Physics I
Exam 3 Review

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November 10, 2010
Outline

1. Must knows!!

2. Multiple Choice
   - Chapter 7: Kinetic Energy and Work
   - Chapter 8: Potential Energy and Conservation of Energy
   - Chapter 9: Center of Mass and Linear Momentum

3. Problems
   - Problem 1
   - Problem 2
Must Knows!!

\[ KE = \frac{1}{2} mv^2 \]
\[ \Delta U = mgh \]
\[ \Delta E_{th} = f_k d \]
\[ U(x) = \frac{1}{2} kx^2 \]

The difference between an elastic and inelastic collision
Multiple Choice
Chapter 7: Kinetic Energy and Work
Question 1

A man pulls a sled along a rough horizontal surface by applying a constant force $\vec{F}$ at an angle $\theta$ above the horizontal. In pulling the sled a horizontal distance $d$, the work done by the man is:

A  $Fd$
B  $Fd \cos \theta$
C  $Fd \sin \theta$
D  $\frac{Fd}{\cos \theta}$
E  $\frac{Fd}{\sin \theta}$
Question 1

A man pulls a sled along a rough horizontal surface by applying a constant force \( \vec{F} \) at an angle \( \theta \) above the horizontal. In pulling the sled a horizontal distance \( d \), the work done by the man is:

A  \( Fd \)
B  \( Fd \cos \theta \)
C  \( Fd \sin \theta \)
D  \( \frac{Fd}{\cos \theta} \)
E  \( \frac{Fd}{\sin \theta} \)

Answer: B
Question 2

Which of the following bodies has the largest kinetic energy?

A. Mass $3M$ and speed $V$
B. Mass $3M$ and speed $2V$
C. Mass $2M$ and speed $3V$
D. Mass $M$ and speed $4V$
E. All four of the above have the same kinetic energy
Question 2

Which of the following bodies has the largest kinetic energy?

A  Mass 3M and speed V
B  Mass 3M and speed 2V
C  Mass 2M and speed 3V
D  Mass M and speed 4V
E  All four of the above have the same kinetic energy

Answer: C
Question 3

The amount of work required to stop a moving object is equal to:

A the velocity of the object
B the kinetic energy of the object
C the mass of the object times its acceleration
D the mass of the object times its velocity
E the square of the velocity of the object
Question 3

The amount of work required to stop a moving object is equal to:

A the velocity of the object
B the kinetic energy of the object
C the mass of the object times its acceleration
D the mass of the object times its velocity
E the square of the velocity of the object

Answer: B
Chapter 8: Potential Energy and Conservation of Energy
Question 1

The sum of the kinetic and potential energies of a system of objects is conserved:

A only when no external force acts on the objects
B only when the objects move along closed paths
C only when the work done by the resultant external force is zero
D always
E none of the above

Answer: E
Question 1

The sum of the kinetic and potential energies of a system of objects is conserved:

A  only when no external force acts on the objects
B  only when the objects move along closed paths
C  only when the work done by the resultant external force is zero
D  always
E  none of the above

Answer: E
Question 2

A golf ball is struck by a golf club and falls on a green three meters above the tee. The potential energy of the Earth-ball system is greatest:

A just before the ball is struck
B just after the ball is struck
C just after the ball lands on the green
D when the ball comes to rest on the green
E when the ball reaches the highest point in its flight

Answer: E
Question 2

A golf ball is struck by a golf club and falls on a green three meters above the tee. The potential energy of the Earth-ball system is greatest:

A just before the ball is struck
B just after the ball is struck
C just after the ball lands on the green
D when the ball comes to rest on the green
E when the ball reaches the highest point in its flight

Answer: E
Question 3

A block slides across a rough horizontal table top. The work done by friction changes:

A only the kinetic energy
B only the potential energy
C only the internal energy
D only the kinetic and potential energies
E only the kinetic and internal energies

Answer: E
Question 3

A block slides across a rough horizontal table top. The work done by friction changes:

A  only the kinetic energy  
B  only the potential energy  
C  only the internal energy  
D  only the kinetic and potential energies  
E  only the kinetic and internal energies  

Answer: E
Chapter 9: Center of Mass and Linear Momentum
Question 1

A man sits in the back of a canoe in still water. He then moves to the front of the canoe and sits there. Afterwards the canoe:

A is forward of its original position and moving forward
B is forward of its original position and moving backward
C is rearward of its original position and moving forward
D is rearward of its original position and moving backward
E is rearward of its original position and not moving
Question 1

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B is forward of its original position and moving backward
C is rearward of its original position and moving forward
D is rearward of its original position and moving backward
E is rearward of its original position and not moving

Answer: E
Question 2

A projectile in flight explodes into several fragments. The total momentum of the fragments immediately after this explosion:

A is the same as the momentum of the projectile immediately before the explosion
B has been changed into kinetic energy of the fragments
C is less than the momentum of the projectile immediately before the explosion
D is more than the momentum of the projectile immediately before the explosion
E has been changed into radiant energy

Answer: A
Question 2

A projectile in flight explodes into several fragments. The total momentum of the fragments immediately after this explosion:

A is the same as the momentum of the projectile immediately before the explosion
B has been changed into kinetic energy of the fragments
C is less than the momentum of the projectile immediately before the explosion
D is more than the momentum of the projectile immediately before the explosion
E has been changed into radiant energy

Answer: A
Question 3

The momentum of an object at a given instant is independent of its:

A inertia
B mass
C speed
D velocity
E acceleration

Answer: A
Question 3

The momentum of an object at a given instant is independent of its:

A inertia
B mass
C speed
D velocity
E acceleration

Answer: A
Problems
Problem 1

A block \( m = 1.0 \text{kg} \) when released will slide down a hill \( h_1 = 10 \text{m} \) and then across a frictional patch \( L_1 = 2.0 \text{m} \), around a loop \( h_2 = 3.0 \text{m} \), across another frictional patch \( L_2 = 1.0 \text{m} \) and into a spring that is compressed \( k = 4160 \frac{N}{m} \). The coefficient of friction between the block and the frictional patches is \( \mu_k = 0.50 \). All other regions are considered frictionless.

\[ \text{m} \]

\[ L_1 \quad B \quad L_2 \quad C \]

a) Find the speed at point B
b) Find the speed at point C
c) how far the spring will compress
d) how much work is done by kinetic friction
Problem 2

A stationary block of mass $m=1.0\text{kg}$ is struck by a bullet moving at $1000\frac{m}{s}$ which propells it up a hill of height $h=2.0\text{m}$ and across a frictional patch ($\mu_k = 0.5$)

a) How fast is the block moving just after the collision if the bullet goes through the block and emerges at $300\frac{m}{s}$

b) How long is the distance between $L_1$ and $L_2$

c) If the bullet embeds itself in the block how fast is the block moving just after the collision

d) What is the distance between $L_1$ and $L_2$ in part C

Bonus: How high does the hill need to be to just stop the block at the top in part A