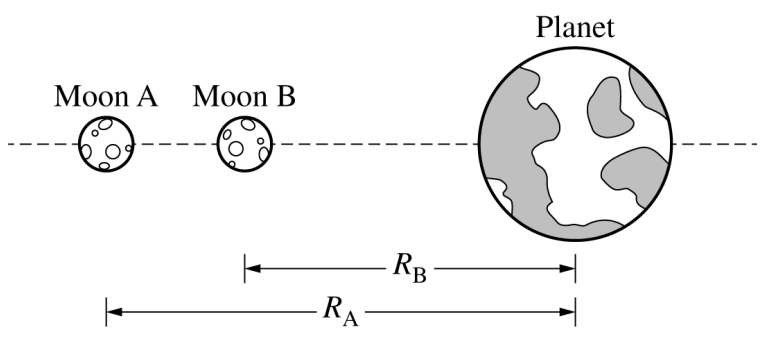
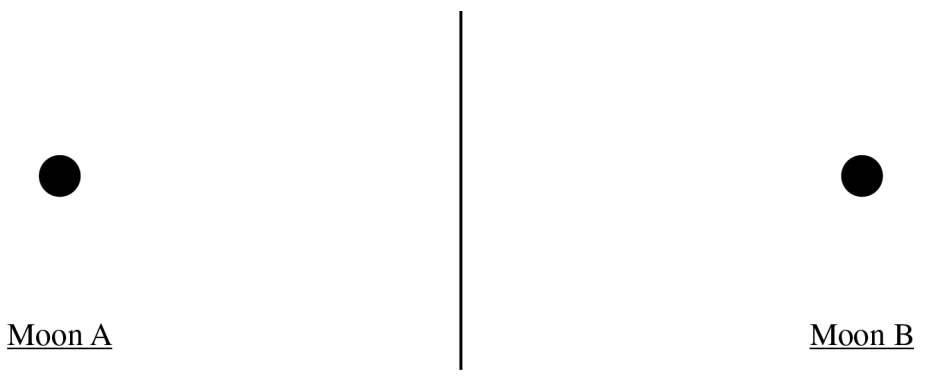


Note: Figure not drawn to scale.

. (12 points, suggested time 25 minutes)

Two identical moons, Moon A and Moon B, orbit a planet. The mass m_0 of each moon is significant, but less than the mass m_p of the planet. At some point in their orbits, the planet and the two moons are aligned as shown in the figure.

(a) The following dots represent the two moons when they are at the locations shown in the previous figure. On each dot, draw and label the forces (not components) exerted on Moon A and on Moon B. Each force must be represented by a distinct arrow starting on, and pointing away from, the appropriate dot.



(b) Consider the net gravitational force exerted on each moon due to the planet and the other moon.

i. Justify why the magnitude of the net force exerted on Moon A could be larger than the magnitude of the net force exerted on Moon B.

ii. Justify why the magnitude of the net force exerted on Moon B could be larger than the magnitude of the net force exerted on Moon A.

(c) Derive expressions for both of the following quantities. Express your answers in terms of m_0, m_p, R_A, R_B, and physical constants, as appropriate.

• The net force F_A exerted on Moon A

• The net force F_B exerted on Moon B

(d)

i. Could the expressions in part (c) support your reasoning in part (b)(i) ?

___ Yes ___ No

Explain your reasoning.

ii. Could the expressions in part (c) support your reasoning in part (b)(ii) ?

___ Yes ___ No

Explain your reasoning.