Ch1 HW3 (1395028)

Current Score: 0/26 **Due:** Thu Sep 2 2010 09:00 AM EDT

Question	1	2	3	4	5	6	7	Total
Points	0/2	0/1	0/6	0/8	0/2	0/2	0/5	0/26

Description
Acceleration; Momentum and Momentum change

Instructions
Reading: Sec. 1.7-1.9

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1. 0/2 points MI3 1.7.X.035. [1250561]

Powerful sports cars can go from zero to 25 m/s (about 60 mph) in 4.5 seconds.
What is the magnitude of the acceleration, including units?
[ ] 5.56 ---Select--- m/s/s
How does this compare with the acceleration of a falling rock?

- ○ It is the same.
- ○ It is less.
- ○ It is greater.

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2. 0/1 points MI3 1.X.105.MAK_corrected [1333389]

A baseball has a mass of about 155 g. What is the magnitude of the momentum of a baseball thrown at a speed of 87 miles per hour? (Note that you need to convert mass to kilograms and speed to meters/second. A mile is 1.6 kilometers or 1600 meters.)
$|\vec{p}|$ = [ ] 5.99 kg·m/s

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3. 0/6 points MI3 1.X.113.MAK_corrected [1333324]

An electron travels at speed $|\vec{v}|$ = 0.998c, where c = 3e8 m/s is the speed of light. It travels in the direction given by the unit vector $\hat{v}$ = < 0.545, -0.545, -0.636 >. The mass of an electron is 9×10^{-31} kg.

What is the value of $\gamma = \frac{1}{\sqrt{1-(|\vec{v}|/c)^2}}$? You can simplify the calculation if you notice that $(|\vec{v}|/c)$ = 0.998.
γ = [ ] 15.8

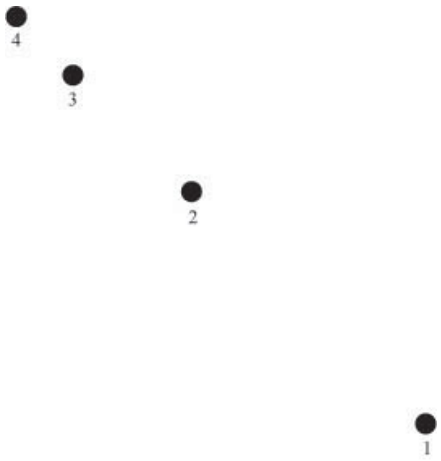
What is the speed of the electron?
$|\vec{v}|$ = [ ] 2.99e+08 m/s

What is the magnitude of the electron's momentum?
$|\vec{p}|$ = [ ] 4.26e-21 kg · m/s

What is the vector momentum of the electron? Remember that any vector can be "factored" into its magnitude times its unit vector, so that $\vec{v} = |\vec{v}|\hat{v}$.

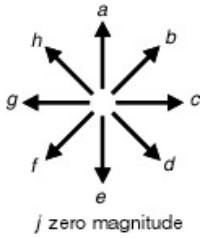
$\vec{p}$ = < [ ] 2.33e-21 , [ ] -2.33e-21 , [ ] -2.71e-21 > kg · m/s

4. 0/8 points one_dimension_vel_changing_noF [1179673]



The diagram shows a single moving object at instants in time separated by *equal* time intervals.

Which arrow (a-j) best indicates the direction of the object's velocity $\vec{v}_1$ at point 1? ---Select--- h



Which arrow (a-j) best indicates the direction of the object's velocity $\vec{v}_2$ at point 2? ---Select--- h

Which arrow (a-j) best indicates the direction of the object's momentum $\vec{p}_1$ at point 1? ---Select--- h

Which arrow (a-j) best indicates the direction of the object's momentum $\vec{p}_2$ at point 2? ---Select--- h

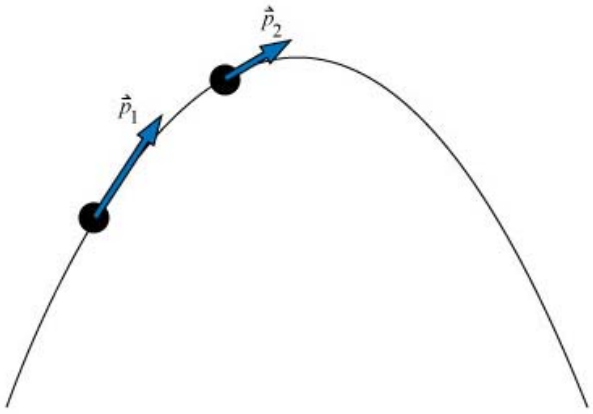
Which is true about the magnitudes of the velocities at points 1 and 2?
$|\vec{v}_1|$ ---Select--- > $|\vec{v}_2|$

