AMI DAY 5 Name: _____ Date:_____

Directions: Each passage is followed by several questions. After reading a passage, choose the best answer to each question and fill in the corresponding oval on your answer document. You may refer to the passages as often as necessary.
You are NOT permitted to use a calculator on this test.

An experiment is set up to look at the physics of bouncing a ball, as shown in Figure 1.

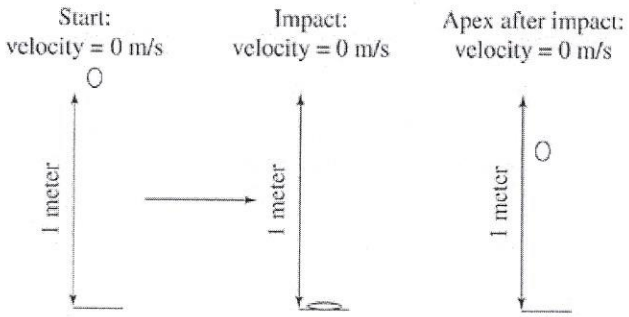

Figure 1

When the ball is dropped, its initial velocity is 0 m/s. Velocity will increase until impact with the ground, at which point the ball's velocity immediately drops to 0 m/s again. After impact, velocity almost immediately increases to maximum post-impact velocity, and then begins to fall again as gravity works against it, slowing it down. The ball's velocity returns to 0 m/s when the ball is at its *apex*, or highest vertical point, post impact.

When a ball bounces, it deforms and becomes flatter. This is called *elasticity*. The more *elasticity* a material has, the better it is able to act like a spring and absorb force by being compressed, then use this force to "spring" back into the air. Post-impact velocity and the amount of time between velocity of 0 m/s at impact and velocity of 0 m/s at post-impact apex are affected by elasticity. Figure 2 shows the velocity of a ball versus time for balls with various elasticities and weights dropped from 1 meter height. Because gravity causes all objects to fall at the same speed regardless of weight, pre-impact velocities are identical for all balls.

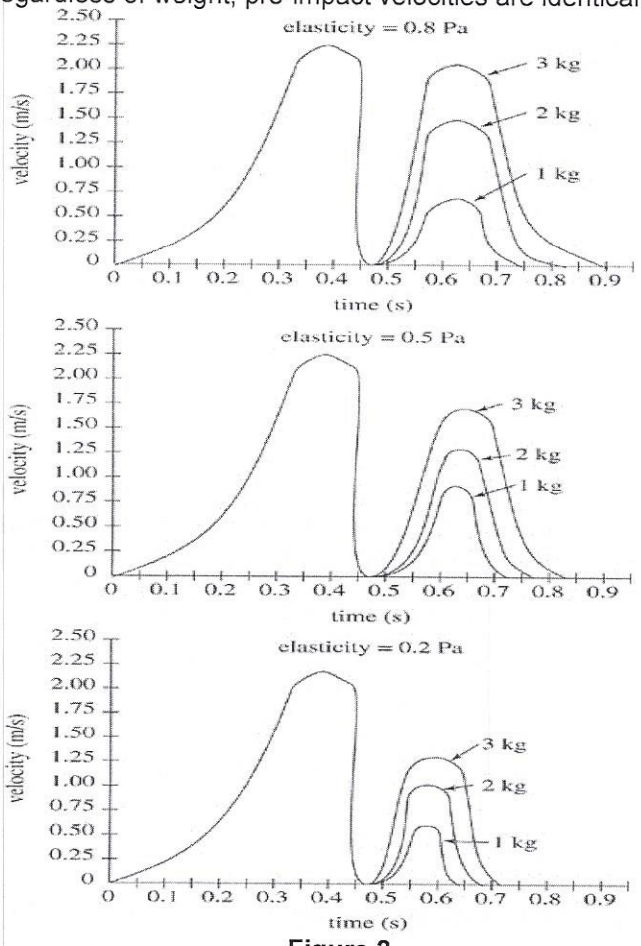

Figure 2

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1. Based on the data in Figure 2, the maximum post-impact velocity of a ball will be smallest if the elasticity of the ball is:

- F. 1.5 Pa.
- G. between 1 and 1.5 Pa.
- H. between 0.5 and 1 Pa.
- J. 0.5 Pa.

2. Based on the information in Figure 2, a ball being dropped from 1 meter height with an elasticity of 0.2 Pa and a weight of 0.5 kg would have a maximum post-impact velocity of:

- A. less than 0.50 m/s.
- B. 0.75 m/s.
- C. 1.0 m/s.
- D. greater than 1.25 m/s.

3. Consider a ball as it completes one bounce, from drop to post-impact apex. If this ball has a weight of 2 kg and an elasticity of 0.50 Pa, based on the data in Figure 2, how many times does the ball have a velocity of 1.00 m/s ?

- F. One time
- G. Two times
- H. Three times
- J. Four times

4. Based on the data in Figure 2, how does the velocity of a ball change as it goes from impact to apex?
Drop to Impact

- A. Increases only
- B. Decreases only
- C. Increases then decreases
- D. Decreases then increases

5. A ball will deform permanently and not spring back off the ground if the velocity with which it hits the ground exceeds the ball's *elastic limit*. Based on the data in Figure 2, if a ball is dropped from one meter and has a weight of 3 kg, an elasticity of 0.8 Pa, and an elastic limit of 2.75 m/s, will the ball deform permanently?

- F. Yes, because the velocity with which the ball hits the ground is less than its elastic limit.
- G. Yes, because the velocity with which the ball hits the ground is greater than its elastic limit.
- H. No, because the velocity with which the ball hits the ground is less than its elastic limit.
- J. No, because the velocity with which the ball hits the ground is greater than its elastic limit.