

**Physics 201 Third Exam—Practice****Equations:**

$$x = x_0 + v_0 \cdot t + \frac{1}{2} a \cdot t^2$$

$$v = v_0 + a \cdot t$$

$$v^2 = v_0^2 + 2a(x - x_0)$$

$$\bar{v} = (v - v_0)/2$$

$$\Sigma \mathbf{F} = m\mathbf{a}$$

$$\mathbf{F}_{12} = -\mathbf{F}_{21}$$

$$\mathbf{F}(G) = m\mathbf{g}$$

$$\mathbf{F}(f)_k = \mu_k \mathbf{F}_N$$

$$\mathbf{F}(f)_s \leq \mu_s \mathbf{F}_N$$

$$v = \Delta x / \Delta t$$

$$a = \Delta v / \Delta t$$

$$a_r = v^2 / r$$

$$\mathbf{p} = m\mathbf{v}$$

$$\mathbf{F} = \Delta \mathbf{p} / \Delta t$$

$$\text{Impulse} = \mathbf{F} \Delta t = \Delta \mathbf{p}$$

$$m\mathbf{v}_1 + m\mathbf{v}_2 = m\mathbf{v}_1' + m\mathbf{v}_2'$$

$$v_x = v \cdot \cos(\theta)$$

$$v_y = v \cdot \sin(\theta)$$

$$v^2 = v_x^2 + v_y^2$$

$$\tan(\theta) = v_y / v_x$$

$$W = Fd \cdot \cos(\theta)$$

$$KE_t = \frac{1}{2} m v^2$$

$$GPE = mgy$$

$$KE_0 + PE_0 + W = KE_f + PE_f$$

$$SPE = \frac{1}{2} k x^2$$

1. Define the following quantities:

a) Work

b) Impulse

c) Potential Energy

d) Momentum

2. In which of the following is work done (by the physics definition) on the object?

Explain why or why not.

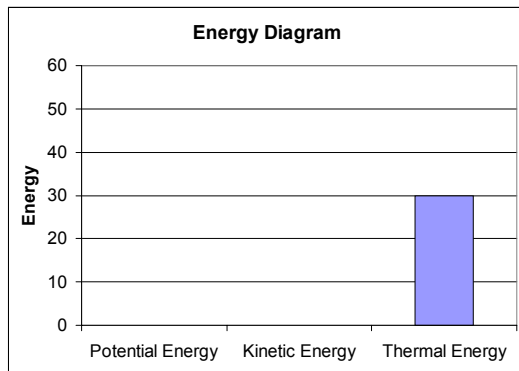
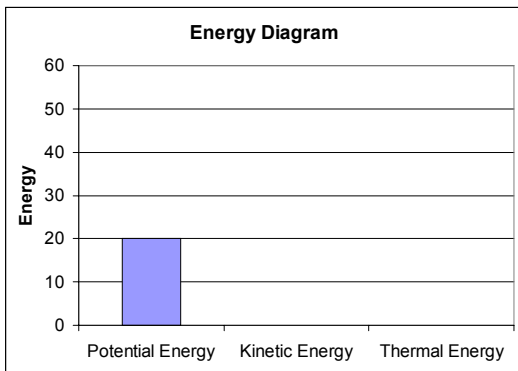
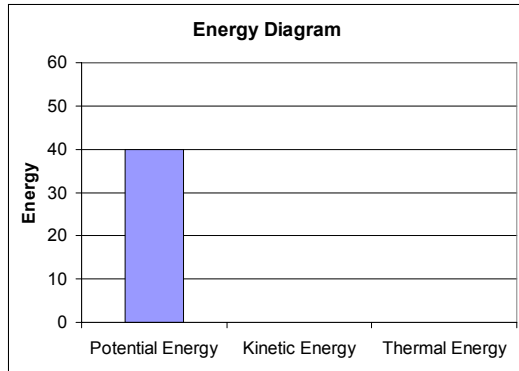
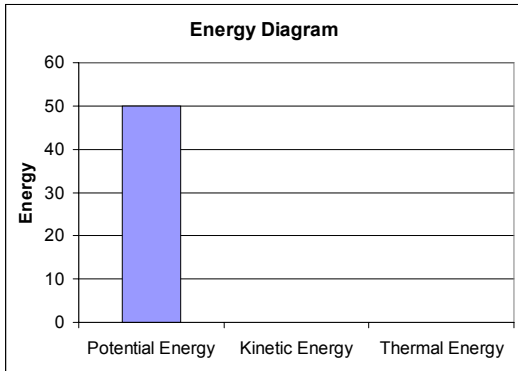
a) You push hard on a cement wall

b) You carry your lunch tray across the cafeteria at the same height.

c) You draw a circle on a sheet of paper with a pencil

- 3) A glass ball collides head-on with a steel ball (about the same size, but heavier) initially not moving. In the space below, draw the momentum diagrams for the system before and after the collision.

- 4) A soapbox car has an initial energy distribution as seen in the first chart. In the remaining charts, draw the amount of kinetic energy there must be in the car and the raceway. (Thermal Energy = Internal energy.)



- 5) An 80 kg skier travels 400 m down a slope that starts out at a  $40^\circ$  angle and gradually flattens out to a  $20^\circ$  angle, resulting in a total vertical drop of 200 meters. The initial push gives her a speed of 3.5 m/s, and she reaches the bottom traveling at 21.5 m/s. What was the average force of friction?

- 6) Tarzan (mass of 75 kg) rescues Jane by swing in at 4.5 m/s and grabbing her so that they then swing off at 2.7 m/s. What must be Jane's mass?

Name \_\_\_\_\_

- 7) A 40 g Velcro dart is launched from a spring-loaded gun. It sticks to a fuzzy die (mass 100 g) hanging from the ceiling. The dart and the die swing back, reaching a maximum height of 10 cm above where the die started. How fast was the dart traveling before it hit the die?

- 8) Real world problem. Fill in ONLY the indicated steps of the FOCUS and DESCRIBE steps. DO NOT SOLVE THE PROBLEM

As a concerned citizen, you have volunteered to serve on a committee investigating injuries to Middle School students participating in sports programs. Currently your committee is investigating the high incidence of ankle injuries on the basketball team. You are watching the team practice, looking for activities which can result in large horizontal forces on the ankle. Observing the team practice jump shots gives you an idea, so you try a small calculation. A 40-kg student jumps 1.0 m straight up and shoots the 0.80 kg basketball at his highest point. From the trajectory of the basketball, you deduce that the ball left his hand at 30° from the horizontal at 20 m/s. What is his horizontal velocity when he hits the ground?

EVERYDAY LANGUAGE  
Sketch with Given Information

What are you trying to find?

What are the physics principle(s)?

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Physics Description  
Diagram

Define Variables

Quantitative Relationships (*Write down ONLY the equations needed to solve this problem.*)