Which is true about the magnitudes of the momenta at points 1 and 2?
$|\vec{p}_1|$ ---Select--- > $|\vec{p}_2|$

Which arrow (a-j) best indicates the direction of the **change** in velocity $\Delta\vec{v} = \vec{v}_2 - \vec{v}_1$ from point 1 to point 2? ---Select--- d

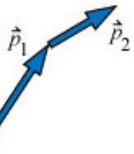
Which arrow (a-j) best indicates the direction of the **change** in momentum $\Delta\vec{p} = \vec{p}_2 - \vec{p}_1$ from point 1 to point 2?
---Select--- d

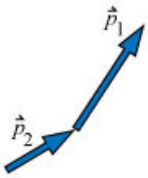
5. 0/2 points parabolic_diagram_for_delta_p [1130120]

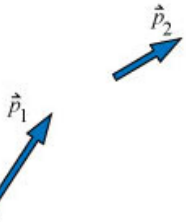


The diagram shows the path of a moving object. The object and its momentum is shown at two instants in time.

Which of the diagrams below would be the best to use to determine graphically the change in momentum of the object from point 1 to point 2?

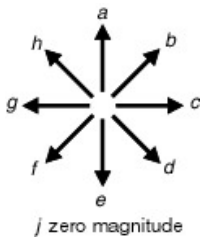






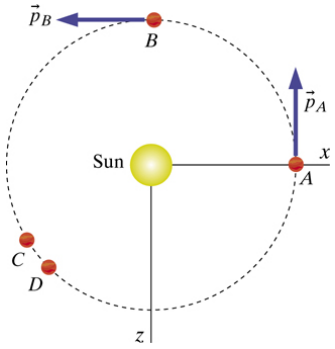
Which arrow (a-j) best indicates the direction of the object's change in momentum from point 1 to point 2 ---Select---

e



6. 0/2 points MI3 1.9.X.043. [1544862]

A planet has a mass of 4×10^{24} kg and travels in a nearly circular orbit around a star as shown. When it is at location *A*, the velocity of the planet is $\langle\ 0,\ 0,\ -1.7\times10^{4}\ \rangle$ m/s. When it reaches location *B*, the planet's velocity is $\langle\ -1.7\times10^{4},\ 0,\ 0\ \rangle$ m/s. We're looking down on the orbit from above, with $+x$ to the right and $+z$ down the page.



(a) What is $\Delta\vec{p}$, the change in the momentum of the planet between locations *A* and *B*?

$\Delta\vec{p}$ = $< -6.80e+28, 0, 6.80e+28 >$ kg · m/s

(b) On a copy of the diagram, draw two arrows representing the momentum of the planet at locations *C* and *D*, paying attention to both the length and direction of each arrow. What is the direction of the change in the momentum of the planet between locations *C* and *D*?

- c
- a
- b

7. 0/5 points MI3 1.X.042.MAK_corrected [1333289]

A tennis ball of mass 57 g travels with velocity < 74, 0, 0 > m/s toward a wall. After bouncing off the wall, the tennis ball is observed to be traveling with velocity < -68, 0, 0 > m/s.

(a) Draw a diagram showing the initial and final momentum of the tennis ball. This will help you answer the following questions.

(b) What is the change in the momentum of the tennis ball?

$\Delta\vec{p}$ = < [ ] -8.09 , [ ] 0 , [ ] 0 > kg · m/s

(c) What is the magnitude of the change of momentum of the tennis ball?

$|\Delta\vec{p}|$ = [ ] 8.09 kg · m/s

(d) What is the change in the magnitude of the tennis ball's momentum?

$\Delta|\vec{p}|$ = [ ] -0.342 kg · m/s

Note that the magnitude of the change of the vector momentum is large, while the change in the magnitude of the momentum is small.

Assignment Details