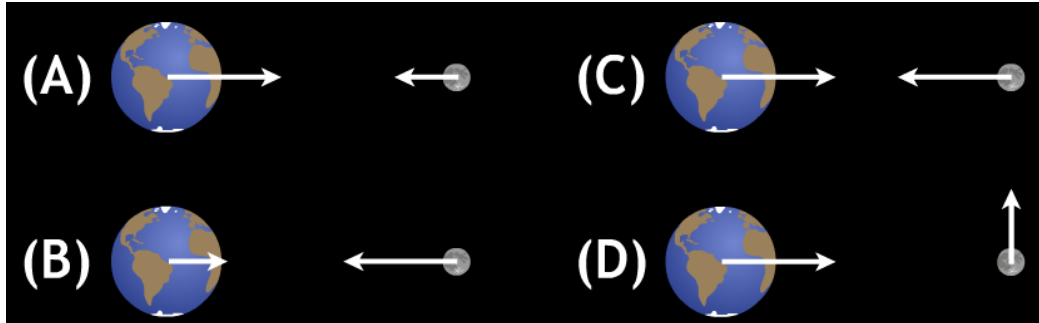
Section: _____

1. The following diagram shows four pairs of asteroids (A - D). The mass of each asteroid, in arbitrary units, is indicated. Note the distance scale marked between each pair. Which of the following pairs of asteroids exerts the **LARGEST** gravitational force on each other? (Assume that none of the pairs affects any of the other pairs.)
- A. Pair B
 - B. Pair C
 - C. Pair A
 - D. It cannot be determined from this information.
 - E. Pair D



2. Imagine that you could ride on a wave of light emitted by the Sun that travels outward through the solar system. Which one of the following best describes how often you'd pass solar system objects? (Assume that the planets are all lined up so that the same light wave will go by each of them.)
- A. You would pass by the terrestrial planets relatively rapidly in minutes. Then you would wait longer and longer after you pass each planet until you reach the next one.
 - B. You would wait quite a long time before you pass each planet - about the same amount of time in between each planet.
 - C. You would have pretty long waits before you reached each terrestrial planet, but the jovian planets would go by rapidly because they are so large.
 - D. You would have short waits between passing some planets, and then longer ones between others, and then shorter waits again - there would be no pattern.

3. The diagrams below illustrate the relative strengths and directions of the gravitational force that the Earth and Moon experience due to their mutual interaction. Which one is correct?
- A. Diagram A
 - B. Diagram C
 - C. Diagram B
 - D. Diagram D
 - E. None of them



4. The diagram below shows the Earth and Mars (the diagram is not to scale), along with four spaceships (A - D). There is a gravitational force between each of the spaceships and the Earth, and each of the spaceships and Mars. List the spaceships in order of the **STRENGTH** of the net gravitational force on them, from **LEAST TO MOST NET GRAVITATIONAL FORCE**. Then explain your reasoning for your ranking. (The gravitational forces between the spaceships are too small to worry about. Please also note that you're thinking only about the strength of the net gravitational force, not its direction.)



5. Imagine that a nearby star is about to make a “close” approach to our Solar System. The star is 100 times as massive as our Sun. *Show all work in the space below. Use the back of this page if you need additional room.*

(5.1) How close to the Earth would the star have to pass in order to exert the same force on the Earth as the Moon does? Remember to give units! If the Earth is directly between the Sun and this star, how far, in astronomical units, is this from the Sun? Would the star be within our Solar System?

(5.2) Pluto happens to be directly between the Sun and this star during the star’s approach. What would happen to Pluto? Defend your answer with a calculation of some sort, and explain why that calculation is relevant.