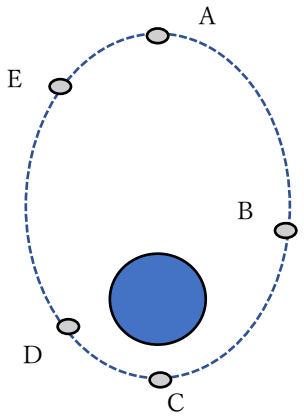
Physics I-B #28 Exercise number name

Satellite motion – Kepler's Law

All answers to 3 significant digit. Remember to include units in answers.

解答は全て有効数字３桁で求めなさい。また、単位を忘れずに書きなさい。

Q1) In the diagram below, five objects are in an elliptical orbit. (1) Draw the gravitational force vector [F] and the velocity vector [V] for each object. Assume that the objects go in a clockwise direction. (2) Rank the objects from largest kinetic energy to smallest kinetic energy. (3) Rank each of the objects from highest potential energy to lowest potential energy.



Q2) An object orbits Mar with a radius of 3500[km]. Mars has a mass of 6.39×10^{23} [kg]. (1) What is the orbital velocity of the object? (2) What is the escape velocity?

Q3) A new satellite is in a circular orbit around earth. The average orbital radius and the mass of the satellite are 20,200 [km] and 4500 [kg] respectively. (1) Assume that the mass of the earth is 5.97×10^{24} [kg]. What is the period of orbit of the satellite around the earth? (2) What is the tangential velocity of the satellite?

Q4) Planet X and Planet Y orbit the same sun. If Planet Y has an average orbital radius of 1,650,000 [km] and a period of 400 [hours]. What is the average orbital radius of Planet X around the sun if the period of Planet Y is four times longer than Planet X?