WebAssign
CH06-HW04-SP12 (Homework)

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PHYS 172-SPRING 2012, Spring 2012
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Current Score : 27 / 27 **Due :** Tuesday, February 21 2012 11:59 PM EST

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1. 1/1 points | Previous Answers MI3 6.8.X.016

Consider an isolated system, by which we mean a system free of external forces. If the sum of the particle energies in the system increases by 151 joules, what must have been the change ΔU in the system's potential energy?

ΔU = -151 ✓ J

- *Read the eBook*
- Section 6.8

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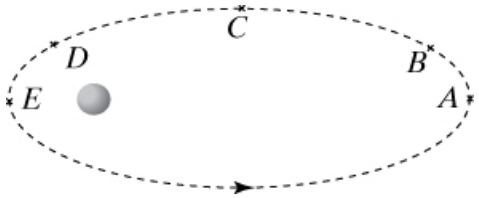
2. 8/8 points | Previous Answers MI3 6.9.X.077



The diagram above shows the path of a comet orbiting a star. You will be asked to rank order various quantities in terms of their values at the locations marked on the path, with the largest first. You can use the symbols ">" and "=". For example, if you were asked to rank order the locations in terms of their distance from the star, largest first, you would type:
"A > B > C > D > E"

Rank order the locations on the path in terms of the magnitude of the comet's momentum at each location, starting with the location where the magnitude of the momentum is the largest:

E > D > C > B ✓

Rank order the locations on the path in terms of the comet's kinetic energy at each location, starting with the location where the kinetic energy is the largest:

E > D > C >B ✓

Consider the system of the ***comet plus the star***. Which of the following statements are correct?

- [ ] As the comet slows down, energy is lost from the system.
- [ ] As the comet's kinetic energy increases, the gravitational potential energy of the system also increases.
- [ ] External work must be done on the system to speed up the comet.
- [x] As the comet slows down, the kinetic energy of the system decreases.
- [x] As the kinetic energy of the system increases, the gravitational potential energy of the system decreases.

Still considering the system of the comet plus the star, which of the following statements are correct?

- [ ] The sum of the kinetic energy of the system plus the gravitational potential energy of the system is a positive number.
- [ ] The gravitational potential energy of the system is inversely proportional to the square of the distance between the comet and star.
- [x] The sum of the kinetic energy of the system plus the gravitational potential energy of the system is the same at every location along this path.
- [x] Along this path the gravitational potential energy of the system is never zero.
- [x] At every location along the comet's path the gravitational potential energy of the system is negative.

Rank order the locations on the path in terms of the potential energy of the system at each location, largest first. (Remember that -3 > -5).

A>B>C>D>E

- *Read the eBook*
- Section 6.9

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3. 5/5 points | Previous Answers MI3 6.12.P.088

A comet is in an elliptical orbit around the Sun. Its closest approach to the Sun is a distance of 5×10^{10} m (inside the orbit of Mercury), at which point its speed is 9.5×10^{4} m/s. Its farthest distance from the Sun is far beyond the orbit of Pluto. What is its speed when it is 6×10^{12} m from the Sun? (This is the approximate distance of Pluto from the Sun.)

speed = 60907.03 m/s

- *Read the eBook*
- Section 6.12

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4. 7/7 points | Previous Answers MI3 6.12.P.081

The radius of Mars (from the center to just above the atmosphere) is 3400 km (3400×10^3 m), and its mass is 0.6×10^{24} kg. An object is launched straight up from just above the atmosphere of Mars.

(a) What initial speed is needed so that when the object is far from Mars its final speed is 3500 m/s?

v_{escape} = 5.991e3 ✓ m/s

(b) What initial speed is needed so that when the object is far from Mars its final speed is 0 m/s? (This is called the "escape speed.")

v_{escape} = 4.863e3 ✓ m/s

- *Read the eBook*
- Section 6.12

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5. 6/6 points | Previous Answers

In certain cases, using both the momentum principle and energy principle to analyze a system is useful, as they each can reveal different information. You will use the both momentum principle and the energy principle in this problem.

A satellite of mass 6500 kg orbits the Earth in a circular orbit of radius of 9.3×10^6 m (this is above the Earth's atmosphere).The mass of the Earth is 6.0×10^{24} kg.

What is the magnitude of the gravitational force on the satellite due to the earth?

F = 30211.59 ✓ N

Using the momentum principle, find the speed of the satellite in orbit. (HINT: Think about the components of [?] parallel and perpendicular to [?].)

v = 6574.63 ✓ m/s

Using the energy principle, find the minimum amount of work needed to move the satellite from this orbit to a location very far away from the Earth. (You can think of this energy as being supplied by work due to something outside of the system of the Earth and the satellite.)

work = 1.405e11 ✓ J